**RULES**

**ON THE MONITORING OF RADIOACTIVITY
(JV10)**

**UNOFFICIAL TRANSLATION**

*Prepared by the Slovenian Nuclear Safety Administration in December 2018.*

*The official text of the Act is located on the pages of* [***the Legal Information System***](http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV13174)*.*

***WARNING****: The unofficial text of this Act is just an informative work tool, for which the Slovenian Nuclear Safety Administration does not guarantee.*

Based on eleventh paragraph of Articles 159 and second paragraph of Article 162 of the Ionising Radiation Protection and Nuclear Safety Act (Official Gazette of the RS, No. 76/17; hereinafter: ZVISJV-1) the Minister of the Environment and Spatial Planning and the Minister of Agriculture are issuing

#### RULES

**ON THE MONITORING OF RADIOACTIVITY**

* 1. **GENERAL PROVISIONS** **Article 1**

#### (Content)

1. These Rules determine:
	* the structure of the programme for the monitoring of radioactivity, the method and scope of the monitoring of radioactivity in the environment, the types of measurements, sampling methods and the taking of measurements of radioactivity, the quality of equipment for measuring radioactivity, the method for regularly informing the public of the results of measuring radioactivity, the scope and method of preparing and adopting programmes for implementing the monitoring of radioactivity;
	* conditions to be complied with by providers of the monitoring of radioactivity and required accreditation;
	* the structure of the programme for emergency monitoring of radioactivity in a case of increased radioactive contamination of air, precipitation, drinking water, water, the ground, food, animal feed and individual products or materials, and the method of reporting and informing the public of the results of the emergency monitoring of radioactivity;
	* the content and conditions for obtaining a document by which its holder demonstrates that food, animal feed, individual products and secondary metal raw materials or waste are not contaminated by radioactivity.
2. These Rules transpose into law Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 13, 17. 1. 2014, p. 1), last amended with the with the Corrigendum to Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 72, 17.3.2016, p. 69).

#### Article 2 (Definitions)

Definitions used in these Rules shall have the following meaning:

1. **Authorised activity limit values** means the permitted values for the activity of a radioactive substance in a particular medium.
2. **Bio-indicators** means plant and animal organisms which, in a particular environment, concentrate certain types of chemical elements or compounds and react to changes in their concentration in the environment.
3. **Emission** means the discharge of radioactive substances in a particular period. Information on emissions determined at a point of discharge include information of individual activities expressed by a unit of becquerel (hereinafter: Bq), all important radionuclides contained by discharges in the period concerned.
4. **In-situ gamma spectrometry** means a fast, direct method for assessing the concentration of gamma beams in the ground (fast detection of radionuclides in the environment). A detector is pointed downwards and usually fitted at a height of 1 m above the surface area to obtain an average over a larger area.
5. **Indicative dose** means committed equivalent dose for one year of consumed drinking water, intended for assessing exposure of the public in accordance with the methodology described in the regulation governing the monitoring of radioactivity in drinking water.
6. **Ingestion** means consuming food or drink.
7. **Inhalation** means inhaling air and other substances.
8. **Emergency monitoring of radioactivity** means the monitoring of a radioactive field where there is the discharge of radioactive substances in emergency situations.
9. **Concentration of activity and specific activity in the environment (emissions)** means the individual concentration of activity expressed by Bq/m3 and similar or specific activities expressed by Bq/kg and similar, of all [key radionuclides](#_bookmark7) at measuring points caused by an [emission](#_bookmark5).
10. **Measuring method** means the logical sequence of generically described operations used when taking measurements.
11. **Detection level** means typical level for each measuring method, representing the lowest real value of measured quantity that can be determined with a certain degree of confidence.
12. **Early notification network (EDN)** means the system of measuring devices for external radiation or concentration of radionuclides in air or in a collected sediment, by using suitable software for taking automatic measurements, sending results into remote centres and automatic alerting when alert levels are exceeded.
13. **Independent measurements** mean measurements taken in parallel with the programme for the regular operating monitoring of radioactivity, independently from taking measurements by a provider responsible for monitoring radioactivity.
14. **Operating monitoring of radioactivity** means a programme of taking measurements of emissions, emissions and external radiation, and the assessment of effects on people, organisms and the environment. It is carried out during the operation of a nuclear or radiation facility.
15. **Food chain** means part of the ecosystem in which food from the environment reaches the consumer.
16. **Comparable measurements** mean measurements of the same material taken in two or more laboratories to ensure that results match and to ensure the accuracy and robustness of measurements in individual laboratories.
17. **Competent administrative authority** means the administrative authority which the law governing protection against ionising radiation and nuclear safety appoints to implement the provisions of this Act and for surveillance over its implementation.
18. **Radioactive sediment** means radioactive particles deposited from the atmosphere or draining onto surface areas.
19. **Traceability** means connecting a measurement results with reference standards, usually national or international standards, through an uninterrupted chain of comparisons with specified uncertainty,
20. **Specific methods** mean [the measuring methods](#_bookmark9) for determining activities of individual radionuclides, their content or concentration. These methods are different from non- specific measuring methods based on which total activity is being determined.
21. **Standard methods** mean the measuring methods conducted according to methods published as national or international standards.
22. **Evaluation of results** means the assessment of the quality, completeness and reliability of measurement results and their interpretation or comparison with related results with the intention of determining trends, and the assessment of suitability for the purpose for which the results were obtained.
23. **Sample** means the representative part of air, precipitation, water, the ground or other material taken for analysis at a measuring point in a given period. Samples are current, collected or composite. Current sample means a single sample of radioactive material or other substance from the environment. Collected sample means a sample taken in a known time period. Composite sample means a mixture of partial samples taken in a known time period.

#### STRUCTURE OF THE PROGRAMME OF THE MONITORING OF RADIOACTIVITY

**IN THE ENVIRONMENT**

#### Article 3

**(Structure of the programme for the monitoring of radioactivity in the environment)**

1. The monitoring of radioactivity in the environment shall be carried out by considering all important methods of the exposure of the population to ionising radiation which occurs from external radiation, inhalation and [ingestion](#_bookmark6).
2. The monitoring of radioactivity in the environment shall involve the surveillance of all significant transmission paths that can spread radioactivity to a human.
3. The monitoring of radioactivity in the environment shall identify radionuclides which significantly contribute to doses and shall ensure their concentration levels are measured.
4. The measurements taken during the monitoring of radioactivity in the environment shall detect the level of radioactive contamination that is measurable by using standard [measurement methods](#_bookmark9). The measuring of radioactivity shall be carried out in a manner that makes it possible to monitor changes in radioactivity contamination in the environment and external radiation over time.
5. Within the framework of the monitoring of radioactivity in the environment, it shall be necessary to take measurements or collect other data required for interpreting the results of radioactivity measurements and for assessing doses such as information on the amount of precipitation, the flow of rivers, the quantity of pumped water from pump stations for the supply of the population with drinking water and other meteorological data.
6. The results of the monitoring of radioactivity in the environment shall be [evaluated](#_bookmark13) and prepared for use in making the assessment of exposure of the population to the radioactivity of the environment, for calculating the trends of exposure of the population to radioactivity of the environment and for deciding on early measures in the event of an unusual increase in radioactivity in the environment.
7. Part of the monitoring of radioactivity in the environment involves the early notification network, which shall be planned in a way the monitoring of the environment is such that the automatic detection of significant discharges is very likely. The network of early warning shall ensure the immediate automatic notification of competent institutions about alarms.
8. The authority responsible for nuclear safety operates and maintains the early notification network.

#### Article 4

#### (Types of measurements)

1. The measurements of radioactivity [in samples](#_bookmark19) shall be carried out by using [specific methods](#_bookmark17).
2. Notwithstanding the provision of the preceding paragraph, the use of [non-specific measurement methods](#_bookmark18) and low resolution gamma spectrometry shall be allowed where measurements are taken while performing protective measures in an emergency, where other methods are not possible if the radionuclide structure of contamination is known and does not change with time or for monitoring indicative doses.
3. Measuring external radiation, the concentration of radionuclides in air or in collected sediment may be carried out by automatic measuring devices at the place and time of sampling, as a component part of the early notification network or by individual measuring devices fitted in an emergency.

#### Article 5

#### (Methods for sampling and measuring radioactivity)

1. Sampling and preparation of [samples](#_bookmark19) shall be carried out in a manner such that loss of radionuclides during sampling and the preparation of samples for measurements are assessed and are as low as possible.
2. The preparation and measurement of [current](#_bookmark20) and [collected samples](#_bookmark21) shall be carried out as soon as possible after sampling to be able to detect the presence of short-lived radionuclides and to allow for immediate action when radioactivity is higher.
3. [For composite samples](#_bookmark22) the preparation of partial samples shall be carried out immediately after completing sampling, and the measurements immediately after preparing the last partial sample.
4. In a case of periodic sampling, the measurement result shall be known no later than by the end of the next sampling period.
5. In a case of [emergency monitoring of radioactivity](#_bookmark10) the period of sampling for collected and composite samples shall be shorter than the period of sampling [for the monitoring of the environment,](#_bookmark10) and adjusted to given conditions. Detection levels for emergency monitoring under Annex 1 which is a component part of these Rules shall apply.
6. The measurements shall be carried out with calibrated and maintained equipment and their results shall be [traceable](#_bookmark16) according to an internationally recognised standard. Each measurement of samples shall also contain a result and its measurement uncertainty. In a case of the automatic measurement of dose rate within the early notification network, it is not necessary to provide measurement uncertainty.
7. Sampling for the purposes of the early notification network shall be conducted with a frequency that is adjusted according to the measuring method and conditions. The flow of information on measured values from the measuring point to a remote central unit and authorised persons shall be in real time, with minimum delay, according to the topology and capability of communication channels.

#### Article 6

#### (Measuring external radiation of the contamination of air, water, the ground, food, agricultural products, food and animal feed, and objects of general use)

1. External radiation shall be measured by using devices for the uninterrupted measurement of dose rate in air, and by passive measuring devices installed at a height of approximately 1 m from the ground. The uninterrupted measurement devices shall be connected to a system that sends information electronically. Information on measured dose rates shall be continuously monitored and included in the early notification network.
2. The authority competent for nuclear safety shall manage and maintain the early notification network.
3. Outdoor contamination shall be assessed based on measurements of gamma radiation dose rate, using in-situ gamma spectrometry and laboratory tests on soil samples.
4. The contamination of air shall be measured with continuous sampling by pumping air through suitable filters and measuring composite samples, or by automatic sampling- measuring sets which continuously send the results to the early notification network.
5. The concentration of 222Rn in air shall be determined by the method for detecting nuclear traces, by the alpha spectrometry method or by taking measurements of the activity of absorbed 222Rn on activated carbon or by other standard methods. The concentration of radon short-lived decay products shall be determined by the uninterrupted pumping of air through filters and by continually assessing activities using the alpha spectrometry method or another standard method.
6. Samples of rainwater used in the monitoring of radioactivity in the environment and for the operating monitoring of radioactivity shall be collected without interruption for 1 month, at a height of 1 m from the ground using a sampling device with a surface area of at least 0.25 m2.
7. Dry sediment shall be sampled by continuous sampling on baseline boards, placed at a height that allows for the undisturbed collection of sediment. The in-situ gamma spectrometry method may also be used.
8. The radioactivity of surface waters shall be measured in composite samples, except for short-lived radionuclides for which taking current samples is more suitable.
9. For accurate measurements of drinking water as part of the monitoring of the environment, the concentration of 3H, 90Sr, and gamma and alpha beams shall be determined. Parametric values for indicative doses intended for detecting the presence of radioactivity in drinking water, in accordance with regulations governing the monitoring of radioactivity in drinking water, shall be monitored by measuring the total alpha activity and total beta activity.
10. The ground shall be sampled at locations where the ground is level, not fertilised and fallow; to obtain a representative sample it shall be necessary to take at least five columns of soil (10 cm long up to a depth of 50 cm) from which at least five samples from different sampling depths will be prepared to determine the depth profile of the radionuclide concentration and a sample of vegetation (grass) that covers the area. Samples shall be prepared by removing roots and rock. The concentration of gamma beams and 90Sr shall be measured. From the measured concentrations, the radioactivity of sediment shall be calculated. The ground shall be sampled at locations intended for processing food (flood areas, cultivated land, irrigation, etc.) to be able to trace the transmission of typical radionuclides into plants and indirectly into the human body, animals and other organisms.
11. When selecting food samples for the purposes of the monitoring of the environment, the population’s typical eating habits shall be considered. Milk samples shall be taken at dairies or directly at producers’ premises. Samples of other food shall be taken in large shopping centres, markets or directly at producers’ premises. In case of operating monitoring, the selection of food shall reflect the consumption of a particular type of food by people, animals and others, which is in an area affected by nuclear or

radiation facilities. In areas where it is deemed necessary, the areas of sampling of food and the ground must be linked.

1. For sampling of agricultural products, the content of gamma beams and of 90Sr needs to be measured.
2. Samples of complete meals, such as a starter, soup, the main course, salad or dessert shall be taken from large restaurants, shopping centres and commercial centres, schools, kindergartens and other facilities where large numbers of people eat. The concentration of gamma beams and 90Sr shall be measured.
3. Samples of animal feed shall include the taking of measurements of green animal feed, compound feeding stuffs and concentrates. Samples of green animal feed shall be taken from areas where the radioactive contamination of milk is being determined. The concentration of gamma beams and 90Sr shall be measured.
4. Contamination of bio-indicators shall be measured if the presence of radionuclides in the environment is too low to be measurable in the usual samples. The mass of prepared samples of a bio-indicator shall be at least 20 g if conditions for measuring the contamination ensure the lowest level of detection set out for food by these Rules.
5. The detection level for individual measurements under this Article is set out in Annex 1 of these Rules.

#### Article 7

#### (Ensuring the quality of the evaluation of measurement results and dose assessments)

1. Entities responsible for the monitoring of radioactivity in the environment, for the operating monitoring of radioactivity and for emergency monitoring of radioactivity shall have in place a system to ensure quality when requesting the taking of measurements [and evaluating](#_bookmark13) their results.
2. Surveillance of the quality of measurements and of the methodology for evaluating measuring results shall be carried out by the national accreditation authority [while the competent administrative authority](#_bookmark15) shall check the use of information and models in assessing doses and checking documentation on the basis of which the evaluation of measurement results and the assessment of doses shall be performed.

#### CONDITIONS TO BE COMPLIED WITH BY A PROVIDER OF THE MONITORING OF RADIOACTIVITY IN THE ENVIRONMENT

#### Article 8

#### (Conditions for obtaining authorization)

1. A person wishing to obtain an authorization for carrying out the monitoring of radioactivity, excluding a provider responsible for taking measurements of radioactivity of secondary metal raw materials packages, must to obtain the authorization submit an application to the authority competent for nuclear safety.
2. The application must contain the following particulars and documents:
	1. the type, area and scope of the monitoring of radioactivity;
	2. the accreditation of the national accreditation service for conducting testing according to the standard SIST ISO/IEC 17025 and in accordance with the requirements of these Rules for those measurements for which the authorization has been requested;
	3. that it has available measuring equipment that complies with the requirements set out by these Rules and is suitable for the types of measurements for which the authorization is requested;
	4. to provide capacity of measuring equipment which for at least one third exceeds the expected scope of taking measurements for which the authorization is requested;
	5. to have available the qualified personnel, capabilities and sampling equipment necessary for the [emergency monitoring of radioactivity](#_bookmark10) as laid down in Articles [36](#_bookmark92) [and](#_bookmark92) [37](#_bookmark96) of these Rules;
	6. to implement a programme of [comparable measurements](#_bookmark14) and participate in international inter-comparable measurements.
3. In emergency cases involving a special [measuring method](#_bookmark9) for which there is no authorized provider with suitable accreditation for such a method, the accreditation is not required to obtain the authorization. In such a case, measurements shall be carried out as part of the management system of the responsible entity, as approved by the authority competent for nuclear safety in the procedure for issuing the authorization.
4. A nuclear facility or a legal person managing the early notification network does not need an authorization for monitoring radioactivity.

#### Article 9

**(Conditions for obtaining an authorization as a provider of measurements of radioactivity in scrap metal and imported goods that could be contaminated)**

1. A natural or legal person, wishing to obtain an authorization as a provider of measurements of radioactivity in shipments of scrap metal, other waste and imported goods that could be contaminated, shall submit an application containing the provider’s name, address and the registration of its economic undertaking or institute, or the details of the independent entrepreneur requesting the authorization. The applicant must also state the programme for taking measurements for which it is requesting the authorization.
2. The programme for measuring radioactivity shall contain:
	1. the description of equipment used for taking measurements;
	2. the programme for training workers who will take measurements;
	3. the list of workers who will take measurements and evidence of their training;
	4. the form of the report on measurements taken; and
	5. the written processes for taking measurements, checking the functioning of used measuring devices and taking actions in the event of increased radioactivity in the shipment.
3. The programme for measurements under the preceding paragraph shall ensure that the provider for taking measurements detects the gamma radiation dose rate on surface areas that are 20 % higher than the radiation dose rate in the natural environment.
4. A positive opinion of the authorized expert on radiation safety shall be enclosed with the measurement programme.

#### Article 10

#### (Issue and withdrawal of authorization)

1. An authorization of a provider for taking the measurements of radioactivity under Articles [8](#_bookmark35) or [9](#_bookmark37) of these Rules shall be issued by the authority competent for nuclear safety for five years at most.
2. The authority competent for nuclear safety shall withdraw the authorization of an authorized provider of the monitoring of radioactivity, or a provider for taking the measurements of radioactivity in scrap metals and imported goods that could be contaminated before its expiry should an inspector competent for nuclear safety propose it because conditions under Articles [8](#_bookmark35) or [9](#_bookmark37) of these Rules are no longer complied with.

#### Article 11

#### (List of authorized providers)

1. For the purposes of carrying out [the monitoring of radioactivity in the environment](#_bookmark10), the authority competent for nuclear safety shall keep a list of authorized providers of the monitoring of radioactivity and a list of authorized providers for taking measurements of radioactivity in scrap metal and imported goods that could be contaminated. The authority competent for nuclear safety shall publish the list on its web pages.
2. The list of authorized providers under the preceding paragraph shall contain the following information:
	1. name and place of establishment of provider;
	2. type, field and [scope](#_bookmark12) of providing the monitoring of radioactivity for which an authorization has been issued; and
	3. the validity of authorization.

#### Article 12

**(Other obligations of the provider of monitoring of radioactivity in the environment)**

1. If a provider responsible for monitoring radioactivity finds radioactive contamination in tested [samples](#_bookmark19) which exceeds criteria under Article [17](#_bookmark54) of these Rules, it shall immediately report to the authority competent for nuclear safety.
2. If increased radioactive contamination occurs or is expected in a State, the provider of the monitoring of radioactivity in the environment shall increase the scope of measurements to determine the level of contamination, in accordance with the programme under Annex 8 which is a component part of these Rules.
3. Additional measurements under the preceding paragraph shall be paid for by the provider; when a polluter is not known or the contamination comes from abroad, it shall be paid for by the authority competent for the monitoring of the environment.
4. A provider responsible for monitoring radioactivity shall immediately report to a competent administrative authority the results from measuring contamination when detecting the presence of a new radionuclide which was not anticipated in the programme for the monitoring of radioactivity in the environment, when detecting an increased concentration of radionuclides compared to past samples or when results are similarly unusual.
5. When the measurement of dose rates of external radiation is interrupted, a provider responsible for monitoring radioactivity shall make available the uninterrupted monitoring of measurement results to the competent administrative authority or the provider of operational or emergency monitoring of radioactivity which had requested the monitoring of radioactivity,
6. A provider responsible for monitoring radioactivity in the environment shall provide records of measurements in the electronic format specified by the competent administrative authority, in accordance with Annex 9, which is a component part of these Rules, and keep its own records of measurements taken.

#### MONITORING OF RADIOACTIVITY IN THE ENVIRONMENT

#### Article 13

#### (Objective and content of the monitoring of radioactivity in the environment)

1. The objective of [the monitoring of radioactivity in the environment](#_bookmark10) is to assess population doses of global and local pollution from the use of ionising sources of radiation and from natural sources of radiation.
2. In a case of a sudden increase in radiation, the monitoring of radioactivity in the environment shall provide information for the timely implementation of protective measures.

#### Article 14

#### (Method and scope of the monitoring of radioactivity in the environment)

1. As part of [the monitoring of radioactivity in the environment](#_bookmark10) it shall be necessary to measure external radiation above ground, the concentration of radionuclides in [samples](#_bookmark19) from the environment, drinking water, food and animal feed.
2. The monitoring of radioactivity in the environment shall include the taking of measurements of:
	1. doses and dose speed above ground;
	2. radioactivity of aerosols in air;
	3. radioactivity of the ground;
	4. radioactivity of precipitation and dry [radioactive sediment](#_bookmark15);
	5. radioactivity of surface water, groundwater and sediment;
	6. radioactivity of drinking water from the water supply, wells and rainwater;
	7. radioactivity in food or prepared meals;
	8. radioactivity in animal feed;
	9. radioactivity of bio-indicators and individual products where necessary.
3. The structure of the monitoring of radioactivity in the environment, including spatial and time distribution of sampling and measurements, and the types of radionuclides that need to be monitored, are set out in detail in Annex 2, which is a component part of these Rules.
4. As part of the monitoring of radioactivity of the environment, it shall be necessary to ensure the sampling is carried out with sufficient frequencyat locations distribute in the manner to enable the assessment of the exposure of the population and the environment in the Republic of Slovenia.

#### Article 15

#### (Preparation and adoption of the annual programme)

1. The annual programme [for the monitoring of radioactivity in the environment](#_bookmark10) shall be prepared by responsible entities under paragraph 3 of the preceding Article, based on the structure of the programme under [Annex 2](#_bookmark115) of these Rules.
2. The annual monitoring programme of radioactivity in the environment referred to in the preceding paragraph shall be prepared each year no later than 30 November for the next year.
3. The preparation of the annual monitoring programme of radioactivity shall ensure that changes in the environment are considered as well as new knowledge on the effects of the radioactivity of people and the environment.

#### Article 16

#### (Reporting on the implementation of the annual programme)

1. The provider of the [monitoring of radioactivity in the environment](#_bookmark10) shall report to the [competent administrative authority](#_bookmark15) in an annual report on the implementation of the monitoring programme of radioactivity in the environment, no later than 15 March of the current year for the past year. No later than 20 March of the current year it shall prepare a preliminary report for the past year and send it to the competent authority.
2. The annual report on the implementation of the monitoring programme on radioactivity in the environment shall contain:
	1. table presentation of prescribed programme measurements;
	2. list of techniques used for sampling, [sample](#_bookmark19) preparation and the taking of measurements;
	3. measurement results and their measurement uncertainty;
	4. geographic coordinates of the sampling and measurement locations;
	5. [evaluation of](#_bookmark13) results of measurements, including a description of methodology;
	6. results [of comparable measurements](#_bookmark14) of the providers of radioactivity monitoring; and
	7. dose assessments.
3. In addition to the measurement results, the annual report must also contain information on sampling, sample preparation and the auxiliary quantity for evaluating the results.
4. Specific activities of all registered radionuclides shall also be stated in the annual report, together with the results of measurements with spectrometric methods.
5. A collection of records on the taking of measurements of radioactivity in an electronic form shall be enclosed with the annual report as laid down by Annex 9 of these Rules.
6. In the annual report, the provider responsible for the monitoring radioactivity in the environment shall also state a proposal for changing the [scope](#_bookmark12) of monitoring of radioactivity in the future, if there are grounds for such a change.

#### Article 17

#### (Criteria for special notification)

While carrying out the [monitoring of radioactivity in the environment](#_bookmark10), the provider of the monitoring of radioactivity shall inform the [competent administrative authority](#_bookmark15) if the results of radioactivity measurement for an individual radionuclide in the same sample line for two consecutive measurements exceed:

* 1. a value ten times the annual average measured in past years; or
	2. the detection level when the level in the past years was not exceeded for that radionuclide.

#### Article 18

#### (Method of storing records)

1. Records on the results of the [monitoring of radioactivity in the environment](#_bookmark10) shall be kept by the entities obligated to perform the monitoring of radioactivity and by the providers of the monitoring of radioactivity.
2. The records referred to in the preceding paragraph shall contain:
	1. the information on sampling and preparing [samples](#_bookmark19);
	2. the geographic coordinates of the sampling and measurement locations;
	3. the measuring conditions (time of measuring, sample geometry, etc.);
	4. the information on parameters used in analysis and on intermediate results;
	5. the measurement results and their measurement uncertainty.
3. The records referred to in paragraph 1 of this Article shall be organized in a manner that allows for their use in analysing the trends of radioactivity in the environment and for other analyses.
4. The records referred to in paragraph 1 of this Article shall be kept permanently by entities obligated to perform the monitoring of radioactivity, while the providers of the monitoring of radioactivity shall keep them for five years after taking the measurements.

#### OPERATING MONITORING Article 19

#### (Objective and scope of operating monitoring of radioactivity)

1. By carrying out the operating monitoring of radioactivity, an operator of a radiation or nuclear facility and a facility that may release radioactive substances into the environment (hereinafter: other facility) demonstrates that the activities of discharges during normal operations do not exceed authorized activity limit values, that operating facilities do not cause exposure of the population to radiation above authorized dose constraints and limit doses set out by regulations and in an operating permit, and that other requirements of competent administrative authorities concerning the radiological influence of the facility on the public and the environment have been satisfied.
2. A provider of operating monitoring of radioactivity shall, in a case of discrepancy in measurement results from the authorized dose constraints and the authorized limit values set out in regulations and in an operating permit or in a permit for carrying out a radiation activity, immediately inform [the entity obligated for the operating monitoring activity](#_bookmark3) and [the authority](#_bookmark15) responsible for radiation safety and, if the facility operates in the healthcare or veterinary fields, also inform [the authority](#_bookmark15) responsible for protection against radiation.
3. [The scope of](#_bookmark12) the operating monitoring of radioactivity shall be proportionate to the characteristics of the source, expected discharges of radioactive substances and the structure of radionuclides in discharges, taking into account their importance through different exposure paths.
4. The operating monitoring of radioactivity shall be carried out by supervising the actual source of radiation which shall include measuring discharges of radioactive substances ([emissions](#_bookmark5)) in air and water and measuring the external radiation of the facility, and by taking measurements in the environment [(emissions](#_bookmark8)) which shall include external radiation and radionuclide content in air, precipitation, radioactive sediment, surface and groundwater, sediment, bio-indicators, drinking water, food and animal feed.
5. The operating monitoring of radioactivity shall include the taking of measurements of radioactivity, collecting radiological and other information and calculations for the spread of radioactive substances and transmission paths in accordance with safety analysis.

#### Article 20

#### (Method of carrying out the operating monitoring of radioactivity)

1. Discharges from a nuclear or radiation facility and levels of radiation in the environment shall be determined by:
	1. uninterrupted taking of measurements of [emissions](#_bookmark5);
	2. interrupted sampling and taking of measurements from [samples](#_bookmark19);
	3. occasional sampling and taking of measurements of samples in a laboratory;
	4. assessment of emissions of radioactive substances and occasional taking of measurements of radioactivity of these discharges;
	5. additional occasional checking of the radiological state of the environment at locations and by methods that allow for the verification of information on emissions of radioactive substances;
	6. systems using measuring devices that automatically take measurements, that send results to a remote centre and issue an automatic alarm when alarm limits are exceeded.
2. The selected method of taking measurements under the preceding paragraph shall depend on the characteristics and the quantity of released radionuclides, the expected time changes of discharges of radioactive substances, and the likelihood of unplanned discharges of radioactive substances that require immediate detection.
3. Measurements and sampling of radioactivity in the environment shall take place at locations where the spread of radiation into the atmosphere is the greatest influence, where there is a nuclear or other facility and in the direction of the water current in case of discharges into surface and groundwater. Most measurements shall be taken at the same locations over longer periods of time to show monitoring trends.
4. Procedures for measuring radioactivity shall include additional criteria and sampling locations which are in the opposite direction of the dominant wind and in the opposite direction of the water current to allow for the assessment of radiological environmental conditions, and include points near larger agglomerations.
5. [Operating monitoring of radioactivity](#_bookmark10) in the vicinity of a radiation, nuclear or other facility may be carried out only by an organisation complying with all the conditions under Article [8](#_bookmark35) of these Rules and which is independent of the [provider of the operating monitoring](#_bookmark3); an entity can take measurements of emissions of radioactive substances and operate the early notification network.

#### Article 21

#### (Pre-operating and post-operating monitoring of radioactivity and long-term surveillance)

1. The scope of pre-operating and post-operating monitoring of radioactivity shall be approved by the competent administrative authority as part of a safety report in the procedure for obtaining a construction permit with the intention to determine the initial radioactivity state.
2. [The scope](#_bookmark12) and duration of pre-operating monitoring of radioactivity shall be proportionate to the expected influence of radiation or of a nuclear facility on the environment. It shall provide information for comparing the state during operation of radiation or of a nuclear facility.
3. As part of the pre-operating monitoring of radioactivity, it shall collect additional information on geological, hydrological, meteorological and ecological conditions, food and animal feed, vegetation, farmed animals, use of land and eating habits of the public.
4. The scope of post-operating monitoring of radioactivity shall be approved by the competent administrative authority in a permit for terminating the operation of a radiation or nuclear facility. The programme of post-operating monitoring of radioactivity shall be prepared by the operator of a radiation or nuclear facility as part of safety report for decommissioning the facility.
5. The scope and duration of post-operating monitoring of radioactivity shall be proportionate to the expected influence of radiation or a nuclear facility on the environment when terminating its operation and until the end of its decommissioning.
6. The scope of long-term surveillance shall be approved by the [competent](#_bookmark15) administrative authority in a permit for decommissioning of a tradition or nuclear facility, with the intention to monitor its condition and ensure its long-term stability. The programme of long-term surveillance of radioactivity shall be prepared by the operator of a radiation or nuclear facility as part of a safety report for decommissioning the facility.
7. The scope of long-term surveillance of radioactivity shall be proportionate with the expected influence of a closed facility on the environment and shall ensure the checking of compliance of possible influences on the environment in accordance with the safety report for decommissioning the facility.

#### Article 22

#### (Programme for operating, pre-operating and post-operating monitoring of radioactivity and long-term surveillance)

1. In the programme for [the operating and post-operating monitoring of radioactivity](#_bookmark10) it shall be necessary to determine the following elements:
	1. types of discharges such as atmospheric and liquid;
	2. main transmission paths and typical reference persons;
	3. radionuclides which most significantly contribute to exposure;
	4. monitoring of other necessary information such as geological, hydrological, meteorological and ecological conditions, food and animal feed, vegetation, farmed animals, use of land and eating habits of the public.
2. The preparation of the programme for the monitoring of radioactivity shall be carried out in the following order:
	1. the identification of facilities and locations of discharges of radioactive substances and the assessment of the quantity of discharged radioactive substances;
	2. the identification of the transmission into the environment through the atmosphere or water as an external radiation or in another way;
	3. the determination of the exposure path of the radioactive radiation such as exposure due to external radiation inhalation or [ingestion](#_bookmark6),
	4. the identification and assessment of exposure of the reference individual and comparison with dose constraints;
	5. the preparation of the programme for taking measurements of [emissions](#_bookmark5) of radioactive substances and the radioactivity of the environment, and collecting other data for assessing the radioactivity of the environment; and
	6. the preparation of the programme for performing [special radioactivity monitoring.](#_bookmark10)
3. The radioactivity monitoring programme shall be prepared by the operator of a radiation or nuclear facility as part of the safety report of the facility which shall be confirmed by the competent administrative body when issuing consent for the test operation of the facility and the operating license.
4. The radioactivity operating monitoring programme for another facility shall be confirmed by the [competent administrative authority](#_bookmark15) in the permit for carrying out radiation activity or for the use of a radiation source.
5. The entity responsible for the operating monitoring shall, at least every five years, review the programme for the operating monitoring of radioactivity of a radiation or nuclear facility and examine any changes in the procedure for approving changes, in accordance with the provisions of the law governing safety against ionising radiation and nuclear safety.
6. When examining the programme for the operating monitoring under the preceding paragraph, the entity responsible for the operating monitoring shall consider changes in the operation of a facility that affect radioactive discharges and changes in the environment that could significantly affect the transmission of radioactive substances, the exposure path as well as the findings in the report on the performance of the radioactivity operating monitoring. The responsible entity shall immediately verify the suitability of the programme when changes to elements in paragraph 1 of this Article occur and when they affect safety analysis or the assessment of safety functions.
7. The provisions of paragraphs 1 and 2 of this Article shall apply to the programme for pre-[operating monitoring of radioactivity](#_bookmark10) and to the programme of long-term surveillance.

#### Article 23 (Transmission paths)

1. An entity obligated for the operating monitoring shall ensure that the programme for pre- operating, operating and post-operating of radioactivity evaluates the main transmission paths for radiating the public and individuals from:
	1. direct external radiation from the facility, exposure to external radiation of a radioactive cloud or water, radiation from radionuclide sediments, radiation on the ground, sediments in surface water or other areas and exposure from skin contamination;
	2. internal radiation after inhalation of radionuclides from a cloud, consumption of contaminated food and drink, and inhalation of radionuclides from particles blown from surface areas.
2. The importance of individual transmission paths shall be determined based on:
	1. the radiological properties of emitted substances such as alpha, beta and gamma beams, half-life or radio-toxicity;
	2. the physical and chemical properties of emitted substances;
	3. mechanisms for spreading such as the height of a discharge and meteorological conditions, and environmental properties such as topography, climate, use of land and type of agricultural products; and
	4. local distribution of the population, its age and structure, eating habits and other habits.

#### Article 24 (Reference person)

1. An entity responsible for the operating monitoring shall identify one or more reference people from the population, representing individuals who receive or could receive a higher dose. People with extreme or unusual habits cannot be taken into consideration when making this selection.
2. The reference people may be different for different transmission paths and individuals may be differently exposed, in which case the assessment of exposure shall add up doses of all transmission paths.
3. Regarding the reference person, the entity obligated for the operating monitoring shall collect basic information about habits of the population included in the group, such as time indoors and outdoors, eating and living habits (for example most frequent outdoor sport, fishing, intensive gardening, picking mushrooms, swimming in rivers, etc.).
4. The information referred to in the preceding paragraph shall be collected for all age groups of the population and checked every five years. Any changes shall be examined in a procedure laid down for approving changes in accordance with the provisions of the law governing safety against ionising radiation and nuclear safety.

#### Article 25

#### (Age group of the population)

1. To assess exposure of the population, it shall be sufficient to asses doses of three age groups: babies up to one year, children from 7 to 12 years and adults older than 17 years.
2. Embryo doses need to be considered only when discharges contain significant quantities of radionuclides which can significantly affect development.

#### Article 26 (Assessment of exposure)

1. The assessment of exposure to radiation from the influence of a radiation, nuclear or other facility shall be real and cannot be based on value detection levels as these do not represent the values of actual activity or the level of radiation; instead, they shall be based on the results from the surveillance of radioactivity in the environment.
2. If the operating monitoring on the basis of a chapter [V](#_bookmark58) of these Rules does not provide sufficient information on radiological influences of a facility because the measured results are below detection levels or the measured results are deleted from natural changes of radioactivity, the assessment of exposure shall be based on information on [emissions](#_bookmark5) of radioactive substances and calculations on the basis of suitable models, taking into account meteorological information from atmospheric discharges, and hydrological information on the flow of surface and groundwater for liquid discharges.
3. The assessment of exposure to radiation shall consider radionuclides in terms of their actual composition at the time of discharge, separately treating radionuclide groups such as 3H, 14C, iodine radioisotope, nobel gases, fission and corrosion product, a group of alpha beams and a group of beta beams. Radon 222Rn and thoron 220Rn with their short-lived progeny shall be considered in terms of the nature of discharges from a facility and the importance of the transmission path.
4. The assessment of radiation exposure shall be as realistic as possible, considering habits and characteristics of a local population.

#### Article 27

#### (Assessment of exposure from the nuclear power plant)

1. To evaluate the influence of atmospheric discharges, it shall be necessary to define the influence of the following groups of radionuclides:
	1. tritium 3H and its physico-chemical structure;
	2. 14C and its physico-chemical structure;
	3. Iodine radioisotopes and their physico-chemical structure;
	4. noble gases;
	5. other beta or gamma beams; and
	6. alpha beams.
2. To evaluate the influence of liquid discharges, it shall be necessary to define the influence of the following groups of radionuclides:
	1. tritium 3H;
	2. other beta or gamma beams;
	3. alpha beams; and
	4. 14C and its physico-chemical structure.
3. When assessing doses from atmospheric and liquid discharges from the nuclear power plant, it shall be necessary to consider the method and paths of exposure set out in Annex 3 which is a component part of these Rules. The selection of examined transmission paths shall contain all specific exposures resulting from local conditions or special features.
4. The structure of the programme for operating monitoring of radioactivity of radiation quantity for the nuclear power plant is set out in [tables 1](#_bookmark118), [2](#_bookmark119) and [3](#_bookmark120) in Annex 4 which is a component part of these Rules. Detailed content is part of the safety report, approved by the competent administrative authority in procedures for giving consent to start test an operation and to issue an operating permit.

#### Article 28 (Research reactor)

1. The structure of the programme for operating monitoring of the radioactivity of radiation for a research reactor is set out in [tables 1](#_bookmark122)and [2](#_bookmark123) in Annex 5 which is a component part of these Rules. Detailed content is part of the safety report, approved by the competent administrative authority in procedures for giving consent to start a test operation and to issue an operating permit.
2. With atmospheric discharges from the research reactor, it shall be particularly necessary to measure [emissions](#_bookmark5) of radionuclide 41Ar and other radionuclides from the reactor hall.

#### Article 29

#### (Uranium mine with surrounding facilities and a repository of mining and hydro- metallurgical tailings)

1. [The operating monitoring of the radioactivity](#_bookmark10) of radiation quantity from the uranium mine, its surrounding facilities and other facilities for processing raw ingredients containing radioactive substances, and for the repository of mining and hydro-metallurgical tailings, shall include all sources of [emissions](#_bookmark5) of radioactive substances that, according to assessment, contribute to the exposure of the population near the facility.
2. For atmospheric discharges from the uranium mine, surrounding facilities and other facilities used for processing raw ingredients, it shall be particularly necessary to measure the emission of 222Rn.
3. For liquid discharges, it shall be necessary to measure emissions 238U and 226Ra, and radionuclides 230Th and 210Pb.
4. The structure of the programme for the operating monitoring of the radioactivity of radiation under paragraph 1 of these Rules is set out in Annex 6 which is a component part of these Rules. Detailed content is part of the safety report for a particular facility, approved by the [competent](#_bookmark15) administrative authority in procedures for giving consent to start a test operation to issue an operating permit, for the repository and a permit for its decommissioning.

####

#### Article 30

#### (Warehouse and repository of low and medium radioactive waste)

1. [The operating monitoring of radioactivity](#_bookmark10) for a warehouse and a repository of low and medium radioactive waste shall include surveillance of atmospheric and liquid discharges and their measurements, their design is set out in tables 1 and 2 of [Annex 7](#_bookmark127) which is a component part of these Rules. Detailed content is part of the safety report for a particular facility, approved by the competent administrative authority in procedures for giving consent to start a test operation and to issue an operating permit.
2. For discharges from a warehouse and a repository of low and medium radioactive waste, the [emissions](#_bookmark5) of radionuclides 3H, 137Cs, 14C in 222Rn or radionuclides considered in safety analysis, and those monitored during pre-operating monitoring, shall be measured.

#### Article 31

#### (Other facilities for carrying out radiation activities)

1. As part of preparations for the assessment of protection against radiation for other facilities, the assessment shall be made if the expected exposure of the reference person is above 10 μSv per year.
2. The assessment under the preceding paragraph shall consider:
	1. direct influence of external radiation from the facilities;
	2. type, form and quantity of discharged radioactive substances into the environment;
	3. most important exposure paths for the reference person; and
	4. model for spreading discharged radioactive substances into the environment.
3. When assessing doses of reference persons under paragraph 1 of this Article, extreme scenarios of exposure of the public to radiation shall not be considered.
4. If the results of dose assessments for the reference person under paragraph 1 of this Article show the expected exposure is above 10 μSv per year, the competent administrative authority shall, in a procedure for issuing a permit for carrying out a radiation activity, specify that the [operating monitoring of radioactivity](#_bookmark10) must be carried out and inform thereof the authority competent for nuclear safety.

#### Article 32

**(Regular and emergency reporting on operating and post-operating monitoring of radioactivity and long-term surveillance)**

1. The entity obligated for the operating or post-operating monitoring of radioactivity shall report to the competent administrative authority by way of an annual report on implementing the monitoring programme no later than 15 April of the current year for the past year. No later than 20 March of the current year it shall prepare a preliminary report for the past year and send it to the competent authority.
2. The annual report shall include:
	1. table presentation of prescribed programme measurements;
	2. list of techniques used for sampling, [sample](#_bookmark19) preparation and the taking of measurements;
	3. measurement results and their measurement uncertainty;
	4. geographic coordinates of the sampling and measurement locations;
	5. evaluation of the results of measurements, including a description of methodology;
	6. results of [comparable measurements](#_bookmark14);
	7. dose assessments; and
	8. results of the independent control with comments.
3. In addition to the measurement results, the annual report must also contain information on sampling, sample preparation and the auxiliary quantity for evaluating the results.
4. Specific activities of all registered radionuclides must also be stated in the report, with the results on measurements using spectrometric methods.
5. A collection of electronic records on the measurements of radioactivity must be enclosed with the annual report, in the format prescribed by the [authority](#_bookmark15) competent for nuclear safety in the annual monitoring report of radioactivity in the environment, based on the fifth paragraph of Article [16](#_bookmark52) of these Rules.
6. The annual report shall also contain a proposal for a modified [scope](#_bookmark12) [of operating or post-operating monitoring of radioactivity](#_bookmark10) in the future when there are justified reasons for such a change.
7. During operating or post-operating monitoring of radioactivity, the entity obligated shall report to the competent administrative authority if the measurement results of radioactivity for an individual radionuclide exceed:
	1. a value ten times the annual average, measured in past years in the environment due to emissions, within 15 days of detection;
	2. the prescribed low detection level, if the limit for this radionuclide in the last 12 months was not exceeded, within 15 days of detection;
	3. the limit values for emissions set out in operating conditions and restrictions, within 12 hours.
8. The report under the preceding paragraph shall contain an explanation of reasons and corrective measures to prevent limits being exceeded again.
9. The provider of operating monitoring of a facility in which sudden and significant discharges into the atmosphere can occur shall have information from automatic stations as part of the early notification network near the facility or in the area of the facility, and ensure continuous immediate transmission of this information to the authority competent for nuclear safety at intervals set out in the programme for the operating monitoring of radioactivity.
10. The entity obligated for the operating and post-operating monitoring and for long-term surveillance shall inform the public of the content of the last annual report under point 2 of this Article and of the emergency report when dose constraints for the reference person are exceeded.

####

#### Article 33

#### (Independent surveillance of operating monitoring of radioactivity)

1. [The competent administrative authority](#_bookmark15) shall ensure that [measurements of](#_bookmark11) [emissions](#_bookmark11) and [immissions](#_bookmark8) are taken independently; they may not be taken by the provider responsible for the monitoring of radioactivity, which will take the same measurements for the provider of operating monitoring. The programme of independent measurement shall be determined by the competent administrative authority each year.
2. The costs of carrying out surveillance measurements under the preceding paragraph shall be covered by the [provider of operating monitoring.](#_bookmark3)
3. The provider of independent surveillance shall report to the competent administrative authority on measurements taken.

#### EMERGENCY MONITORING OF RADIOACTIVITY Article 34

#### (Objective of emergency monitoring of radioactivity)

1. [Emergency monitoring of radioactivity](#_bookmark10) shall be carried out in emergency situations to ensure timely:
	1. information on the level and type of external radiation and radioactive contamination;
	2. information required by the competent administrative authority to perform protect and rescue tasks in the national plan and in the event of a nuclear accident [national plan for protection and rescue in an emergency situation](http://zakonodaja.gov.si/rpsi/r04/predpis_DRUG2184.html) (hereinafter: national plan) to determine the required protective measures;
	3. information required to decide on the type and level of protection required by providers of protective measures;
	4. information required to inform the public of the level of danger;
	5. information required for categorised individuals who need to be medically monitored for a longer period of time after the event;
	6. information for international information exchange;
	7. information needed for the dose assessments of providers of protective measures and the population.
2. [Emergency monitoring of radioactivity](#_bookmark10) shall consist of taking measurements of radioactivity at the source of radiation, in the environment and of the population.

#### Article 35

#### (Programme of emergency monitoring of radioactivity)

1. The programme of emergency monitoring of radioactivity in an emergency in a nuclear or radiation facility shall be prepared by the operator of that facility as a special section of the programme for the operating monitoring under Article [22](#_bookmark65) of these Rules.
2. The programme of emergency monitoring of radioactivity in an emergency abroad or if a radiological accident occurs in the Republic of Slovenia shall be prepared by the authority competent for nuclear safety during the early phases of the emergency. The same authority will immediately inform the providers of emergency monitoring and manage the programme’s implementation during the emergency.
3. Regarding the emergency detailed in the preceding paragraph of this Article, the programme may be adjusted according to the development of events.
4. The structure for preparing the programme for emergency monitoring under the first two paragraphs of this Article is set out in [Annex 8](#_bookmark130) of these Rules.
5. At the request of the authority competent for nuclear safety, entities obligated for the emergency monitoring of radioactivity shall immediately send the results of their measurements of radioactivity in an emergency.
6. At the request of the authority competent for nuclear safety, the entities responsible for the emergency monitoring of radioactivity shall enlarge the scope for taking measurements of radioactivity in the environment in an emergency, in accordance with point 4 paragraph 1 of Article [8](#_bookmark35) of these Rules.

#### Article 36

#### (Additional conditions for providers responsible for monitoring radioactivity during emergency situations)

1. Providers of emergency monitoring of radioactivity who take measurements in emergencies shall:
	1. have available suitable equipment for personal radiological protection;
	2. be adequately skilled to work in conditions of increased radiation and under stress;
	3. protect measuring equipment and access to measuring areas to prevent their contamination.
2. Providers of emergency monitoring of radioactivity in the field shall be treated as providers of protective measures.

#### Article 37

#### (Measuring equipment for the emergency monitoring of radioactivity)

In accordance with conditions for obtaining authorisation under Article [8](#_bookmark35) of these Rules, a provider of emergency monitoring shall have available suitable equipment for taking measurements of:

* 1. gamma, beta and neutron dose rates;
	2. gamma doses in the environment, personal gamma doses and neutron doses;
	3. surface contamination with alpha, beta and gamma beams;
	4. specific activities of beta and gamma beams.
	5. total activity of alpha, beta and gamma.

#### Article 38

#### (Maintaining preparedness for emergency monitoring of radioactivity)

1. A provider of emergency monitoring of radioactivity shall be in a constant state of preparedness for the emergency monitoring of radioactivity by:
	1. having a suitable number of available and adequately trained individuals for taking measurements of radioactivity in emergency conditions; a suitable number means at least two teams in which each member can take individual measurements under Article [37](#_bookmark96) of these Rules;
	2. regularly maintaining, testing and calibrating measuring devices and other equipment used in emergency situations;
	3. checking the preparedness of individuals participating in emergency monitoring of radioactivity through the occasional taking of measurements in the field and during exercises. The annual programme for taking measurements in the field is prepared by the provider of emergency monitoring in accordance with table 3 Annex 8 of these Rules;
	4. preparing procedures for every task, measurement and analysis as part of emergency monitoring of radioactivity; and
	5. conducting inter-laboratory and other [comparable measurements](#_bookmark14), including by international institutions or laboratories.
2. The costs of maintaining preparedness for emergency monitoring shall be covered [by the provider of monitoring](#_bookmark3).

#### Article 39

#### (Reporting on the emergency monitoring of radioactivity)

1. A provider of emergency monitoring of radioactivity or the direct provider of emergency monitoring of radioactivity shall, as fast as possible, report electronically to the authority competent for nuclear safety on the measurements of radioactivity during an emergency.
2. The provider of emergency monitoring shall, no later than 14 days after the emergency, deliver to the authority competent for nuclear safety a report on the [emergency monitoring of radioactivity](#_bookmark10) which shall contain:
	1. measurement results and their measurement uncertainty;
	2. the period for which the results are valid;
	3. the geographic coordinates of the sampling and measurement points;
	4. information on sampling and [samples](#_bookmark19);
	5. information on auxiliary quantity for [evaluating](#_bookmark13) results;
	6. short and long-term assessment of received doses for a population group that received the largest doses and the population as a whole.

#### DOCUMENT ON RADIOACTIVE CONTAMINATION Article 40

**(Content and conditions for obtaining a document on the level of contamination)**

1. A person wishing to obtain a document to demonstrate that in the event of increased radioactive contamination (hereinafter: document) its food, animal feed, individual products or waste (hereinafter: goods) are not radioactively contaminated, shall request the competent administrative authority to issue such a document.
2. If the application under paragraph 1 of this Article concerns food or animal feed, the applicant shall submit a certificate of measurements taken by a provider responsible for monitoring radioactivity which shall confirm that the content of radionuclides does not exceed limit values under Council Regulation (Euratom) No. 2016/52 of 15 January 2016, laying down the maximum permitted levels of radioactive contamination of food and animal feed following a nuclear accident or any other case of radiological emergency and repealing Regulation (Euratom) No. 3954/87 and Commission Regulations (Euratom) No. 944/89 and (Euratom) No. 770/90 (OJ L 13, 15. 1. 2016, p.2).
3. If the application under paragraph 1 of this Article concerns individual products or waste, the applicant shall enclose a certificate of measurements taken by the authorised provider of radiation protection or the provider responsible for measurements of radioactivity who is authorised to take such measurements. This certificate shall demonstrate that the content of radionuclides does not exceed limit values of radioactive contamination set out by regulations governing dose limits, radioactive contamination and intervention levels.
4. If the person wishes to export or take out from the Republic of Slovenia goods under paragraph 2 of this Article, the certificate of measurements taken under paragraph 2 of this Article shall also contain the information required for completing the form in Annex 1 to [Commission Regulation (EC) No. 1621/2001 of 8 August 2001](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ%3AL%3A2001%3A215%3A0018%3A0022%3AEN%3APDF) amending Regulation (EC) No. 1661/1999 as regards the export certificate required for agricultural products and the list of customs offices permitting the declaration of products for free circulation in the Community (OJ L 214, 9. 8. 2011, p. 18; hereinafter: Regulation 1621/2001/EC).
5. If a person requires the document under paragraph 1 of this Article for internal trade in the Republic of Slovenia or for export or removal of individual products or waste, the certificate of measurements taken shall have similar content as that prescribed in the form in Annex 1 to Regulation 1621/2001/EC.

#### Article 41

#### (Issuing the document on level of contamination)

1. If the person under paragraph 1 of Article 40 of these Rules requires the document for export or removal of food or animal feed from the Republic of Slovenia, [the competent administrative authority](#_bookmark15) shall, on the basis of a certificate of a provider responsible for monitoring radioactivity under [paragraph 4 of the preceding Article](#_bookmark106) issue the document on the form in Annex 1 to Regulation 1621/2001/EC.
2. If the person under paragraph 1 of Article 40 of these Rules requires the document for the release of individual products or waste or for the internal release of food or animal feed, the competent administrative authority shall, based on a certificate of an authorised provider of radiation protection or a provider responsible for monitoring radioactivity under paragraph 3 of the preceding Article, issue the document on the form in Annex 1 to Regulation 1621/2001/EC.

#### TRANSITIONAL AND FINAL PROVISIONS Article 42

#### (End of validity)

On the day, these Rules enter into force the Rules on the monitoring of radioactivity (Official Gazette of the RS, No. 97/09) shall cease to have effect.

#### Article 43 (Entry into force)

This Decree shall enter into force on the fifteenth day after its publication in the Official Gazette of the Republic of Slovenia.

Number: 007-237/2017
Ljubljana, 19th March 2018
EVA 2017-2550-0054

 **Irena Majcen**

Minister of Environment and Spatial Planning

**Milojka Kolar Celarc**

Minister of Health

**Mag. Dejan Zidan**

Minister of Agriculture, Forestry and Food

**Annex 1
Lowest technical requirements for measuring and analysis equipment**

Connected automatic measuring devices (online):

Requirements refer to all new automatic measuring devices to be used in the early notification networks and not to existing measuring devices.

|  |  |  |  |
| --- | --- | --- | --- |
| **Measurement** | **Method** | **Sensitivity, area of operation, detection level, linearity** | **Note:** |
| **Monitoring of the environment, operating monitoring** | **Emergency monitoring** |
| Ongoing measurements of gamma dose rate | Early notification network | Sensitivity: >10 thrusts/Sv/h,Area: 50 nSv/h to 1 Sv/h Linearity in this area: ±20%Energy dependency on the area of operation:±30% when compared with Cs-137 | same | Activating alarm Speed of surrounding equivalent dose H\*(10)Unit Sv/h |
| Ongoing | Early notification | Gamma: 1 Bq/m3 (Cs-137) Total beta: 1 Bq/m3 (Sr-90) Total alpha: 1 Bq/m3 (Am-241) Iodine 1 Bq/m3 | same | Duration of the |
| measurements | network |  | measuring cycle 1h |
| of radionuclide |  |  |  |
| concentration |  |  |  |
| bound to |  |  |  |
| aerosols |  |  |  |

Unconnected measuring devices/sampling devices (offline), measurements are taken in a laboratory

|  |  |  |  |
| --- | --- | --- | --- |
| **Medium/measurements** | **Method** | **Sensitivity, area of operation, detection level,\* linearity** | **Note:** |
| **Monitoring of the environment,****operating monitoring** | **Emergency monitoring** |
| **AIR**Dose measurements | Passive dosimeters | Dosimeters response: from 60 keV to 3000 keVfrom 50 Sv to 1 Sv | From 10 Sv | Environmental dose equivalent H\*(10) |
| **AIR**Measurements of radionuclides concentration | VLG (gamma spectrometry) | 1 Bq/m3 (Cs-137)1 Bq/m3 (I-131) | 0.1 Bq/m3 (Cs-137)0,1 Bq/m3 (I-131) | In the case of an emergency situation, total alpha activity should be determined |
| Determining Sr-90 | 1 Bq/m3 | 0.1 Bq/m3 |
| Alpha spectrometry | 0.1 mBq/m3 | 0.01 Bq/m3 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Medium/measurements** | **Method** | **Sensitivity, area of operation, detection level,\* linearity** | **Note:** |
| **Monitoring of the environment, operating monitoring** | **Emergency monitoring** |
|  | H-3 C-14 | 2 000 Bq/m310 Bq/m3 | 10 kBq/m3100 Bq/m3 |  |
| **PRECIPITATION**Measurements of radionuclides concentration | VLG (gamma spectrometry) | 1 Bq/m3 (Cs-137) | 1 000 Bq/m3 (Cs-137) |  |
| Determining Sr-90 | 1 Bq/m3 | 1 000 Bq/m3 |
| Determining H-3 | 500 Bq/m3 | 10 000Bq/ m3 |
| Alpha spectrometry | 1 Bq/m3 | 100 Bq/m3 |
| **WATER**Measurements of radionuclides concentration in surface and rainwater | VLG spectrometry | 1 Bq/m3 (Cs-137) | 1 000 Bq/m3 (Cs-137) |  |
| Determining Sr-90 | 1 Bq/m3 | 1 000 Bq/m3 |
| Determining H-3 | 300 Bq/m3 | 10 000 Bq/m3 |
| Alpha spectrometry | 1 Bq/m3 | 100 Bq/m3 |
| **WATER**Measurements of radionuclides concentration in drinking water | VLG spectrometry | 1 Bq/m3 (Cs-137)1 Bq/m3 (I-131) | 1 000 Bq/m3 (Cs-137),1 000 Bq/m3 (I-131), | Detection levels, intended for detecting the presence of radioactivity in drinking water, are set out in the Rules on the monitoring of radioactivity in drinking water (OJ RS No 74/15); for the purpose of the operating monitoring, the same detection levels as for surface and groundwater apply. |
| Determining Sr-90 | 1 Bq/m3 | 1 000 Bq/m3 |
| Determining H-3 | 300 Bq/m3 | 1 0000 Bq/m3 |
| Alpha spectrometry | 1 Bq/m3 | 100 Bq/m3 |
| **SOIL** | VLG spectrometry | 0.1 Bq/kg (Cs-137) | 10 Bq/kg (Cs-137) | Per unit of dry mass; in the case |

|  |  |  |  |
| --- | --- | --- | --- |
| **Medium/measurements** | **Method** | **Sensitivity, area of operation, detection level,\* linearity** | **Note:** |
| **Monitoring of the environment, operating monitoring** | **Emergency monitoring** |
| Measurements of radionuclides concentration | Determining Sr-90 | 1 Bq/kg | 100 Bq/kg | of an emergency situation, per unit of fresh sample |
| In-situ measurements (HPGE) | 200 Bq/ m2 (Cs-137) v 30 min | 1 000 Bq/m2 (Cs-137) v < 30 min |  |
| **FOOD**Measurements of radionuclides concentration in milk, sample of food and animal feed, and complete meals | VLG spectrometry | 0.01 Bq/kg (Cs-137) | 100 Bq/kg (Cs-137)50 Bq/ kg (I-131) | Per unit of dry mass; in the case of an emergency situation, per unit of fresh sample |
| Determining H-3 | 10 Bq/L (per quantity of water obtained) | 1 000 Bq/L |
| Determining Sr-90 | 0.01 Bq/kg | 10 Bq/kg |
| **AIR**Measurements of **radon** | Detection of nuclear traces | 10 – 150.000 Bq/m3 | In a closed cave or mining shaft and storage areas where radon from natural or radium sources is expected and which cannot be ventilated |  |
| absorption in activated carbon | From a few 10 Bq/m3 to 1 MBq/m3 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Medium/measurements** | **Method** | **Sensitivity, area of operation, detection level,\* linearity** | **Note:** |
| **Monitoring of the environment, operating monitoring** | **Emergency monitoring** |
| ***Measurement of radon progeny*** | Alpha spectrometryscintillation detectors (ZnS) | From 5 Bq/m3 to MBq/m3 |  |  |
|  | Ionising cells |  |
|  | Radon short-lived |  |  |
|  | decay products |  |
|  | (bound and free): |  |
|  | pumping air through |  |
|  | filters (filter fromglass fibres four | From 5 Bq/m3 to MBq/m3 |
|  | bound and |  |
|  | electrostatic (metal) |  |
|  | filters for free |  |
|  | progeny), alpha |  |
|  | spectrometry |  |

\* detection levels for individual measurements may fluctuate within the magnitude class of prescribed magnitude as a consequence of a smaller quantity of sample, shorter measuring time, higher background and other factors affecting the quality of results.

## Annex 2Design for the annual monitoring programme for radioactivity in the environment in the Republic of Slovenia

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Medium | Measuring method, radionuclide category and sample | Location\*\* | Frequency of sampling ornumber of samples | Measuring frequency | Number of annual measurements |
| External radiation in the environment | dose rate measuring devices | at least 50 locations (\*) | - | Half-hourly | - |
| passive dosimeters | at least 50 locations (\*) | - | twice per year | 100 |
| Land |  |  |  |  |  |
| Gamma spectrometry, 90Sr- layers from 10 cm to 0-50 cm (five columns of the soil) | Ljubljana | twice per year | twice per year | 20 |
| Murska Sobota | twice per year | twice per year | 20 |
| Kobarid | twice per year | twice per year | 20 |
| Air | Spectrometry of gamma aerosols | Ljubljana | continued | monthly | 12 |
| Maribor | continued | monthly | 12 |
| Area before the State border above Ajdovščina | continued | monthly | 12 |
| Automatic measuring device forradioactivity of aerosols | Ljubljana | continued | hourly | - |
| Drnovo | continued | hourly | - |
| Precipitation and radioactive sediment | Gamma spectrometry, 90Sr- rainwater | Ljubljana (including tritium) | continued | monthly γ and3h quarterly 90sr | 28 |
| Novo mesto | continued | quarterly | 8 |
| Murska Sobota | continued | quarterly | 8 |
| Kobarid | continued | quarterly | 8 |
| Surface water | Gamma spectrometry- unfiltered water | Sava, Ljubljana-Dol (including tritium and 90Sr) | twice per year | twice per year | 6 |
| Sava, Brežice (including tritium) | twice per year | twice per year | 4 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Medium | Measuring method, radionuclide category and sample | Location\*\* | Frequency of sampling ornumber of samples | Measuring frequency | Number of annual measurements |
|  |  | Savinja, Celje under the purification facility | twice per year | twice per year | 2 |
| Drava, Dravograd (including tritum and 90Sr) | twice per year | twice per year | 6 |
| Soča | twice per year | twice per year | 2 |
| Krka | twice per year | twice per year | 2 |
| Kolpa | twice per year | twice per year | 2 |
| Mura, Petanjci (including tirtum and 90Sr) | twice per year | twice per year | 6 |
| Piran, sea | twice per year | twice per year | 2 |
| Gamma spectrometry- sea sediment | Piran | twice per year | twice per year | 2 |
| Drinking water | Gamma spectrometry, tritium, 90Sr | Defined in the annual programme for the monitoring of drinking water in accordance with the implementing act based on the Act Regulating the Sanitary Suitability of Foodstuffs, Products and Materials Coming into Contact with Foodstuffs (UL RS No 52/00,42/02 and 47/04) | at least 15 per year | at least 1 per year | at least 45 |
| Food: | Gamma spectrometry, 90Sr | Considering the regional principle: central Slovenia, Alpine and Pannonian region | at least 18 per year | at least 1 per year in a particular location | at least 36 |
| Milk | Gamma spectrometry, 90Sr | Considering the regional principle(Ljubljana, Bohinjska Bistrica, Kobarid, Murska Sobota) | at least 6 per year, composite samples | two-month samples | at least 24 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Medium | Measuring method, radionuclide category and sample | Location\*\* | Frequency of sampling ornumber of samples | Measuring frequency | Number of annual measurements |
| Full meal | Gamma spectrometry, 90Sr | Cities with larger population | at least 5 per year | at least 1 per year in a particularlocation | at least 10 |
| Feed: | Gamma spectrometry, 90Sr | Considering the regional principle: central Slovenia, Alpine and Pannonian region | 10 per year | at least 1 per year in a particular location | at least 20 |
| Individual products for which there is a suspicion of radioactivecontamination | Gamma spectrometry or suitable radiochemical analysis | As needed | 2-3 times per year | 2-3 times per year | 2-3 times per year |

(\*) exact location is determined by the Slovenian Nuclear Safety Administration, with the consent of the Slovenian Environmental Agency, according to current conditions in the field.

(\*\*) The position of locations is determined by the administrative bodies according to current conditions in the field.

# Annex 3

### **Guide for assessing methods and exposure paths to be considered during the operating monitoring of radioactivity of nuclear power plants**

When selecting the methods and exposure paths, local conditions or specific elements need to be considered.

|  |  |
| --- | --- |
| Method of exposure | Exposure path |
| Atmospheric discharges |
| External radiation | Beta and gamma radiation from clouds |
| Bata and gamma radiation from radioactive substance sediment |
| Inhalation | Inhalation of radionuclides from clouds |
| Inhalation of re-suspended activity |
| [Ingestion](#_bookmark6) | Meat |
| Milk and dairy products |
| Vegetables |
| Grains |
| Tuberous plants |
| Fruit |
| Water |
| Fish |
| Free growing fruits |
| Discharges into rivers |
| External radiation | Gamma radiation from sediment by a river bank |
| Gamma radiation during swimming |
| Gamma radiation from bathing |
| Inhalation | Resuspended sediment |
| Ingestion | River fish |
|  | Drinking untreated river water |
|  | Eating animals that have drunk from the river |
|  | Drinking the milk of animals that havedrunk from the river |
|  | Eating produce from flood areas |
|  | Eating produce from areas irrigated by river water |
|  | Eating river plants, water birds |

**Annex 4**

**Structure of the programme for operating monitoring of radioactivity of a nuclear power plant**

#### Table 1: Current discharges (emissions)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of****measureme nts** | **Type of sample** | **Sampling point** | **Sampling frequency** | **Measuring frequency** |
| Indirect measurements of current discharges |
| Gamma beams, 3H, | Liquid | Control tank | Ongoing | Ongoing |
| Bilge evaporator | Ongoing | Ongoing |
| Laboratory analysis of current discharges |
| Gamma beams, 3H, | Liquid | Control tank | Every emission | Every emission |
| Bilge evaporator | Before discharge and then twice perday | Once per week |
| 89Sr-90Sr,55Fe, 14C | Liquid | Control tank | Composite sample | Once per month |
| Bilge evaporator |

#### Table 2: Atmospheric discharges (emissions)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of measurements** | **Type of sample** | **Sampling point** | **Sampling frequency** | **Measuring frequency** |
| Indirect measurements of atmospheric discharges |
| Noble gases, iodine radioisotopes,aerosols and particles |  | Main ventilation channel | Ongoing | Ongoing |
| Nobel gases |  | Ejector air vent condenser | Ongoing | Ongoing |
| Laboratory analysis of atmospheric discharges |
| Iodine radioisotopes, aerosols |  | Ejector air vent condenser | Weekly | Once weekly |
| Nobel gases | Flow sampler | Main ventilation channel | Ongoing | Once per week |
| 3H, 14C | Weekly |
| Iodine radioisotopes Aerosols | Filter | Weekly |
| Alfa beams, 89Sr-90Sr | Filter | Quarterly |
| Nobel gases, 3H, 14C, Iodine radioisotopes, aerosolsAlfa beams, 89Sr-90Sr |  | The building ventilation for fuel handling is the same as the main ventilation channel (only in cases where an emission is separate from the main ventilation channel of the power plant), drywarehouse |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Iodine radioisotopes, | Filter | Warehouse ventilation of | Ongoing | Once per |
| aerosols and |  | low and medium |  | week |
| particles |  | radioactive waste, facility |  |  |
| 89Sr-90Sr \* |  | for decontamination | Ongoing | Quarterly |
|  |  |  |  |  |

* only facility for decontamination

#### Table 3: Measurements in the environment of the nuclear power plant (immissions)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of****measureme nts** | **Type of sample** | **Sampling point** | **Sampling frequency** | **Measuring frequency** |
| EXTERNAL RADIATION |
| Dose rate |  | More than 10 positions at a distance of at least 10 km from the facility | Continued | Recording in half-hourly intervals |
| Dose |  | More than 50 positions at a distance of at least10 km from the facility | Continued | Once in six months |
| AIR |
| Gamma beams | Aerosol filters | 7 positions | Continued | Once per month |
| Aerosol and iodine radioisotopes | Combined filter (Aerosol and iodine) | 7 positions | Continued | Once in six months |
| 89Sr-90Sr | Aerosol filters | 1 position | Continued | Once in three months |
| DEPOSITION |
| gammabeams, 3H, 89Sr-90Sr | Precipitation-catcher | 3 positions | Continued | Once per month |
| Gammabeams | Dry sediment –vaseline boards | 7 positions in 3 groups | Continued | Once per month |
| SOIL |
| Gamma spectrometr y, 90Sr | Underground samples0-5 cm5-10 cm10-15 cm and15-30 cm | 4 position Rainwater Pasture land or arableland | Twice per year | Twice per year |
| SURFACE WATER |
| gamma beams, 3H, 89Sr-90Sr | Water and filter residue | 1. location in counter current direction – reference
2. locations in current direction
 | Continued | Once per month |
| Gamma spectrometr y, 89Sr-90Sr | Sediment | 2 location in counter current direction – reference2 locations in current direction | Once in three months | Once in three months |
| Gamma spectrometr y, 89Sr-90Sr | Fish | 1. location in counter current direction – reference
2. locations in current direction
 | Once in three months | Once in three months |
| Gammaspectrometr | Water flora | 1 location in countercurrent direction – | Once in sixmonths (6 | Once in sixmonths |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of measureme nts** | **Type of sample** | **Sampling point** | **Sampling frequency** | **Measuring frequency** |
| y, 89Sr-90Sr |  | reference1 location in current direction | samples) |  |
| DRINKING WATER |
| Gamma beams, 3H, | Singe water sample | 1 larger location in counter current direction– reference1 larger location in current direction | Once in three months | Once in three months |
| gamma beams, 3H,89Sr-90Sr | Composite water sample | Pump, coverage at least 5 locations | Once per month | Once per month |
| Gamma beams, 3H, | Singe sample | at least 1 well | Once in three months | Once in three months |
| FOOD |
| Gamma beams | Milk | 3 positions | Once per month | Once per month |
| 89Sr-90Sr | Milk | 3 positions | Once per month | Once per month |
| 131I | Milk | 3 positions | once per month during pasture (8months) | once per month during pasture (8 months) |
| Gamma beamsand 89Sr-90Sr | Meat, eggs | 6 samples | Once per year | Once per year |
| Gamma beamsand 89Sr-90Sr | Garden and field crop | 20 samples | Seasonally | Once per year |
| Gammaspectrometr y, 14c | Grains | 4 samples and 1 reference location | Once per year | Once per year |
| Gamma beamsand 89Sr-90Sr | Fruit | 10 samples | Seasonally | At the time of taking |
| Gamma spectrometr y, 89Sr-90Sr | bio-indicators (lichens, mosses) | 2 locations in the direct vicinity of the nuclear power plant and 1reference | Once in six months (6 samples) | Once in six months |

**Annex 5**

**Structure of the programme for operating monitoring of radioactivity of a research reactor**

#### Table 1: Control of discharges (emissions)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type and****description of measurement** | **Type of sample** | **Sampling point** | **Sampling frequency** | **Measuring frequency** |
| LIQUID DISCHARGES |
| High spectrumgamma spectrometry | Liquid | Discharges from reactor reservoir | Once per month | Once per month |
| ATMOSPHERIC DISCHARGES |
| Continued measuring device HD | Dose rate | Outlet from reactor hall | Continued | Recording in half-hourly intervals |
| Dosimetry | Dose | Outlet from reactor hall | Once per month | Once per month |
| High spectrumgamma spectrometry | Gaseous | Outlet from reactor hall | Once per month | Once per month |
| Gamma beams in air particles | Filter | Outlet from reactor hall | Twice per week | Twice per week |

#### Table 2: Measurements in the environment (emissions)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type and description of****measurement** | **Type of sample** | **Sampling point** | **Sampling frequency** | **Measuring frequency** |
| EXTERNAL RADIATION |
| Continuedmeasuring device | External radiation dose rate | 1 position within the fence | Continued | Recording inhalf-hourly intervals |
| Dose | External radiationdose | At least 4 positionswithin the fence | Continued | Once in sixmonths |
| Continuedmeasuring device | Dose rate | Circular path around the facility | Once per year | At intervals of 5 sec maximum |
| OTHER |
| High spectrum gamma spectrometry | River sediment | 2 positions at canal outflow(current and anti- current direction) | Once per year | Once per year |
| High spectrumgamma spectrometry | Liquid | Well | Monthly | Monthly |
| High spectrum gammaspectrometry | Soil 0–10 cm | Within the fence of the facility | Once per year | Once per year |
| In-situ gamma spectrometry | outdoor | At the location of soil sample | Once per year | Once per year |

**Annex 6**

**Structure of the programme for operating monitoring of radioactivity in the uranium mine and its facilities, including repository of mining and hydro-metallurgical tailings**

#### Table 1: Method of exposure, transmission paths and radionuclides

|  |  |  |
| --- | --- | --- |
| Method of exposure | Exposure path | Radionuclide |
| External radiation | Direct radiation fromfacilities | Decay type 238U |
| Radiation from the cloud | Short-lived progeny 222Rn |
| Sediment | Short-lived progeny 222Rn |
| Inhalation | Inhalation of radionuclides from clouds | Radon 222RnShort-lived progeny 222Rn Long-lived radionuclides of decay type 238U (238U, 226Ra,210Pb, 210Po, 230Th) |
| [Ingestion](#_bookmark6) | Local food | Long-lived radionuclides of decay type 238U (238U, 226Ra, 210Pb, 210Po, 230Th), different scope of analysis |
| Watercourses, groundwaters |
| Fish, organisms |

Notes:

- The influence of mining facilities must be evaluated based on discrepancies in conditions in an area not influenced by the mine.

#### Table 2: Structure of the programme for operating monitoring of radioactivity in the uranium mine and its facilities, including the repository of mining and hydro- metallurgical tailings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of measureme nts | Type of sample | Sampling point | Sampling frequency | Measuring frequency |
| EXTERNAL RADIATION |
| External radiation doseExternal radiationdose rate | Passive dosimetersdose rate measuringdevices | Once in each neighbouring agglomeration (up to 3)At 3 locations | ContinuedHourly | Twice per yearOngoing |
| AIR |
| 222Rn | Air-trace detector | 5 outdoor locations of which one is at a reference pointAt least the minimum necessary for theassessment of doses (largest contribution) | Continued | Twice per year (summer and winter period) |
| 222Rnprogeny238U, 230Th, | Air-measuring instrument | At least at 5 outdoor locations in the near vicinityof the facility | 3-4 days continued | Twice per year |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of measureme nts | Type of sample | Sampling point | Sampling frequency | Measuring frequency |
| 226Ra. |  | andAt least 2 locations, one in the vicinity of repositories and one at the referencepoint | Continued | Hourly values |
| WATERCOURSES |
| Long-lived natural radionuclide s | Water | At least at 3 locations in significant areas (in the direction of the current) | Continued collection once per day | Quarterly |
| SEDIMENTS |
| Long-lived naturalradionuclide s | Sediment | At least at 3 locations in significant areas (in the direction of the current) | Single sample | Yearly |
| FOOD, ANIMAL FEED |
| Long-lived radionuclide s of uraniumdecay | Milk | 1 significant area1 comparable location | Once per year | Yearly |
| Long-lived radionuclide s ofuranium decay | Grass | 1 significant area1 comparable location | Once per year | Yearly |

**Annex 7**

**Structure of the programme for operating monitoring of radioactivity of the warehouse and repository of low and medium radioactive waste**

#### Table 1: Warehouse

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type and description of measurement | Type of sample | Sampling point | Sampling frequency | Measuring frequency |
| EXTERNAL RADIATION |
| Passive dosimeters | External radiation dose | 6 LD(4 near a warehouse, one above and one referencelocation) | Continued | Once per month |
| AIR (EMISSION) |
| 222Rn | Air-trace detector | outlet from the warehouse based on measurements in the warehouse and operating times of theventilation system | Continued | Once per month |
| High spectrum gamma spectrometry | Aerosol filters | outlet from warehouse | Continued | Once per month |
| GROUNDWATER |
| High spectrum gamma spectrometry | Liquid | Vegetable | Once per year | Once per year |
| CURRENT DISCHARGES (EMISSIONS) |
| High spectrum gamma spectrometry | Liquid | Tanks | Each time during discharge | Ongoing |

#### Table 2: *Repository* for low and medium radioactive waste

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type and description ofmeasurement | Type of sample | Sampling point | Sampling frequency | Measuring frequency |
| **Control of discharge – EMISSIONS** |
| *AIR DISCHARGE* |
| High spectrum gamma spectrometryTotal alpha/beta | Aerosol filters | Outlet from silos shaftOutlet from TO (control point, first phase TO or climate machinery, second phase TO)Reference location | Continued | Once per month |
| Strontium Sr-90, specific analysis | Aerosol filters | Outlet from silos shaftReference location | Continued | Once in three months |
| C-14 | Aerosol filters | Outlet from silosReference location | Continued | Once in three months |
| Rn-222 | Air-trace detector | Outlet from silos or location on the silos8 locations around silosReference location | Continued | Once per month |
| Rn-222 | Air – continued measurements (measurements for one week) | Location on the silos | Continued | Twice per year (winter, summer period) |
| *LIQUID DISCHARGES* |
| High spectrum gamma spectrometry1. Phase: Total alpha/beta
2. Phase: specific analysis of alpha and beta beams (in particular potential C-14, Sr-90 and H-

3). | Liquid | Collecting silos basinsCollecting reservoir (TO, first phase)Collecting shaft (TO, second phase)Control basin | Each time during discharge | Ongoing |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type and description ofmeasurement | Type of sample | Sampling point | Sampling frequency | Measuring frequency |
| **Measurements in the environment - IMMISSIONS** |
| *EXTERNAL RADIATION* |
| Passive dosimeters, external radiation dose | Air | Entry into silos8 locations at the fence of repository, each direction of the skyReference location | Continued | Once in three months |
| In-situ measurements | Contaminated land | Location at the repository | Once per year | Once per year |
| *GROUNDWATER* |
| High spectrum gamma spectrometryStrontium Sr-90, specific analysis | Liquid | Vegetables near the repository in both water-current directions5 deep5 shallowReference location | Once in three months | Once in three months |
| C-14 Pu-239 | Liquid | Vegetables near the repository in both water-current directions5 deep5 shallowReference location | Once per year | Once per year |
| *SURFACE WATER, SEDIMENT* |
| High spectrum gamma spectrometryTotal alpha/betaStrontium Sr-90, specific analysis | Liquid | Canal effluent into the gravel pit Spodnji Stari GradReference location | Continued sampling | Once in three months |
| High spectrum gamma spectrometryStrontium Sr-90, specific analysis | Sediment | Canal effluent into the gravel pit Spodnji Stari GradReference location | Single sample | Once per year |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type and description ofmeasurement | Type of sample | Sampling point | Sampling frequency | Measuring frequency |
| *FOOD, GARDEN AND FIELD CROP* |
| High spectrum gamma spectrometryStrontium Sr-90, specific analysis | Garden and field crop (if not available, grass/hay are samples) | Location (field) near the repository, two samplesReference location | Once per year, seasonal sample | Once per year |
| C-14 |  |  |  |  |
| *FOOD, FRUIT* |
| High spectrum gamma spectrometry | Fruit | Location near therepository, two samples | Once per year,seasonal sample | Once per year |
| Strontium Sr-90, specific analysis |  | Reference location |  |  |
| C-14 |  |  |  |  |

**Annex 8**

**Structure of the programme for the emergency monitoring of radioactivity**

#### Table 1: General instructions for drawing up a programme of emergency monitoring of radioactivity in the environment and people in case of radiological accident

|  |  |  |
| --- | --- | --- |
| Type of emergency  | Type of measurements | Purpose |
| Lost, missing or stolen radioactivesource | 1. Measurements of dose rate (while walking, driving, from aplane/helicopter) | 1. Find radioactive source |
| Found radioactive source or contamination | 1. Measurements of dose rate
2. Measurements of contamination of the ground and/or objects, materials
3. Measurements of contamination of water, food or feed
4. Measurements of personal doses
 | 1. Determine safe and protected area
2. Determine protective measures
3. Recognised radioactive source or contamination
4. Determine contaminated areas and/or facilities
5. Check radiation and contamination of people
6. Plan corrective measures and measures for monitoring contamination
 |
| Non-secured sealed radioactive source | 1. Measurements of dose rate
2. Measurements of contamination of objects
3. Measurements of personal doses
 | 1. Determine safe and protected area
2. Determine protective measures
3. Determine possible contamination of surface areas and/or objects
4. Check radiation of people
5. Plan corrective measures
 |
| Damaged sealed radioactive source | 1. Measurements of dose rate
2. Measurements of contamination of the ground and objects
3. Measurements of personal doses
 | 1. Determine safe and protected area
2. Determine protective measures
3. Determine contaminated areas and/or objects
4. Check radiation and contamination of people
5. Plan corrective measures
 |
| Accident with open radioactive sources | 1. Measurements of contamination of a radionuclide in air
2. Measurements of dose rate
3. Measurements of personal contamination
4. Measurements of contamination of the ground and objects
5. Measurements of contamination of water, food, feed, products or materials
6. Measurements of personal doses
 | 1. Determine safe and protected area
2. Determine protective measures
3. Determine contamination of air and surface areas
4. Determine contamination of an area, objects food and/or water
5. Check radiation and contamination of people
6. Plan corrective measures
 |

|  |  |  |
| --- | --- | --- |
| Type of emergency  | Type of measurements | Purpose |
| Fire in nuclear or radiation facility | 1. Measurements of contamination of a radionuclide in air
2. Measurements of dose rate
3. Measurements of personal contamination
4. Measurements of contamination of the ground and objects
5. Measurements of contamination of water, food, feed, products or materials
6. Measurements of personal doses
 | 1. Determine safe and protected area
2. Determine protective measures
3. Determine contamination of air and surface areas
4. Determine contamination of an area objects food and/or water
5. Check radiation and contamination of people
6. Plan corrective measures
 |
| Contamination with alpha beams | 1. Measurements of contamination of a radionuclide in air
2. Measurements of personal contamination
3. Measurements of contamination of the ground and objects
4. Measurements of contamination of water, food, feed, products or materials
5. Measurements of personal doses
 | 1. Determine safe and protected area
2. Implement protective measures
3. Determine contamination of air
4. Determine contaminated areas and/or objects
5. Check contamination of people
6. Plan corrective measures
7. Determine long-term protective measures, measures for the monitoring of contamination and other measures
 |
| Uncontrolled return of a satellite with radioactive substances | 1. Measurements of dose rate (while walking, driving, from a plane/helicopter)
2. Measurements of contamination of the ground and objects
3. Measurements of personal contamination
4. Measurements of contamination of water, food, feed, products or materials
5. Measurements of personal doses
 | 1. Find satellite’s remains
2. Determine protective measures
3. Determine contaminated areas and/or objects
4. Check contamination of people
5. Plan corrective measures
6. Plan long-term protective or other measures
 |
| Contamination from nuclear or radiation accident outside our State borders | 1. Measurements of dose rate
2. Measurements of contamination of radionuclides in air
3. Measurements of contamination of the ground
4. Measurements of contamination of water, food, feed, products or materials
5. Measurements of doses in the environment
 | 1. Determine protective measures
2. Determine contamination of the ground
3. Identification of radionuclides
4. Determine relationships between radionuclides
5. Measurements of contamination of water, food, feed, products or materials
6. Asses dose constraints for the population
 |

|  |  |  |
| --- | --- | --- |
| Type of emergency  | Type of measurements | Purpose |
|  | 6. Measurements of personal doses | 7. Determine measures formonitoring contamination and corrective measures |

#### Table 2: Structure of the programme for emergency monitoring of radioactivity of the environment and people upon emission of radioactive substances in the environment

|  |
| --- |
| **MEASUREMENTS** |
| **When** | **What** | **Quantity** | **Frequency** | **Where** |
| ***Air discharge of radioactive substances*** |
| Continuousl y(EDN) | External radiation | Gamma dose rate [Sv/h] | Continuous automatic measurements, automatic data collection in a central unit | Area for planning preventative and immediate protective measures |
| Air | Total concentration of alpha, beta and gamma activity |
| During discharge, upon crossing of a radioactive clouda | External radiation | Gamma dose rate [Sv/h] | Continued | Area of general readinessb |
| Neutron dose rate (in case of neutron radiation) | Continued | Near discharge |
| Air | Concentration of radionuclides activity [Bq/m3]Total activity | Continuous collection, measurements every hour during discharge | Area for planning immediate protective measuresc |
| Precipitation | Concentration of radionuclides activity [Bq/m3 or Bq/m2]Total activity | Continuous collection,measurements every two hour during discharge | Area for planning food protective measures |
| After discharge or crossing of radioactive cloud | External radiation | Gamma dose rate | Continued | Area of general readinessd |
|  | Gamma dose | First month: weekly First year: monthly | Contaminated areae |
| Air | Concentration of radionuclides activity [Bq/m3] | Continuous collection,measurements in first week: daily, then monthly | Contaminated areaf |
| Land |  |  |  |
| Soil | Concentration of radionuclides activity [Bq/m2] | Sampling and measurements: first year monthly | Contaminated area |
| Grass | Specific activity [Bq/kg] and concentration of radionuclide activity [Bq/m2] | Sampling and measurements: first week daily, then monthly | Contaminated area |

|  |
| --- |
| **MEASUREMENTS** |
| **When** | **What** | **Quantity** | **Frequency** | **Where** |
|  | Precipitation and dry radioactivesediment | Concentration of radionuclides activity [Bq/m3 or Bq/m2] | Continuous collection, measurements: first week daily, then monthly | Area for planning food protective measures |
| Food chain: | Specific activity [Bq/kg] and concentration of radionuclide activity [Bq/l] |  |  |
| Drinking water |  | Sampling and measurements: first monthweekly, then monthly | Water supply and wellsin contaminated areas |
| Milk |  | Sampling and measurements: first month daily, then monthly | Milk collectors from contaminated areas |
| Milk products |  | Sampling and measurements: first month daily then monthly | Products from contaminated area |
| Leaf vegetables |  | Sampling and measurements: first week daily then monthly | Contaminated areas |
| Root crops |  | Sampling and measurements: once per season | Contaminated areas |
| Seasonal fruit |  | Sampling and measurements: once per season | Contaminated areas |
| Flour |  | Sampling and measurements: once perseason | Contaminated areas |
| Mean (beef, pork, poultry) |  | Sampling and measurements: first month weekly, then monthly | Contaminated areas |
| Eggs |  | Sampling and measurements: first year monthly | Contaminated areas |
| Fish |  | Sampling and measurements: monthlyduring catching season | Water in contaminatedareas |
| Green feed |  | Sampling and measurements: first week daily, then monthly | Contaminated areas |
| Mushrooms |  | Sampling and measurements: monthlyduring picking season | Contaminated areas |

|  |
| --- |
| **MEASUREMENTS** |
| **When** | **What** | **Quantity** | **Frequency** | **Where** |
|  | Forest fruits |  | Sampling and measurements: monthly during picking season | Contaminated areas |
| Game |  | Sampling and measurements: monthly during hunting season | Area of general readiness |
| Herbs |  | Sampling and measurements: monthly during picking season | Contaminated areas |
| People | External dose rate | As needed | Contaminated areas |
|  | Surface specific radionuclides activity in the skin [Bq/cm2] | As needed | Contaminated areas |
|  | Activity of radioactive iodine in thyroid | As needed | Contaminated areas |
|  | Activity of radionuclides in body and/or organs | As needed | Contaminated areas |
|  | Activity of radionuclides in secretions | As needed | Contaminated areas |
| ***Liquid discharge of radioactive substances*** |
| After discharge | Surface water | Concentration of radionuclides activity [Bq/l] | Continuous collection, daily measurements in first week then monthly | Contaminated water |
| Sediment | Specific activity of radionuclides [Bq/kg] | Sampling and measurements: first month weekly, then monthly | Contaminated water |
| Fish | Specific activity of radionuclides [Bq/kg] | Sampling and measurements: weekly during catching season | Contaminated water |
| Water plants | Specific activity of radionuclides[Bq/kg] | Sampling and measurements: first monthweekly, then monthly | Contaminated water |
| Drinking water | Concentration of radionuclides activity [Bq/l] | Sampling and measurements: first month weekly, then monthly | Area of contaminated waters |
| Groundwater | Concentration of radionuclides activity [Bq/l] | Sampling and measurements: first month weekly, then monthly | In areas where contamination is possible |

a in the initial phase of general danger from the discharge of radioactive substance, the measurements of dose rate and the sampling of air are taken by a mobile unit (or vehicle) of the nuclear power plant at a distance of 10 km at most which shall be available within two hours after declaring objective danger. The scope of measurements of gamma dose rate involves taking measurements from typical doses for the natural environment up to dose rates that could cause stochastic effects in one hour. The measurements of air contamination are taken to determine group activity. Mobile unit of the nuclear power plant shall be read for deep detection of surface iodine and cesium activity in air filters and for central collection of dose rate information from automatic measuring devices from the edge of the location of the facility, up to the distance of 5 km.

b Measurements of gamma dose rate in the environment shall be taken by automatic measuring devices at the edge of the location of the facility, in eight directions of the sky, at a distance between 200 m and 500 m from the nuclear reactor. When the measuring devices are placed at a greater distance their number is accordingly increased. The measuring devices shall provide continuous taking of measurements in all emergency situations; the central unit for sending information on the facility shall operation for at least two hours after electricity power cut. The scope of measurements of gamma dose rate involves taking measurements from typical doses for the natural environment up to dose rates that could cause deterministic effects in one hour. The calibration of the measuring devices is carried out by cesium Cs-137 once in three years in the manner which ensures traceability according to a standard.

c Sampling of air in the environment at a location of the facility is carried out by pumps with filters of iodine and dust particles, at a distance between 200 m and 500 m from the nuclear reactor in at least four locations in directions which are typical for the wind direction. The purpose of this sampling is to provide a sample in the initial phase of an emergency. The measurements of total radioactivity (and activity I-131 and Cs-137) in air are taken by automatic radiological monitoring at a distance between 200 m and 500 m from the nuclear reactor, in at least for locations, in directions which are typical for wind direction and in the direction of larger agglomerates, with the intention collect information in the initial phase of an emergency.

d Measurements of gamma radiation in vicinities of agglomerates or hamlets with greater number of houses near the nuclear power plant shall be taken by a stationary automatic radiation measuring devices with an area of typical doses for the natural environment, up to dose rates that could cause stochastic effects.

e Passive dosimeters for measuring received doses of gamma radiation after the crossing of a radioactive cloud are in an area of the closest agglomerates, at a distance of 10 km from the nuclear power plant. Their scope is from the natural to acute dose values - environmental equivalent.

f Sampling of air in neighboring agglomerates near the nuclear power plant are taken by some stationary pumps with filters for iodine and dust particles. The purpose of this sampling is to provide samples for gamma spectrometry after the crossing of a radioactive cloud.

#### Table 3: General instructions for drawing up a programme for ensuring readiness

Nuclear power plant

|  |  |  |  |
| --- | --- | --- | --- |
| Category | Type | Number of samples/locations | Frequency of training/checking |
| Round by a mobile unit for taking field measurements | Dose rate measurements in the environment with transmission measuring devices at points where measurements are taken as part of operatingmonitoring (learning about locations) | 10 locations | twice per year for each provider of emergency monitoring(at least once individually, once together) |
| Measurement of contamination of surface areas - total beta and alpha activity | 10 locations |
| Measurements of dose rate from a moving vehicle by mapping | Once per round |
| Gamma spectrometry in the field (in-situ) | Once per round |
| Sampling and measurements of radionuclide concentration in samples in a mobile laboratory\*Air - filters Precipitation Dry Sediment SoilWaterProduce Grass | 1 sample by round |
| "Hot" samples - measurement of radionuclide concentration | 1 sample at the boarder of taking from the nuclear power plant NEK |
| Determining the position of measuring/sampling point (GPS) |  |
| Measurement of meteorological parameters |  |
| Measurements of personal doses |  |
| Hand measurements of personal contamination upon discharge from a contaminated area and the use of basic protective equipment | 2 hours per round |
| Measurements of iodine content in thyroid | Once per round |
| Measurements of radionuclides in body (WBC) |
| Reporting results - communication from the field |  |
| Laboratory measurement\* | High spectrum gamma spectrometry |  | twice per year for each provider of emergency |
| Measurements/analysis of beta beams |  |
| Measurements of personal doses |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Measurements of iodine content in thyroid |  | monitoring |
|  |  |
|  |  |
| Comparable field measurements of providers of operating monitoring or theobligated entity | Gamma spectrometry in the field –in-situ | 2 samples | Total 3 comparable measurements per year\*\* |
| Gamma spectrometry in a mobile laboratory | 2 samples |
| Dose measurements | 10 locations |
| Laboratory comparable measurements of providers of operating monitoring or theobligated entity | Measurements of gamma beams | 3 samples | Total 3 comparable measurements per year\*\* |
| Measurements of beta beams | 3 samples |
|  |  |

* Partially performed in the field, partially in the laboratory

\*\* providers compare all results, the obligated entities only those taken within a nuclear facility

Warehouse, reactor

|  |  |  |  |
| --- | --- | --- | --- |
| Category | Type | Number of samples/locations | Frequency of training/checking |
| Round by a mobile unit for taking field measurements | Dose rate measurements in the environment with transmission measuring devices at points where measurements are taken as part of operatingmonitoring (learning about locations) | 4 locations | Once per year for each provider of emergency monitoring |
| Measurement of contamination of surface areas - total beta and alpha activity | 4 locations |
| Measurements of dose rate from a moving vehicle by mapping | Once per round |
| Gamma spectrometry in the field (in-situ) | Once per round |
| Sampling and measurements of radionuclide concentration in samples in a mobile laboratory\*Air - filters Precipitation SoilWater | 2 sample by round,Analysis in mobile laboratory |
| Determining the position of measuring/sampling point (GPS) |  |
| Measurements of personal doses |  |
| Measurements of personal contamination upon discharge from a contaminated area and the use of basic protective equipment | 1 hour per round |
| Reporting results - communication from the field | Once per round, reporting of all measured results |
| Laboratory measurement\* | High spectrum gamma spectrometry |  | once per year |
| Measurements/analysis of beta beams |  |
| Measurements of personal doses |  |
| Comparable field measurements of providers of operating monitoring or theobligated entity | Gamma spectrometry in the field –in-situ | 2 samples | once per year between providers, once between obligated entities\*\* |
| Gamma spectrometry in a mobile laboratory | 2 samples |
| Dose measurements | 10 locations |
| Laboratory comparable | Measurements of gamma beams | 3 samples | twice per year between providers, |
| Measurements of gamma beams | 3 samples |

|  |  |  |  |
| --- | --- | --- | --- |
| measurements of providers of operatingmonitoring or the obligated entity |  |  | once between obligated entities\*\* |
|  |  |

# Annex 9

**Structure for reporting electronically the measurement results of the monitoring**

Authorised providers of monitoring shall send information in an excel document, in columns, which shall be named according to the table below the title of a line shall contain the name of columns (fields), each next line shall contain a new, individual measurement Table of cods for individual fields is provided by URSJV.

|  |  |  |
| --- | --- | --- |
| **FIELD NAME** | **FIELD TYPE** | **FIELD DESCRIPTION** |
| LOCATION | General | Location code |
| ISOTOPE | General | Radionuclide code |
| VALUE | General | Measured value\*\* |
| UNIT | General | Unit code of measured value |
| ERROR | General | Measurement error\*\* |
| ERROR\_TYPE | General | Error code of error type |
| TYPE\_MONITORING | General | Monitoring code type |
| SAMPLE\_TYPE | General | Sample code type |
| SAMPLE\_PREPARATION | General | Method code for sample preparation |
| MEASUREMENT\_TYPE | General | Measurement code type |
| DATE\_START | Date | Date of starting collecting samples (dd/mm/yyyy) |
| DATE\_END | Date | Date of ending collecting samples (dd/mm/yyyy) |
| DATE\_MEASUREMENT | Date | Date of taking measurement (dd/mm/yyyy) |
| PROVIDER | General | Measurement provider type |
| INSTRUMENT | General | Code of Instrument used for measurement taking |
| SOURCE | General | Name of information source, field to be used to determine from which source input value comes Source starts with the abbreviation of the monitoring type code, followed by the year of the report, page in the report, and at the end the table number in which therecording measurement appears |
| REPORT | General | Code report |
| CONTRACT | General | Contract code |
| LLD | General | If the value measured is LLD, field value is 1, otherwise is 0 |
| PERIOD\_MEASURING\_START | Date | Start of measuring interval\* (dd/mm/yyyy) |
| PERIOD\_MEASURING\_END | Date | End of measuring interval\* (dd/mm/yyyy) |

* Nominal start of measuring (example: October data starts to be collected 01.10 and end on 31.10)

\*\* Accuracy of measurements taken must be of the same class quantity as the error. Recording of error is usually single digit.