Unofficial Translation from Finnish.
Legally binding only in Finnish and Swedish.

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REGULATION STUK Y/4/2018

Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste

Adopted in Helsinki on 10 December 2018

In accordance with the Radiation and Nuclear Safety Authority's decision, it is issued, by virtue of Section 7 q of the Nuclear Energy Act (990/1987), as it is in Act 676/2015:

Chapter 1
Scope of application and definitions

Section 1 Scope

1. This regulation shall apply to the disposal of spent nuclear fuel and other nuclear waste into nuclear facilities to be constructed in bedrock and facilities constructed into the ground. The regulation shall also be applied to nuclear facilities intended for the handling and storage of spent nuclear fuel and other nuclear waste that are not part of a nuclear power plant and in which the amount of spent nuclear fuel at any given time is not more than 100 tonnes of uranium.

2. This regulation shall also apply to radioactive waste referred to in Section 4 of the Radiation Act (859/2018) if it is handled or stored at a nuclear facility or disposed of in a disposal facility for nuclear waste referred to in Paragraph 1.

3. Provisions on the handling and storage of spent nuclear fuel and other nuclear waste in a nuclear facility attached to a nuclear power plant or a separate nuclear facility, in which the amount of spent nuclear fuel at any given time is more than 100 tonnes of uranium, intended for the processing of spent nuclear fuel are laid down in the Radiation and Nuclear Safety Authority's Regulation on the Safety of a Nuclear Power Plant.

Section 2 Definitions

1. For the purposes of this regulation:

1) *very low-level waste* shall refer to nuclear waste whose average activity concentration of significant radionuclides does not exceed the value of 100 kBq per kilogram and the total activity does not exceed the values laid down in Section 6(1) of the Nuclear Energy Decree (161/1988);
2) *intermediate level waste* shall refer to nuclear waste that, because of its high level of activity, requires effective radiation protection arrangements when processed. The activity concentration of such waste is usually 1 MBq/kg–10 GBq/kg.

3) *high level waste* shall refer to waste that, because of its high level of activity, requires highly effective radiation protection arrangements when processed and usually also cooling. The activity concentration of such waste is usually more than 10 GBq/kg.

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4) *disposal facility* shall refer to an entirety comprising the rooms for the disposal of the waste packages *(emplacement rooms)* and the adjoining underground and above-ground auxiliary facilities;

5) *disposal site* shall refer to the location of the disposal facility and, after disposal has been completed, the area entered in the real estate register in accordance with Section 85 of the Nuclear Energy Decree, and the ground and bedrock under it;

6) *short-lived waste* shall refer to nuclear waste, the calculated activity concentration of which after 500 years is below the level of 100 MBq/kg in each disposed waste package, and below an average value of 10 MBq/kg in waste in one emplacement room;

7) *low level waste* shall refer to nuclear waste that, because of its low level of activity, can be processed without any special radiation protection arrangements. The activity concentration of such waste is usually not more than 1 MBq/kg;

8) *anticipated operational occurrence* shall refer to such a deviation from normal operation that can be expected to occur once or several times during any period of a hundred operating years;

9) *expected evolution* shall refer to evolution where the disposal system performs as planned or where one or more long-term safety functions are assumed to degrade;

10) *postulated accident* shall refer to a deviation from normal operation which is assumed to occur less frequently than once over a span of one hundred operating years, excluding design extension conditions; and which the nuclear facility is required to withstand without sustaining severe fuel failure, even if individual components of systems important to safety are rendered out of operation due to servicing or faults. Postulated accidents are grouped into two classes on the basis of the frequency of their initiating events:
    a) class 1 postulated accidents, which can be assumed to occur less frequently than once during any period of one hundred years of operation, but at least once during any period of one thousand years of operation;
    b) class 2 postulated accidents, which can be assumed to occur less frequently than once during any period of one thousand years of operation.

11) *design extension condition* shall refer to:
    a) an accident where an anticipated operational occurrence or class 1 postulated accident involves a common cause failure in a system required to execute a safety function;
    b) an accident caused by a combination of failures identified as significant on the basis of a probabilistic risk assessment; or
    c) an accident caused by a rare external event which the nuclear facility is required to withstand without severe fuel damage;

12) *accident* shall refer to postulated accidents, design extension conditions and severe accidents;

13) *long-term safety shall refer to the safety of disposal after the closure of the disposal facility, taking account of radiation exposure on humans and the environment;*

14) *long-term safety functions* shall refer to functions achieved by the characteristics or processes of engineered and natural barriers that are intended to isolate the nuclear waste from the bedrock and the biosphere or to impede the migration of radionuclides;

15) *rare event impairing long-term safety* shall refer to a potential event significantly reducing the performance of barriers that has a very low probability of occurring but that may jeopardize long-term safety in case of occurrence. Such an rare event may be caused by geological phenomena, climatic phenomena or human action.

16) *long-lived waste* shall refer to nuclear waste the calculated activity concentration of which after 500 years is above 100 MBq/kg in a disposed waste package, or above an average value of 10 MBq/kg in waste placed in one emplacement room;

17) *safety case* shall refer to documentation for demonstrating compliance with the long-term safety requirements;

18) *safety functions* shall refer to functions important from the point of view of safety, the purpose of which is to control disturbances or prevent the generation or propagation of accidents or to mitigate the consequences of accidents;

19) *barrier* shall refer to an engineered or natural barrier used for achieving long-term safety functions;

20) *nuclear waste facility* shall refer to a nuclear facility that is used for the encapsulation of spent nuclear fuel or the processing of other nuclear waste for disposal, and to a disposal facility for spent nuclear fuel or other nuclear waste, but not permanently closed facilities where nuclear waste has been disposed of in a manner approved as permanent by STUK (Nuclear Energy Decree, Section 1);

21) *nuclear facility* shall refer to the facilities used for the generation of nuclear energy, including research reactors, facilities for the large-scale disposal of nuclear waste, and facilities for the large-scale production, use, processing or storage of nuclear material and nuclear waste (Nuclear Energy Act, Section 3(5)). However, nuclear facility shall not refer to:

    a) mines or ore processing plants intended for the production of uranium or thorium, or premises and sites including their precincts where nuclear wastes from such facilities are stored or deposited for final disposal;

    b) facilities and premises that have been permanently closed and where nuclear waste has been disposed in a manner approved as permanent by the Radiation and Nuclear Safety Authority; or

    c) premises or parts of a nuclear facility that have been decommissioned in a manner approved by the Radiation and Nuclear Safety Authority.

Chapter 2
General safety

Section 3 Demonstration of a nuclear facility's compliance with safety requirements

1. The safety of operation of a nuclear facility shall be assessed when applying for a construction license and operating license, in connection with plant modifications, and at Periodic Safety Reviews during the operation of the facility. The safety assessment shall demonstrate that the nuclear facility has been designed and implemented in a manner that meets the safety requirements. The safety assessment shall cover the operation of the facility in accordance with the Operating Limits and Conditions as well as anticipated operational occurrences and accident situations.

2. The nuclear facility's safety and the technical solutions of its safety systems shall be assessed and substantiated analytically and, if necessary, experimentally. These assessments and justifications shall be maintained and revised as necessary, taking into account operating experience from the facility itself and from other similar nuclear facilities, the results of safety research, plant modifications, and the advancement of calculation methods.

3. The methods employed to demonstrate compliance with safety requirements shall be reliable and suited to the purpose. The analyses shall demonstrate the conformity with the safety requirements with high certainty. Any uncertainty in the results shall be assessed and considered when assessing the meeting of the safety requirements.

4. The selection of operational occurrences and accidents to be analysed shall take account of their estimated probabilities and impacts.

5. The safety of decommissioning a nuclear waste processing or storage facility shall be assessed in connection with the updates of the decommissioning plan, when applying for a decommissioning license and at Periodic Safety Reviews during decommissioning. The safety assessment shall demonstrate that the decommissioning of the nuclear waste processing or storage facility and the final disposal of decommissioning waste have been designed and can be implemented in a manner that meets the safety requirements. The safety assessment shall cover activities pursuant to the plant's final decommissioning plan, including transients and accidents.

Section 4 Long-term safety of the disposal of nuclear waste

1. The long-term safety of the disposal of nuclear waste shall be assessed based on the applicable principles when selecting the disposal site and applying for a decision in principle. It shall also be assessed when applying for a licence for operations for a very low level waste disposal facility, a construction licence and operating licence for a disposal facility and a decommissioning license for a nuclear waste facility as well as during the periodic safety assessments. Furthermore, the safety assessment shall be updated prior to the permanent closure of the disposal facility and the termination of the waste management obligation. The assessment of long-term safety at different stages shall demonstrate that the disposal has been designed and implemented in accordance with the safety requirements. The safety assessment shall cover the period of time following the closure of the facility which is required for the purposes of ensuring the safety of disposal.

2. Long-term safety shall also be assessed on the basis of safety research results. The effect on long-term safety of any potential accident events occurring at the disposal facility shall be assessed.

3. The safety assessment is presented in the safety case, which shall assess the evolution of the disposal system after the closure of the disposal facility and the related releases of radioactive substances by means of calculational analyses and other complementary considerations.

Section 5 Safety classification

1. The safety functions for the operation of the nuclear facility and long-term safety functions shall be defined, and the systems, structures and components performing them and related to them shall be classified. The classification shall take into account the use of the systems, structures and components on the basis of significance in terms of operational safety, long-term safety or both, if necessary.

2. Safety classification shall be applied in determining the quality requirements for systems, structures and components.

3. The requirements set for and the actions to ascertain the compliance with the requirements of the systems, structures and components implementing operational safety functions and connecting systems, structures and components shall be commensurate with the safety class of the item in question.

4. Systems, structures and components performing long-term safety functions shall be designed, manufactured and installed so that their quality level, and the assessments, inspections and tests required to verify their quality level, are commensurate with the safety significance of the item in question.

Section 6 Ageing management

1. The design, construction, operation, condition monitoring and maintenance of a nuclear facility shall provide for the ageing of systems, structures and components important to operational safety in order to ensure that they meet the design-basis requirements with necessary safety margins throughout the service life of the facility.

2. Systematic procedures shall be in place for preventing such ageing that may deteriorate the availability of the systems, structures and components that are important in terms of the operational safety of the nuclear facility, and for the early detection of the need for their repair, modification and replacement. Safety requirements and applicability of new technology shall be periodically assessed in order to ensure that the technology applied is up to date, and the availability of the spare parts and the system support shall be monitored.

Section 7 Management of human factors relating to safety

1. Human factors relating to safety shall be controlled with systematic procedures throughout the entire life cycle of the nuclear facility. Human factors shall be taken into account in the design of the nuclear facility and in the planning of its operations, maintenance and decommissioning, so that the quality implementation of the work is as easy as possible and human activities do not endanger plant safety. Special attention shall be paid to the avoidance, detection and correction of human errors and the limiting of their effects.

Section 8 General design bases for the safety of a nuclear facility

1. Disposal shall be implemented in stages, with particular attention paid to aspects affecting long-term safety. The planning of the construction, operation and closure of a disposal facility shall account for the reduction of the activity of nuclear waste through interim storage, the utilisation of high-quality technology and research data, and the need to develop an understanding of the performance of the barriers and long-term safety through investigations and monitoring.

2. The design and implementation of the processing and storage of nuclear waste processed and arisen at the nuclear facility shall be made comprehensively taking into account possible dependencies between the different stages of nuclear waste management.

Chapter 3
Limitation of radiation exposure and releases of radioactive substances

Section 9 Safety of workers and the members of the public during the operation of the facility

1. Section 2 a(1) subparagraph (1) and Section 7 c of the amendment to the Nuclear Energy Act (862/2018) contain provisions regarding the limiting of the radiation exposure caused by the nuclear waste facility or a nuclear facility intended for the interim storage of nuclear waste to the workers and the public in the surroundings of the nuclear facility.

2. Radiation exposure and emissions of radioactive substances shall be limited through layout and placement design of the nuclear facility, material choices and planning of the working methods for operation and decommissioning of the facility and by using systems, structures, components, special radiation shielding and workers' equipment.

Section 10 Radiation exposure caused by the disposal after closure

1. The dose constraints of long-term radiation exposure caused by the disposal of nuclear waste and the threshold values of the emissions are enacted in the Nuclear Energy Decree (161/1988). The disposal of nuclear waste shall be designed and implemented in a manner where the radiation exposure and emissions caused by nuclear waste as a result of expected evolution will not exceed the dose constraints and the threshold values of the emissions set in the Nuclear Energy Decree.

Section 11 Taking account of rare events during the assessment of the long-term safety of disposal

1. The probabilities of rare events impairing long-term safety and their impacts on the disposal system and the long-term safety of disposal shall be assessed. The radiation exposure caused by them shall be assessed where possible. The probability of events causing significant radiation exposure shall be very low, and the widespread effects of the release of radioactive substances caused by them shall be low.

2. The radiation exposure caused by inadvertent human intrusion into the emplacement rooms during the period following their closure shall be assessed.

Chapter 4
Nuclear safety

Section 12 Siting of a nuclear facility

1. The impact of local conditions on operational safety and the feasibility to implement the arrangements for security and emergency arrangements shall be considered when selecting the site of a nuclear facility. The site shall be such that the detriments and threats posed by the operation of the facility to its vicinity remain very low.

Section 13 Defence-in-depth

1. In order to prevent anticipated operational occurrences and accidents, and to mitigate the consequences thereof, the functional defence-in-depth principle shall be implemented in the design, construction and operation of a nuclear facility taking into account safety significance.

2. In accordance with the functional defence-in-depth safety principle, the design shall include the following levels of defence:

1) prevention to ensure that the operation of the facility is reliable and deviations from normal operating conditions are rare;

2) control of deviations from the plant's normal operating conditions so that the plant is equipped with systems which are able to limit the development of operational occurrences into accidents;

3) control of accident situations so that the nuclear facility is equipped with systems that function automatically and reliably to limit the release of radioactive substances in postulated accidents and in design extension conditions; manually actuated systems can also be used to manage accident situations if it can be justified from a safety perspective;

4) mitigation of the consequences, when necessary, by means of emergency arrangements to limit the public's exposure to radiation in situations where radioactive substances are released from the facility into the environment.

3. The levels of defence implementing the defence-in-depth principle shall be as independent of one another as is reasonably achievable.

4. High quality proven technology is to be used for the different levels of the defence-in-depth.

5. The necessary measures to bring a situation under control or to prevent harmful effects of radiation shall be planned in advance. When organising the licensee's operations, it must be ensured that operational occurrences and accidents are reliably prevented. There shall be effective technical and administrative provisions to ensure staff's ability to operate in these situations.

Section 14 Technical barriers for preventing the dispersion of radioactive substances

1. In order to prevent the dispersion of radioactive substances during the operation of the nuclear facility, the principle of structural defence-in-depth shall be followed during the operation while taking the safety significance of the nuclear facility into account. The design in accordance with the principle of structural defence-in-depth shall use consecutive technical barriers for limiting the dispersion of radioactive substances into the environment.

Section 15 Safety functions and provisions for ensuring them

1. Ensuring the functions important to safety shall primarily be based on inherent safety features, alongside systems and components that do not require external power supply or which, as a consequence of a loss of power supply, will settle into a state preferable from the safety point of view.

2. The functions at a nuclear facility, the failure of which could result in a significant release of radioactive substances or radiation exposure of personnel at the facility, shall be ensured.

3. A nuclear facility shall encompass systems that facilitate quick and reliable detection of an operational occurrence or accident and prevent the escalation of any event.

4. The possibility of damage to the fuel rod cladding of spent nuclear fuel as a result of the prevention of the removal of residual heat shall be very low.

4a. Damage to the fuel rod cladding of spent nuclear fuel during handling and storage must be prevented with a high degree of confidence.

4b. The possibility of criticality during the handling and storage of spent nuclear fuel shall be very low.

5. Repealed.

Section 16 Safety of nuclear waste processing and storage

1. Waste generated during the operation and decommission of a nuclear facility, the activity concentration of which exceeds the levels set by the Radiation and Nuclear Safety Authority (STUK), shall be treated as nuclear waste. Nuclear waste shall be sorted, categorised according to its characteristics, processed and packaged in an appropriate manner in terms of its storage and disposal, and stored safely.

2. Repealed.

3. Sufficient radiation protection shall be ensured in the handling of spent nuclear fuel or other highly irradiating nuclear waste by using remote handling and radiation shielding.

4. Limiting values shall be set for each waste class, which the waste package used for the waste in question shall meet in terms of the operational safety of the nuclear facility and long-term safety. Acceptance criteria shall be defined for the waste and waste packages.

5. A licensee under a waste management obligation who intends to deliver nuclear waste to a handling, storage or disposal facility of another licensee shall ensure that the waste is handled and packed acceptably, taking into account the later stages of waste management.

Section 17 Protection against external hazards affecting safety

1. The design of a nuclear facility shall take account of external hazards that may endanger operational safety. Systems, structures and components as well as access routes shall be designed, located and protected so that the impacts of external hazards deemed possible on nuclear facility safety remain minor. The operability of systems, structures and components important to safety shall be demonstrated in the external environmental conditions used as their design bases.

2. External hazards shall include exceptional weather conditions, seismic events, the effects of accidents that take place in the environment of the facility, and other factors resulting from the environment or human activity. The design shall also consider unlawful and other unauthorised activities compromising nuclear safety, as well as aircraft crashes.

Section 18 Protection against internal hazards affecting safety

1. The design of a nuclear facility shall take account of internal hazards that may endanger safety. Systems, structures and components shall be designed, located and protected so that the probability of internal hazards remains low and impacts on plant safety minor. The operability of systems, structures and components shall be demonstrated in the environmental conditions used as their design bases.

2. Internal hazards to be considered shall include fire, flood, explosion, electromagnetic radiation, drop of heavy objects, different types of rock slides, and other possible internal events. The design shall also consider unlawful and other unauthorised activities compromising nuclear safety.

Section 19 Safety of monitoring and control of the nuclear facility

1. The operators of the nuclear facility shall have access to equipment that provides information regarding the state of components and systems that are important in terms of the safety of the facility.

2. A nuclear facility shall be equipped with automatic systems as deemed necessary, that actuate safety functions as required, and that control and supervise their functioning during operational occurrences to prevent accidents and during accidents to mitigate their consequences.

Section 20 § Taking the safety of the decommissioning of a nuclear facility into consideration in design, and the safety of the decommissioning of a nuclear facility

1. The design of a nuclear facility and its operation shall take account of the safety of decommissioning of the facility so that it is possible to limit the accumulating volume of nuclear waste for disposal during dismantling, and radiation exposure to workers due to the dismantling, and to prevent radioactive substances from spreading into the environment during decommissioning.

Section 21 Safety of the closing of the disposal facility

1. The disposal facility shall be designed, constructed and operated in a manner that allows it to be closed without jeopardising long-term safety after its operation has ended.

Chapter 5
Safety of the construction and commissioning of a nuclear facility

Section 22 Safety of construction of a nuclear facility

1. The holder of the nuclear facility's construction license shall ensure during construction that the facility is constructed and implemented in conformity with the safety requirements and using approved plans and procedures.

2. At the construction stage, the licensee shall ensure that an expedient organisation is in place for the construction of the nuclear facility, alongside a sufficient number of qualified personnel and appropriate procedures.

3. Repealed.

Section 23 Safety of commissioning of a nuclear facility

1. In connection with the commissioning of the nuclear facility or its modifications, the licensee shall ensure that the systems, structures and components and the facility as a whole operate as designed and that the disposal system can be implemented. The procedures of the commissioning of the nuclear facility or its modifications shall be planned, and instructions shall be provided.

2. At the commissioning stage, the licensee shall ensure that appropriate procedures are in place for the future operation of the nuclear facility.

Chapter 6
Safety of the operation of a nuclear facility

Section 24 Safety of operation

1. Repealed.

2. The control and supervision of a nuclear facility shall utilise written procedures that correspond to the existing structure and state of the facility. Written orders and related procedures shall be provided for the maintenance and repair of components.

3. Procedures shall be made available for the identification and control of operational occurrences and accidents.

4. Significant events influencing safety shall be documented so as to facilitate their later analysis.

5. The holder of the nuclear facility's operating license shall ensure that the modifications to the nuclear facility are designed and implemented in conformity with the safety requirements and using approved plans and procedures.

Section 24 a Safety of decommissioning

1. The holder of the nuclear facility's decommissioning license shall ensure during decommissioning that the dismantling of the nuclear waste facility is implemented in conformity with the safety requirements and using approved plans and procedures.

Section 25 Taking operating experience and safety research into consideration in order to improve safety

1. Safety-significant operational events shall be investigated for the purpose of identifying the root causes as well as defining and implementing the corrective measures.

2. For further safety enhancement, operating experience from the facility and from other nuclear facilities, the results of safety research and technical developments shall be regularly monitored and assessed.

3. Opportunities for improvements in technical and organisational safety, identified from operating experience, safety research and technical developments shall be assessed and implemented to the extent regarded as justified on the basis of the principles laid down in Section 7 a of the Nuclear Energy Act.

Section 26 Operational Limits and Conditions

1. The Operational Limits and Conditions of a nuclear facility shall include the technical and administrative requirements for ensuring the facility's operation in compliance with the design bases and the assumptions of safety analyses. The requirements for ensuring the availability of systems, structures and components important to safety, as well as the limitations that are to be complied with when they are unavailable, shall also be included in the Operational Limits and Conditions.

2. The facility shall be operated as laid down in the requirements and limitations of the Operational Limits and Conditions, and complying with them shall be monitored and any deviations shall be reported.

3. The Operational Limits and Conditions shall be applied during the decommission of a nuclear facility to the extent necessary for ensuring the safe decommissioning of the nuclear facility.

Section 27 Condition monitoring and maintenance to ensure the safety of the facility

1. Systems, structures and components important to the safety of the operation of a nuclear facility shall be available as detailed in the design basis requirements.

2. Operability and the effects of the operating environment shall be monitored by means of inspections, tests, measurements and analyses. Regular maintenance shall be used to ensure operability in advance. Overhaul and maintenance shall be prepared for in order to prevent the degradation of operability. Condition monitoring and maintenance shall be planned, supervised and

implemented so that the integrity and operability of systems, structures and components are reliably preserved throughout their service life.

Section 28 Radiation measurements, monitoring of releases of radioactive substances and estimation of radiation doses to public and workers

1. The radiation levels of the nuclear facility's rooms and the activity concentrations of indoor air and gases and liquids inside the systems shall be measured.

1a. The discharges of radioactive substances from the nuclear facility shall be monitored and their concentrations in the environment shall be measured.

2. The radiation doses to the workers and the public in the surroundings caused by the operation of a nuclear facility shall be measured or otherwise estimated with due consideration given to external and internal radiation exposure.

3. As concerns the public's radiation doses, the radiation dose for an individual representing the most exposed group shall be defined. In the definition of radiation exposure, the significant migration routes of radioactive substances shall be taken into account.

4. The radiation doses and the releases and concentrations of radioactive substances in the environment shall be reported to the Radiation and Nuclear Safety Authority.

Section 29 Disposal functions

1. The transfer of waste packages into the emplacement rooms shall be carried out so that the possibility of accident events remains low and the waste packages are not damaged in a way that would affect operational or long-term safety.

2. The transfer of the waste packages into the emplacement rooms shall be implemented in a manner that will not cause unnecessary radiation exposure to the personnel.

3. The excavation and construction work of the disposal facility shall be separated from the disposal functions in such a manner as to ensure that the excavation and construction work will not negatively affect the operational safety of the facility or the long-term safety of the waste disposed of.

4. The licensee shall maintain a record of the disposed waste that includes waste package specific data on the waste type, radioactive substances, location within the emplacement rooms and other information deemed necessary by the authority. The waste records shall be submitted to the Radiation and Nuclear Safety Authority (STUK) in a format approved by it. The Radiation and Nuclear Safety Authority arranges the permanent keeping of records of information concerning the disposal facility and disposed waste.

Chapter 7
Disposal system

Section 30 Long-term safety of the disposal of nuclear waste

1. The long-term safety of disposal shall be based on long-term safety functions achieved through mutually complementary barriers so that the degradation of one or more long-term safety function or a foreseeable change in the bedrock or climate will not jeopardise the long-term safety.

Section 31 Disposal site

1. The characteristics of the rock at the disposal site shall, as a whole, be favourable to the isolation of the radioactive substances from the living environment. Any area with a feature that is substantially adverse to long-term safety shall not be selected as the disposal site.

2. The planned disposal site shall contain sufficiently large, intact rock volumes that facilitate the construction of the waste emplacement rooms. For the purposes of disposal facility design and acquiring data required for safety assessments, the characteristics of the rock at the site shall be characterised through investigations from ground surface and at the intended disposal depth, if necessary.

3. No significant or exceptional deposits of exploitable natural resources shall be present at the disposal site or its vicinity.

4. The siting, excavation, construction and closure of underground rooms shall be implemented so that the characteristics of the rock deemed important in terms of long-term safety are retained, as far as possible.

5. The depth of the waste emplacement rooms shall be selected appropriately as regards the waste type and local geological conditions. The aim shall be that impacts on the long-term safety of above-ground events, activities and environmental changes will remain minor and that intrusion into the waste emplacement rooms will be difficult.

6. If nuclear waste referred to in the Nuclear Energy Act is disposed of in a facility constructed in the ground, the disposal shall be planned and implemented according to the requirements of this regulation while taking into account the limited activity of the waste. Only very low-level waste, the total activity of which does not exceed the limits laid down in section 6(1) of the Nuclear Energy Decree, can be placed in a facility constructed in the ground.

Section 32 Engineered barriers

1. The characteristics of engineered barriers shall be such that they effectively prevent the release of radioactive substances into the bedrock surrounding the underground emplacement rooms for a duration of time that is sufficient in relation to the half-life of the radioactive elements contained within the waste. In the case of disposal of very low-level waste in the ground, the entry of radioactive substances into the environment must be prevented effectively. For short-lived waste, this period shall be at least several hundreds of years, and for long-lived waste, at least several thousands of years.

1a. The engineered barriers shall slow down the passage of radionuclides.

1b. Engineered barriers shall not be constructed of materials or combinations of materials that have a clearly unfavourable characteristic in terms of long-term safety or whose operability may be reduced under the conditions present in the emplacement rooms in a manner that jeopardises long-term safety of disposal.

2. The characteristics of a disposal package that contains spent nuclear fuel shall effectively prevent the release of radioactive substances.

3. The disposal package containing spent nuclear fuel shall be designed so that no self-sustaining chain reaction of fissions can occur, with a high level of certainty, under the disposal conditions.

Section 33 Research and monitoring programme

1. In order to ensure the performance of the barriers, a research and monitoring programme shall be established and implemented for the operating stage of the disposal facility.

Section 34 Protection zone

1. An adequate protection zone shall be reserved around the disposal facility as a provision for the prohibitions on measures referred to in Section 63(1)(6) of the Nuclear Energy Act.

Chapter 8
Long-term safety

Section 35 Long-term safety

1. Compliance with the requirements concerning nuclear and radiation safety and the suitability of the disposal method, engineered barriers and disposal site shall be demonstrated by means of a safety case that shall study the possible evolutions of the disposal system, including evolutions caused by rare events impairing long-term safety. The safety case includes, for example, calculational safety analysis based on the evolutions and the complementary considerations.

2. Compliance with the dose constraints for the most exposed people, as referred to in the Nuclear Energy Decree, shall be demonstrated by considering a community that derives nourishment from the immediate surroundings of the disposal site and is most exposed to radiation. In addition to exposure on people, possible impacts on flora and fauna shall be analysed.

3. The radiation exposure caused to people during the assessment periods referred to in the Nuclear Energy Decree where the maximum values of the long-term averages for the amount of released radioactive substances apply shall also be assessed by using stylized models of the surface environment that consider alternative evolutions of the surface environment.

Section 36 Reliability of the safety case

1. The safety case and the methods, data and models used in it shall be based on high-quality research data and expert judgement, and they shall be documented in a traceable manner. The data and models

shall be appropriate and correspond to the anticipated conditions at the disposal site and system during each assessment period.

2. The basis for calculational analyses shall be that the actual amounts of radioactive substances released and the actual radiation exposure shall be, with a high degree of certainty, lower than the results received from the safety analyses. The safety case shall separately assess the uncertainties included in the data, models and analyses and their significance.

Section 37 Presentation of, and updates to, the safety case

1. The safety case shall be presented when applying for a construction licence and operating licence for the disposal facility and when making substantial plant modifications. The safety case shall be updated during the periodic safety assessments of the disposal facility unless otherwise provided in the licence conditions. The need for updating the safety case shall be assessed before making modifications that concern the disposal system. Furthermore, the safety case shall be updated prior to the closure of the facility.

Chapter 9
Organisation and personnel

Section 38 Ensuring safety by management, organisation and personnel of a nuclear facility

1. When designing, constructing, operating and decommissioning a nuclear facility, a good safety culture shall be maintained. Safety shall take priority in all operations. The decisions and activities of the management of each organisation participating in the abovementioned activities shall reflect its commitment to operational practices and solutions that promote safety. Personnel shall be encouraged to perform responsible work, and to identify, report, and eliminate factors endangering safety. Personnel shall be given the opportunity to contribute to the continuous improvement of safety.

2. Organisations participating in the design, construction, operation and decommissioning of a nuclear facility shall employ a management system for ensuring safety and the management of quality. The objective of such a management system shall be to ensure that safety is prioritised without exception, and that quality management requirements correspond to the safety significance of the activity and function. The management system shall be systematically assessed and further developed.

3. The management system shall cover all organisational activities impacting the nuclear facility's safety. For each function, requirements significant to safety shall be identified, and the planned measures described in order to ensure conformity with requirements. The operating methods of the organisation shall be systematic and instructed.

4. Systematic procedures shall be in place for identifying and correcting deviations significant in safety terms.

4a. If it becomes necessary to make changes to approved designs, they are to be implemented in a systematic and controlled manner.

5. The licensee shall commit and oblige its employees and the suppliers and subcontractors whose involvement affects the safety of the nuclear facility to adhere to the systematic management of safety and quality.

6. The lines of management in the licensee's organisation, as well as the positions and related responsibilities of employees, shall be defined and documented. The operation of the organisation shall be evaluated and continuously developed and the risks associated with the organisation's operation are to be evaluated regularly. The safety impacts of significant organisational changes are to be evaluated in advance.

7. Significant functions with respect to safety shall be designated. The competence of the persons performing these functions shall be verified.

8. The licensee shall have a sufficient number of competent personnel suitable for the related tasks for ensuring the safety of the nuclear facility. The licensee shall have access to the professional expertise and technical knowledge required for the safe construction, operation and decommission of the nuclear facility, the maintenance of equipment important to safety, and the management of accidents, and the long-term safety of disposal, including closure.

9. The licensee shall, as support for the responsible manager, have a group of experts, independent of the other parts of the organisation, convening on a regular basis to handle safety-related issues and giving recommendations thereon if necessary.

Chapter 10
Entry into force and transitional provisions

Section 39 Entry into force

1. This regulation enters into force on15 December 2018.

2. This regulation repeals the Radiation and Nuclear Safety Authority's Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2016) issued on 22 December 2015.

3. Upon the entry into force, this regulation shall be applied to any pending matters.

Adopted in Helsinki 10 December 2018

Director General Petteri Tiippana

Director Jussi Heinonen

Availability of the regulation, guidance and advice

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

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