GUIDE YVL D.4

PREDISPOSAL MANAGEMENT OF LOW AND INTERMEDIATE LEVEL NUCLEAR WASTE AND DECOMMISSIONING OF A NUCLEAR FACILITY

Definitions

Authorisation

According to Section 7 r of the Nuclear Energy Act (990/1987), *the Radiation and Nuclear Safety Authority (STUK) shall specify detailed safety requirements for the implementation of the safety level in accordance with the Nuclear Energy Act.*

Rules for application

The publication of a YVL Guide shall not, as such, alter any previous decisions made by STUK. After having heard the parties concerned STUK will issue a separate decision as to how a new or revised YVL Guide is to be applied to operating nuclear facilities or those under construction, and to licensees' operational activities. The Guide shall apply as it stands to new nuclear facilities.

When considering how the new safety requirements presented in the YVL Guides shall be applied to the operating nuclear facilities, or to those under construction, STUK will take due account of the principles laid down in Section 7 a of the Nuclear Energy Act (990/1987): *The safety of nuclear energy use shall be maintained at as high a level as practically possible. For the further development of safety, measures shall be implemented that can be considered justified considering operating experience and safety research and advances in science and technology.*

According to Section 7 r(3) of the Nuclear Energy Act, *the safety requirements of the Radiation and Nuclear Safety Authority are binding on the licence holder, while preserving the licence holder's right to propose an alternative procedure or solution to that provided for in the regulations. If the licence holder can convincingly demonstrate that the proposed procedure or solution will implement safety standards in accordance with this Act, the Radiation and Nuclear Safety Authority may approve the procedure or solution.*

With regard to new nuclear facilities, this Guide shall apply as of 1 January 2020 until further notice. With regard to operating nuclear facilities and those under construction, this Guide shall be enforced through a separate decision to be taken by STUK. This Guide replaces Guide YVL D.4 (15.11.2013).

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1 Introduction

101. Low and intermediate level waste is generated at nuclear facilities, notably nuclear power plants, when radioactive liquids and gases are processed and repair and maintenance work is carried out in the controlled area, among other things. In the present Guide, this type of waste is referred to as operational waste. Most of operational waste contains radioactive materials to such an extent that it must be processed, stored and disposed of in compliance with radiation protection requirements. **[**2013-11-15 **]**

102. According to Section 3(1)(5b) of the Nuclear Energy Act the decommissioning of a nuclear facility means *the dismantling of a finally closed nuclear facility so that no special measures are required on the plant site due to radioactive materials originating in the dismantled nuclear facility.* Decommissioning also involves the processing, storage and disposal of the low and intermediate level waste arising from the dismantling of the facility (decommissioning waste). Under Section 3(1)(4) of the Nuclear Energy Act, all measures related to the decommissioning of a nuclear facility are regarded as part of nuclear waste management. **[**2019-12-15 **]**

103. Any waste generated inside the controlled area of a nuclear facility, including the structures and components of a permanently closed nuclear facility, is by definition nuclear waste. According to Section 3(1)(3b) of the Nuclear Energy Act, *nuclear waste means materials, objects and structures which, having become radioactive in connection with or as a result of the use of nuclear energy and having been removed from use, require special measures because of the danger arising from their radioactivity.* According to Section 27 c(1–2) of the Nuclear Energy Act, *nuclear waste other than spent nuclear fuel may, regardless of its radioactive nature, be reused, recycled, recovered and disposed of in accordance with the provisions of the Waste Act (646/2011) if the amount of radioactive substances within it does not exceed the clearance level provided by the virtue of section 7 q(1)(28). If the amount of radioactive substances within the waste referred to in subsection 1 is greater than the clearance level, the operations referred to in subsection 1 will require the approval of the Radiation and Nuclear Safety Authority.* **[**2019-12-15 **]**

104. According to Section 33 of the Nuclear Energy Act, a nuclear facility is considered decommissioned when the Radiation and Nuclear Safety Authority (STUK) has confirmed that the quantity of radioactive materials remaining in the buildings and soil of the facility site complies with the requirements specified under this Act. In the present Guide, this procedure is referred to as the clearance of a nuclear facility site and any buildings therein left undismantled. **[**2019-12-15 **]**

105. This Guide addresses the facilities and activities referred to above. Chapters 3 through 7 of the Guide contain requirements pertaining to the processing and storage of operational waste and the decommissioning of a nuclear facility, as well as obligations concerning a licence applicant or licence holder. Chapter 8 describes the regulatory oversight exercised by the STUK and other regulatory control. **[**2019-12-15 **]**

106. The basic requirements concerning the safe use of nuclear energy are set out in the Nuclear Energy Act. Section 7 h of the Act provides general safety requirements for nuclear waste management, and Section 7 g for the decommissioning of a nuclear facility, respectively. The general principles for radiation protection and provisions concerning radiation work are set out in the Radiation Act (859/2018) and the Government Decree on Ionising Radiation (1034/2018). **[**2019-12-15 **]**

107. The Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018) applies to the processing and storage of the waste of nuclear power plants, including the interim storage of spent nuclear fuel, and to the decommissioning of a nuclear power plant. The Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018) applies respectively to nuclear facilities intended for the processing and storage of spent nuclear fuel and other nuclear waste that are not part of a nuclear power plant. The Radiation and Nuclear Safety Authority Regulations on Security in the Use of Nuclear Energy (STUK Y/3/2016) and on the Emergency Arrangements of a Nuclear Power Plant (STUK Y/2/2018) apply to the processing and storage of operational waste and the decommissioning of a nuclear facility where applicable. The Radiation and Nuclear Safety Authority Regulation on Exemption Values and Clearance Levels (STUK SY/1/2018) applies to the clearance from regulatory control of solid materials. **[**2019-12-15 **]**

108. According to Annex 1 (7b) of the Act on the Environmental Impact Assessment Procedure (252/2017), nuclear power plants and other nuclear reactors, including the dismantling and decommissioning of such plants and reactors, are projects that are subject to an environmental assessment procedure. **[**2019-12-15 **]**

109. The disposal of nuclear waste is addressed in Guide YVL D.5 "Disposal of nuclear waste". Several other YVL Guides issued by STUK are applicable to the processing and storage of operational waste and to the decommissioning of nuclear facilities. This Guide contains references to the applicable Guides. **[**2019-12-15 **]**

2 Scope of application

201. This Guide sets out the requirements that shall be complied with when planning and implementing the sorting, processing, storage, activity determination and record-keeping of low and intermediate level waste arising from the operation of nuclear facilities (hereinafter the processing and storage of operational waste). **[**2013-11-15 **]**

202. The Guide sets out the basic requirements for planning and implementing the decommissioning of a nuclear facility and for the sorting, processing, storage, activity determinations and record-keeping of the waste arising from decommissioning (hereinafter the processing and storage of decommissioning waste). **[**2013-11-15 **]**

203. The Guide also addresses the clearance of nuclear waste, including recyclable material, arising from the operation and decommissioning of a nuclear facility, as well as the clearance of a decommissioned nuclear facility. The Guide discusses the clearance procedures and the activity determination and record-keeping of the materials to be cleared. **[**2013-11-15 **]**

204. This Guide primarily concerns nuclear power plants and research reactors, but it also pertains, where applicable, to other nuclear facilities and to the processing and storage of radioactive waste, the custody of which is permanently assigned to the Government by virtue of Section 80(3) of the Radiation Act. According to Section 32 of the Government Decree (1034/2018), STUK *shall ensure that the duties involved in managing the obligations specified for the Government in Section 80(1–3) of the Radiation Act are carried out. Responsibility for the waste shall pass to the Government when the waste has been surrendered to STUK.* The Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste shall also, according to Section 1(2), apply to the radioactive waste referred to in Section 4(15) of the Radiation Act if it is handled or stored at a nuclear facility or disposed of in a disposal facility for nuclear waste referred to in Section 1(1) of the Regulation. **[**2019-12-15 **]**

3 Nuclear and radiation safety

3.1 Operation and decommissioning of a nuclear facility

301. Under Section 22 b of the Nuclear Energy Decree, the annual dose constraint for the member of the public arising from the normal operation of a nuclear power plant and other nuclear facility equipped with a nuclear reactor shall be 0.1 mSv. The annual dose constraint for the member of the public arising from the planned decommissioning of a nuclear power plant and other nuclear facility equipped with a nuclear reactor shall be 0.01 mSv. **[**2019-12-15 **]**

302. Pursuant to Section 22 d of the Nuclear Energy Decree, the processing and storage of operational waste and the decommissioning of the nuclear facility shall be so designed that the annual dose constraint for the member of the public arising from planned processing and storage is 0.01 mSv. **[**2019-12-15 **]**

303. The annual dose constraints for the most exposed member of the public arising as a result of an operational occurrence or accident where nuclear waste is processed or stored shall be, under Section 22 d(2) and Section 22 b(2–6) of the Nuclear Energy Decree:
a. 0.1 mSv as a result of an anticipated operational occurrence
b. 1 mSv for a Class 1 postulated accident
c. 5 mSv for a Class 2 postulated accident. **[**2019-12-15 **]**

304. The decommissioning of a nuclear power plant shall be designed based on the dose constraints for operational occurrences and accidents specified in requirement 303.
[2019-12-15 **]**

305. In Section 2 of the Radiation and Nuclear Safety Authority Regulation STUK Y/1/2018, anticipated operational occurrences have been defined as such deviations from normal operation that can be expected to occur once or several times during any period of a hundred operating years. **[**2019-12-15 **]**

306. In Section 2 of the Radiation and Nuclear Safety Authority Regulation STUK Y/1/2018, the postulated accidents to be considered have been defined so that Class 1 postulated accidents *can be assumed to occur less frequently than once over a span of one hundred operating years, but at least once over a span of one thousand operating years* and Class 2 postulated accidents *less frequently than once during any one thousand operating years.* **[**2019-12-15 **]**

307. The dispersion analyses of radioactive releases to the environment and the analyses of the radiation doses arising from the releases are presented in Guide YVL C.4 "Assessment of radiation doses to the public in the vicinity of a nuclear facility". This applies to normal

operation, operational occurrences and accidents. **[**2019-12-15 **]**

3.2 Clearance

308. According to Section 27 d of the Nuclear Energy Act *clearance levels shall be set in such a way that the exposure caused to members of the public is of minor significance. Clearance levels may apply to the facility site or building referred to in Section 33(2) or waste referred to in Section 27 c*. The basic radiation protection requirement for the clearance of nuclear waste is that the annual dose constrain to any member of the public or worker handling the waste is 0.01 mSv, and that the radiation exposure arising from the cleared waste is otherwise kept as low as reasonably achievable. This dose constraint applies to the clearance of materials arising from the operation or dismantling of a single nuclear power plant or other nuclear facility. **[**2019-12-15 **]**

309. The basic radiation protection requirement for the clearance of the buildings and the site of a nuclear facility is that the typical annual dose constrain to the most exposed individual arising from the use of the cleared site and buildings is 0.01 mSv. In a case-specific clearance procedure where the future use of the site and the buildings is restricted, an annual dose constrain of an individual 0.1 mSv may be permitted based on radiation protection optimisation. Furthermore, it must be demonstrated by means of analyses that even if the restrictions imposed on the use of the site were to fail, the annual dose arising from use of the buildings and occupancy at the site would remain below 1 mSv with high certainty. **[**2019-12-15 **]**

4 Design requirements

4.1 General safety principles

4.1.1 Processing and storage of operational waste

401. According to Section 7(h)(1) of the Nuclear Energy Act, *the nuclear facility shall have premises, equipment, and other arrangements required to ensure the safe handling and storage of [...] any nuclear waste generated during operation and decommissioning.* **[**2019-12-15 **]**

402. The planning and implementation of the processing and storage of operational waste shall be carried out with due consideration given to potential dependencies between different waste management stages. Account shall be taken of the following safety principles in particular:
a. The generation of waste that needs to be stored or disposed of shall, among other things, be limited by means of repair work and maintenance planning, and decontamination and volume reduction.
b. Waste shall be appropriately sorted and classified in view of its further treatment, clearance, storage and disposal.
c. Waste that can be disposed of in a repository shall be conditioned and packed in accordance with the disposal requirements.
d. Waste that cannot yet be disposed of in a repository shall be safely processed and stored until disposal.
e. The radiation exposure of workers arising from waste management actions shall be limited, the spreading of radioactive materials inside the facility and into the environment shall be prevented, and preparedness for operational occurrences and accident conditions shall be maintained.
f. The radioactivity and other properties of waste shall be determined and recorded such as to ensure the availability of the necessary information concerning the waste packages that are to be disposed of, or any waste that is to be stored for a prolonged period of time. **[**2013-11-15 **]**

4.1.2 Decommissioning of a nuclear facility

403. According to Section 7 g(1) of the Nuclear Energy Act, *in design of a nuclear facility, provision shall be made for the decommissioning of the facility. In decommissioning of a nuclear facility, attention shall be paid primarily to safety. The dismantling of the facility and other measures for the decommissioning may not be postponed without due cause.* **[**2019-12-15 **]**

404. According to Section 7 g(2) of the Nuclear Energy Act, *the licence applicant and the licence holder shall prepare a plan for the decommissioning of the nuclear facility.* In the design stage of a nuclear facility, a decommissioning plan shall be established that at least defines the implementation stages with timetables, an outline of the dismantling and waste management solutions adopted, and the end state of the facility site. If the plan involves a prolonged period of monitored storage prior to the dismantling of the facility, this shall be justified by considerations such as radiation protection optimisation, co-implementation of the decommissioning with other nuclear facilities at the same site, or the commissioning of disposal facilities. **[**2019-12-15 **]**

405. A nuclear facility's operating licence application shall include a sufficiently detailed decommissioning plan commensurate with the type and state of the facility. According to Section 7 g(2) of the Nuclear Energy Act, *unless otherwise provided in the licence terms, the licence holder shall also, during the operations requiring a licence, present on a regular basis, at least at 6-year intervals, an update to the plan for the decommissioning of the nuclear facility for assessment by the Radiation and Nuclear Safety Authority.* The updated plan can be used as the basis for the final decommissioning plan drafted after the permanent shutdown of the facility. **[**2019-12-15 **]**

406. According to Section 17 of the Radiation and Nuclear Safety Authority Regulation STUK Y/1/2018 and Section 20 of STUK Y/4/2018, the design of a nuclear facility and its operation shall take account of the decommissioning of plant so that it is possible to limit the volume of nuclear waste for disposal accumulating during the dismantling, and radiation exposure to workers due to the dismantling of the nuclear facility, and to prevent radioactive materials from spreading into the environment during decommissioning. **[**2019-12-15 **]**

407. Account shall be taken of the safety principles included in requirements 401 and 402 when the processing and storage of the waste arising from the decommissioning of a nuclear facility is planned and implemented. **[**2013-11-15 **]**

408. During the design, construction, operation and particularly in connection with final shutdown of a nuclear facility, information concerning the facility that is of use when the decommissioning plan of the facility is kept up to date and when the facility is decommissioned

shall be sought out, collected and recorded. **[**2013-11-15 **]**

4.1.3 Clearance

409. Nuclear waste may be cleared from regulatory control following a general or case-specific procedure.
a. In a general clearance procedure, the destination of the materials released from the facility need not be designated, or is only designated in its outline, and the activity levels to be applied are fixed.
b. In a case-specific clearance procedure, the recipient of the material and the maintenance process must be defined; the activity levels will be imposed based on case-by-case consideration. **[**2013-11-15 **]**

410. The general clearance procedure is not applicable to waste that is volatile or flammable or is otherwise particularly prone to cause radiation exposure. **[**2013-11-15 **]**

411. In the event that solid waste is cleared following the general procedure without any limitations, the radionuclide-specific activity levels specified in Annex A shall be complied with under Nuclear Safety Authority Regulation STUK SY/1/2018. Alternatively, if the annual amount of waste to be cleared does not exceed 100 tonnes for one nuclear power plant or other nuclear facility, the activity levels specified in Annex B may be applied for waste that is disposed of in a public landfill or dispatched to be melted as recyclable metal. When the levels specified in the annexes are applied to several radionuclides, the sum of the ratios between radionuclide-specific activities and the respective activity levels shall be less than one. When necessary, an assessment of the radionuclide composition and activities of the waste may be used.
[2019-12-15 **]**

412. In a case-specific clearance, the activity levels approved by STUK for each case shall be complied with, the determination of which shall take due account of the provisions contained in Section 10(1) of the Nuclear Energy Decree:
a. *the total activity of nuclear waste in the possession of the transferee shall be lower than 1 GBq and the alpha activity lower than 10 MBq*
b. *it is estimated that the annual effective dose caused by the transferred nuclear waste to any individual cannot exceed 0.01 mSv*
c. *the radiation exposure caused by the transferred nuclear waste shall also otherwise be as low as reasonably achievable.*
According to Section 27 c(4) of the Nuclear Energy Act, *the approval may be withdrawn if the prerequisites for release from regulatory control are not met or the conditions for release from*

regulatory control have not been complied with and the deficiencies have not been rectified within the specified time despite a request to do so. **[**2019-12-15 **]**

413 The material to be cleared may not contain any nuclear material within the meaning of Section 3(1)(2) of the Nuclear Energy Act or nuclear use items within the meaning of Section 1(1)(8) of the Nuclear Energy Decree. **[**2019-12-15 **]**

414. The site of a decommissioned nuclear facility and any buildings therein left undismantled may be cleared from regulatory control following the general or case-specific procedure. In the case-specific procedure, the future use of the site and buildings need to be defined. **[**2013-11-15 **]**

415. Buildings left undismantled may be cleared following the general procedure and without restrictions if the average surface activity contamination on the walls, floors and ceilings inside the buildings is less than 0.4 Bq/cm^2 (4,000 Bq/m^2). Furthermore, surface activity contamination on any area of one square metre shall be less than 10,000 Bq. These surface contamination levels may be applied to radionuclide compositions typically occurring at nuclear power plants. **[**2019-12-15 **]**

416. For a case-specific clearance, the future use of the nuclear facility site and any buildings therein left undismantled shall be defined with the necessary restrictions, and the resulting radiation doses to the representatives of the most exposed group shall be assessed. **[**2013-11-15 **]**

4.2 Radiation safety

417. A nuclear facility where operational waste is processed and stored or that is being decommissioned shall have radiation protection procedures in place. In the design of the facility and its operations, due account shall be taken of the following considerations:
a. The facility shall have in place a division into radiation protection areas and zones as provided in Guide YVL C.2 "Radiation protection and exposure monitoring of nuclear facility workers".
b. The layout design and the design of systems and components shall comply with the requirements of Guide YVL C.1 "Structural radiation safety at a nuclear facility".
c. The facility shall have a radiation monitoring system in place as specified in Guide YVL C.6 "Radiation monitoring at a nuclear facility".
d. The limitation and monitoring of potential radioactive releases shall be conducted in compliance with the requirements of Guide YVL C.3 "Limitation and monitoring of radioactive releases from a nuclear facility". **[**2019-12-15 **]**

4.3 Activity determinations and record-keeping

418. According to Section 116(2) of the Nuclear Energy Decree, *in addition, STUK must confirm how the party with a waste management obligation should keep accounts of the nuclear waste generated as a result of nuclear energy use.* **[**2019-12-15 **]**

4.3.1 Processing and storage of operational waste

419. At least the following shall be specified and recorded with regard any to unconditioned waste that is stored for several years:
a. waste type and origin;
b. amount (expressed in, for example, cubic meters, kilograms, linear meters or as number of items);
c. activity inventory data using appropriate determination methods;
d. special characteristics, such as exceptional radionuclide composition, flammability or classification as nuclear use item; and
e. location in different storage rooms. **[**2019-12-15 **]**

420. The activities of dominant radionuclides in packed waste shall be determined before the waste packages are transferred for prolonged storage or disposal. The activities can be determined by applying the methods described in Annex C. **[**2019-12-15 **]**

421. It shall be possible to identify individual waste packages and link them to the respective accounting records based on their markings. At least the following shall be recorded with regard to waste packages transferred into a storage:
a. waste type and the amount of waste;
b. treatment and conditioning method and year;
c. waste package identifier and storage location;
d. activities of dominant radionuclides, potential surface contamination, and the date of activity determination;
e. classification as nuclear use item or other exceptional composition;
f. origin and owner of the waste; and
g. any other information required for wastes to be disposed of. **[**2019-12-15 **]**

422. The information concerning stored waste shall be kept up-to-date and reported as addressed in Guide YVL A.9 "Regular reporting on the operation of a nuclear facility".
[2019-12-15 **]**

4.3.2 Decommissioning of a nuclear facility

423. At a nuclear facility under construction, the material characteristics of the structures that will be subject to significant neutron activation shall be determined to allow the assessment of the activity concentrations in these structures due to activation. **[**2013-11-15 **]**

424. At an operating nuclear facility, activity and surface contamination measurements shall be carried out and the results recorded on a regular basis to provide baseline data for planning and designing the decommissioning of the facility. **[**2013-11-15 **]**

425. At a permanently closed nuclear facility, a comprehensive activity and contamination level survey and recording programme shall be implemented to update the activity data used as the baseline in the final decommissioning plan. The activity and contamination level data shall be updated as the decommissioning proceeds whenever significant changes to them can be assumed to have occurred. **[**2013-11-15 **]**

426. The activity monitoring of the decommissioning waste of a nuclear facility as well as the recording and reporting of the results shall be carried out following the same procedure as with operational waste as specified in requirements 419 through 422. **[**2019-12-15 **]**

427. When the decommissioning of a nuclear facility has been completed, a survey of activity and contamination levels shall be carried out to demonstrate that the quantities of radioactive materials remaining in the buildings and soil at the facility site comply with the clearance requirements 309 and 415. **[**2019-12-15 **]**

4.3.3 Clearance

428. The activity in materials, structures or sites to be cleared shall be reliably determined or estimated. Instrument failures and human errors shall be taken into account by using redundant methods. **[**2013-11-15 **]**

429. Account shall be taken of the origin, type and radionuclide composition of waste and the homogeneity of the activity distribution when the methods and the extent of the measurements used in activity determinations are selected. The guidelines provided in Annex C shall be observed when the suitability of various methods is assessed. **[**2019-12-15 **]**

430. Records shall be taken of the activity determinations related to clearance that can be used for determining the activity data of each cleared batch and for compiling and reporting the annual summary as set out in Guide YVL A.9. **[**2019-12-15 **]**

4.4 Design of systems, structures and functions

4.4.1 Classifications

431. Systems, structures and components important for the occupational radiation protection or the prevention of radioactive releases shall be classified in terms of the safety of the processing and storage of operational waste or the decommissioning of a nuclear facility. At a minimum, the relevant functions include shielding from external exposure, the containment of radioactive materials, transfers of loads containing radioactive materials, radiation monitoring, and fire protection in rooms accommodating radioactive materials. Safety classification is addressed in more detail in Guide YVL B.2 "Classification of systems, structures and components of a nuclear facility". **[**2019-12-15 **]**

432. As the decommissioning of the nuclear facility proceeds, the safety classification document shall be updated to reflect the current state of the facility. **[**2013-11-15 **]**

433. The licence holder shall state in the classification document the seismic class of the systems, structures and components of the processing and storage facilities for nuclear waste and of the nuclear facility being decommissioned, and the environmental conditions serving as the design basis of structures and components. Classification requirements concerning this are presented in Guide YVL B.2. **[**2019-12-15 **]**

4.4.2 Design of systems, structures and components

434. The systems, structures and components of a processing and storage facility for operational waste shall be designed with due consideration given to their foreseen service life and environmental conditions. The design of systems, structures and components shall take account of operational occurrences and postulated accidents. It shall be possible to repair or replace structures and components susceptible to wear or damage. **[**2013-11-15 **]**

435. The design of a processing and storage facility for operational waste or the decommissioning of a nuclear facility shall give priority to concepts where high temperatures, elevated pressures or other operational conditions that increase the accident potential are not necessary. Priority shall also be given to concepts that are based on inherently safe systems and components. **[**2013-11-15 **]**

436. One of the design objectives of a nuclear facility shall be the facilitation of its eventual decommissioning. In the design of the facility, due account shall be taken of the following considerations in particular:

a. Materials shall be so selected as to minimise the generation and spreading of radioactive materials and to facilitate the cleaning of surfaces.
b. The removal of large components, the handling of activated components and the decontamination of systems shall be possible.
c. Use can be made of the structures and systems of the facility when the facility is being decommissioned. **[**2013-11-15 **]**

437. When the decontamination, dismantling, transfer, cutting and packing techniques used in the decommissioning of a nuclear facility are selected, an important selection criterion shall be that the radiation exposure of workers, the releases of radioactive materials and the waste volumes generated are kept as low as reasonably achievable. The final disposal of the decommissioning waste shall also be considered in the selection of decontamination methods. The risk for potential accidents shall be assessed, and to accommodate them, priority shall be given to methods that are proven or otherwise deemed appropriate. **[**2019-12-15 **]**

438. The safety of a permanently closed nuclear facility that has been brought to a state of monitored storage shall, to the extent practicable, be independent of active systems and operational actions. The condition of the facility shall not decline during storage to such an extent that it complicates subsequent dismantling. **[**2013-11-15 **]**

439. The requirements concerning design of the structures of a processing and storage facility for operational waste are presented in Guide YVL E.6 "Buildings and structures of a nuclear facility". **[**2019-12-15 **]**

440. The general requirements concerning the design of systems and components and ventilation systems are presented in Guide YVL B.1 "Safety design of a nuclear power plant". The requirements concerning electrical and I&C equipment are presented in Guide YVL E.7 "Electrical and I&C equipment of a nuclear facility". **[**2019-12-15 **]**

441. The design of hoisting and transfer equipment is addressed in more detail in Guide YVL E.11 “Hoisting and transfer equipment of a nuclear facility”. **[**2019-12-15 **]**

442. The requirements of the design of new structures and systems to be installed, or those to be refurbished, for the decommissioning a nuclear facility, as well as the design of hoisting and transfer equipment are presented in the Guides specified in requirements 439 through 441. **[**2019-12-15 **]**

4.4.3 Sorting, treatment and packing of waste

443. The amounts of waste generated as a result of maintenance and repair work at a nuclear facility shall be limited. The bringing of any unnecessary objects and materials into the controlled area shall be avoided. Where possible, the working methods shall be so selected that the amount of waste generated remains small and the further processing of the waste generated is facilitated. **[**2019-12-15 **]**

444. In the event that liquid wastes are markedly different from other types of waste in terms of their chemical composition, activity concentration or radionuclide composition and their amounts are substantial, they shall, as a rule, be processed separately. In the event that a certain type of waste is only generated in small amounts, it can be mixed with other waste, provided that this does not complicate its further treatment or essentially degrade the properties of the end product. **[**2019-12-15 **]**

445. When the treatment and conditioning methods for liquid waste are selected, due consideration shall be given to the requirements imposed by operational safety and final disposal. Such waste can be immobilised, i.e. mixed with a binding agent to form uniform strong or ductile products. Alternatively, liquid waste can be closed in a durable container after drying or absorbing in a suitable medium. **[**2013-11-15 **]**

446. The containers intended for the temporary storage of contaminated oils, chemicals and other similar fluids or sludges shall be resistant to corrosion and fit for the purpose in other regards as well. Non-immobilised waste of this kind may only be stored for long time periods in exceptional cases, such as when ageing them for clearance from regulatory control. **[**2013-11-15 **]**

447. For the purpose of interim storage or disposal, solid waste shall be packed into containers that facilitate their transfer, prevent the spreading of radioactive contamination and reduce the fire risk associated with the waste. Efforts shall be made to reduce the volume of waste by means of sorting, compaction or cutting, for example. **[**2013-11-15 **]**

448. Highly radioactive waste shall be stored in water pools or in other storages providing sufficient radiation shielding prior to packing for disposal. During the cutting and packing of such waste, due consideration shall be given to ensuring the radiation protection of workers and preventing the spreading of radioactive materials. **[**2013-11-15 **]**

449. Contaminated metal waste shall be decontaminated of easily removable radioactive materials whenever the decontamination does not cause any significant occupational exposure,

and whenever this may significantly reduce the risk of the spreading of radioactive materials or enable the clearance of the waste from regulatory control. **[**2013-11-15 **]**

4.4.4 Transfers and storage of waste

450. A nuclear facility shall have adequate storage space for both unconditioned and packed waste. The design shall take account of the need for repairs of the storage containers and rooms as well as potential failures and disruptions in the processing equipment and disposal activities. **[**2013-11-15 **]**

451. Intermediate level waste packages shall, as a rule, be transferred to a storage facility by remote control. In a low level waste storage, transfer operations close to the waste packages are also possible. In the design of the transfer equipment, due account shall be taken of the prevention of handling accidents and it shall be possible to maintain and repair the equipment in a radiation-shielded manner. **[**2013-11-15 **]**

452. The storage conditions shall be such that the condition of the waste packages will not degrade during the planned storage period. Air humidity and temperature variations in the storage shall be limited where necessary. The condition of waste packages that are stored for a prolonged period of time shall be systematically monitored, and it shall be possible to remove degraded waste packages from the storage. **[**2013-11-15 **]**

4.5 Prevention of occurrences and accidents

453. To make provision for the occurrence of a single failure, steps shall be taken to ensure the availability of any functions related to the processing and storage of operational waste or the decommissioning of a nuclear facility, the failure of which might cause an accident resulting in a significant release of radioactive materials or radiation exposure of the facility’s personnel. In ensuring the functions, the principles of separation and diversity shall be applied whenever practicable. The functions to be ensured shall be determined based on their safety classification. **[**2013-11-15 **]**

454. When liquid waste is stored, provision shall be made for phenomena adverse to safety, such as:

a. the corrosion of containers

b. sedimentation or crystallisation that complicates the further treatment of the waste

c. the generation of volatile or combustible compounds in containers.

Arrangements shall be in place for the detection and recovery of container leaks. **[**2019-12-15 **]**

455. The prevention and containment of fires and explosions shall primarily be based on facility layout planning and fire compartmentation. Any materials or equipment that increase the fire load or pose an ignition or explosion hazard may not be unnecessarily placed within fire compartments important to safety or in their immediate vicinity. The prolonged storage of flammable waste shall be avoided. The materials used in storage facilities shall predominantly be incombustible and heat resistant. **[**2013-11-15 **]**

456. A processing and storage facility for operational waste or a nuclear facility being decommissioned shall be equipped with an automatic fire alarm system by means of which any fire can be located. Where necessary, the rooms of the facility shall be equipped with a suitable fire extinguishing system and with first-response firefighting equipment suitable for operative firefighting. The requirements of planning and design of fire safety arrangements are presents in Guide YVL B.8 "Fire protection at a nuclear facility". **[**2019-12-15 **]**

457. In the planning and design of the processing and storage of operational waste or the decommissioning of a nuclear facility, due account shall be taken of any external events that may give rise to occurrences or accidents important to radiation safety. The requirements concerning this are presented in Guide YVL B.7 “Provisions for internal and external hazards at a nuclear facility”. **[**2019-12-15 **]**

458. Security arrangements shall be in place to protect the processing and storage of operational waste or the decommissioning of a nuclear facility against unlawful action, the extent of which shall be commensurate with the threat arising from unlawful action. The requirements of the planning and design of such arrangements are presented in Guide YVL A.11 "Security of a nuclear facility". **[**2019-12-15 **]**

5 Operation and decommissioning of the nuclear facility

501. The holder of an operating licence for a nuclear facility or the licence holder of a nuclear facility being decommissioned shall have in its possession the documents required under Section 36 and 36 a of the Nuclear Energy Decree and Sections 20–23 of Radiation and Nuclear Safety Authority Regulation STUK Y/1/2018 or Sections 24–27 of STUK Y/4/2018. These documents shall be regularly updated to reflect the current structure and state of the facility. **[**2019-12-15 **]**

502. The holder of an operating licence for a nuclear facility or the licence holder of a nuclear facility being decommissioned shall have an operating experience feedback programme in place for collecting, analysing and reporting operating experience and events at its own facility and other similar facilities, and for keeping current with safety research. Based on the programme, the opportunities for enhancing the safety of operational waste management or the decommissioning of the nuclear facility concerned shall be considered, and any improvements deemed justified shall be implemented. The requirements of the monitoring of the feedback from operating experience are presented in Guide YVL A.10 "Operating experience feedback of a nuclear facility". **[**2019-12-15 **]**

503. A licence holder who stores waste for a prolonged period of time (e.g. for more than 10 years) shall have a condition monitoring programme for stored waste packages or unpacked waste in place to ensure that the characteristics of the waste remain consistent with the requirements pertaining to their safe interim storage and eventual disposal. The programme shall comprise the inspection of stored waste to a representative extent. Where necessary, the waste shall be returned for re-conditioning or packing. **[**2013-11-15 **]**

504. A licence holder who processes and packs waste for storage or disposal shall determine the technical requirements pertaining to the waste packages. These requirements shall satisfy the criteria defined by the licence holder of the storage or disposal facility based on the safety of interim storage or the long-term safety of disposal. The licence holder responsible for processing and packing the waste shall ensure that the waste packages comply with the requirements. Any waste packages that do not satisfy the facility-specific criteria may not be transferred to the storage or disposal facility without an approval by STUK. **[**2013-11-15 **]**

505. In the event that the waste transferred to a disposal facility contains components or structures of a nuclear facility that have been classified as nuclear use items other than nuclear material, the licence holder shall write such components or structures off from the nuclear material accounting records. A similar procedure shall be complied with whenever waste

classified as nuclear use items is cleared from regulatory control. The applicable procedures are specified in more detail in Guide YVL D.1 "Regulatory control of nuclear safeguards". **[**2019-12-15 **]**

506. In the event that the licence holder, following the commissioning of the nuclear facility concerned, wishes to modify any system, structure, component or mode of operation related to the processing and storage of operational waste that STUK has previously approved, the modification plan shall be subjected to STUK's approval as provided in section 112 of the Nuclear Energy Decree prior to its implementation. The requirements conserning plant modifications are presented in Guide YVL A.1 "Regulatory oversight of safety in the use of nuclear energy". **[**2019-12-15 **]**

507. The licence holder of a nuclear facility being decommissioned shall break down the decommissioning project into appropriate implementation stages. According to Section 112 b(2) of the Nuclear Energy Decree, *the key phases of the decommissioning of a nuclear facility may be initiated only after the Radiation and Nuclear Safety Authority has, with regard to each phase and on the basis of the documents referred to in section 36 a as well as the other detailed plans and documents it has required, stated that safety-related factors and regulations have been observed to a sufficient degree. Parallel implementation of the phases shall be possible.* **[**2019-12-15 **]**

508. The amounts of radioactive materials released to the environment from a nuclear facility or a nuclear facility being decommissioned shall be monitored by means of representative measurements performed at the potential release pathways of radioactive materials. Release measurements are addressed in Guide YVL C.3 "Limitation and monitoring of radioactive releases from a nuclear facility". **[**2019-12-15 **]**

509. A radiation monitoring programme shall be implemented in the vicinity of a nuclear facility or a nuclear facility being decommissioned, the extent of which shall be determined based on the foreseen releases of radioactive materials. Environmental radiation monitoring is addressed in Guide YVL C.7 “Radiological monitoring of the environment of a nuclear facility”. **[**2019-12-15 **]** (Translation corrected 2020-02-05)

510. The radiation protection and exposure monitoring of the personnel of a nuclear facility or a nuclear facility being decommissioned shall be carried out in compliance with Guide YVL C.2. **[**2019-12-15 **]**

511. A nuclear facility or a nuclear facility being decommissioned shall have emergency response arrangements in place, the extent of which shall be commensurate with the foreseen

accidents. Guide YVL C.5 “Emergency arrangements of a nuclear power plant” presents requirements for the planning and maintenance of emergency arrangements and action in an emergency situation. **[**2019-12-15 **]**

512. Under Section 7 k of the Nuclear Energy Act, the licence holder shall appoint a responsible manager and his or her deputy for the construction, the operation and the decommissioning of the nuclear facility. The holder of an operating licence of a nuclear facility, or a licence holder of a nuclear facility being decommissioned, shall also specify the positions important to safety and define the required qualifications. The licence holder shall verify the competences of the individuals in these positions prior to the commissioning of the facility or prior to the commencement of its decommissioning and prepare training programmes for developing and maintaining the professional competence of the personnel. The organisation of a nuclear facility is addressed in Guide YVL A.4 "Organisation and personnel of a nuclear facility". **[**2019-12-15 **]**

513. According to Section 25 of the Radiation and Nuclear Safety Authority Regulation STUK Y/1/2018, *when designing, constructing, operating and decommissioning a nuclear facility, a good safety culture shall be maintained.* Guide YVL A.3 “Leadership and management for safety” presents more detailed requirements for the management system of a nuclear facility. **[**2019-12-15 **]**

6 Demonstration of compliance with safety requirements

6.1 Principles for the demonstration of safety

601. Compliance with the safety requirements pertaining to the undisturbed processing and storage of operational waste and planned decommissioning actions for the nuclear facility concerned shall be verified in connection with the commissioning testing of systems, structures and components. The performance of safety systems designed in view of operational occurrences and accidents shall be similarly verified as far as practicable. **[**2013-11-15 **]**

602. In the event that the probability or consequences of an anticipated operational occurrence or a postulated accident cannot be shown to remain insignificant by reference to the design basis or safety systems, compliance with safety requirements shall be demonstrated by means of computational analyses. The representativeness of the analyses shall be ensured by considering various kinds of occurrences and accidents with the greatest safety impact that may occur in connection with the management of operational waste or decommissioning of the nuclear facility. **[**2013-11-15 **]**

603. The fulfilment of the requirements concerning radiation protection of the facility's workers and the public in its vicinity shall be primarily demonstrated by means of a deterministic safety analysis. Additionally, if an accident may have severe consequences based on deterministic analyses, it shall be assessed by means of a probabilistic risk assessment where the probability of the accident and the potential radioactive releases resulting from it are assessed. **[**2013-11-15 **]**

6.2 Safety analysis reports and their annexes

604. When the preliminary and final safety analysis reports pertaining to a processing and storage facility for operational waste and final safety analysis reports pertaining to a decommissioning of a nuclear facility are prepared, the requirements set out in section 6 of Guide YVL B.1 shall be complied with where applicable. Additionally, the safety analysis reports shall at least provide:

a. a description of the safety principles, design bases and other criteria adopted in the design of the facility;

b. a generic plan concerning the processing and storage of operational waste, with due consideration given to the general safety principles set out in requirements 401 and 402;

c. a detailed description of the site of the facility;

d. a detailed description of the planned or constructed facility;

e. a description of the processing and storage activities; an outline in the preliminary safety analysis report and a detailed description in the final safety analysis report;
f. a description of the facility's personnel and of the procedures used for verifying the competences of the persons in positions important to safety; an outline in the preliminary safety analysis report and a detailed description in the final safety analysis report;
g. a description of the waste to be processed and stored at the facility and a description of waste processing methods and the properties of the resulting waste packages; an outline in the preliminary safety analysis report and a detailed description in the final safety analysis report;
h. a description of the criteria pertaining to the properties of the waste to be processed and stored that have been derived from safety requirements; an outline in the preliminary safety analysis report and a detailed description in the final safety analysis report;
i. a description of the monitoring programmes to be implemented at the facility (quality control of waste packages, ageing management programme, operating experience feedback programme); an outline in the preliminary safety analysis report and a detailed description in the final safety analysis report; and
j. a summary of the analyses concerning the operational safety of the facility addressing the radiation exposure of workers and potential radioactive releases, and the resulting radiation doses arising from normal operation, anticipated operational occurrences and accidents.
[2019-12-15 **]**

605. In the final decommissioning plan of a nuclear facility shall at least be presented:
a. a description of the radiation sources at the facility (activity concentration and surface activity contamination levels of structures and components, dose rates in different rooms);
b. a detailed description of the technical implementation of the decommissioning (implementation of monitored storage where relevant, the different implementation stages involved in dismantling, the required new structures and components);
c. a description of the management of the waste arising from decommissioning, including disposal;
d. a description of the monitoring procedures related to decommissioning (monitoring of occupational exposure, monitoring of radiation and contamination levels at the facility, monitoring of environmental releases); and
e. a summary of the analyses concerning the safety of the decommissioning addressing the radiation exposure of workers and potential radioactive releases, and the resulting radiation doses arising from planned actions, anticipated operational occurrences and accidents.
[2019-12-15 **]**

606. The safety analysis reports shall be kept up-to-date as specified in Guide YVL A.1. The updates to the safety analysis reports shall take account of any changes in the properties or handling and storage conditions of waste that may have a bearing on safety. **[**2019-12-15 **]**

607. The safety analysis reports shall be supplemented with topical reports, the purpose of which is to clarify on what kind of experimental studies and analyses the design and planning of the facility and its operations are based. **[**2013-11-15 **]**

6.3 Periodic safety review

608. A safety review shall be periodically conducted at nuclear facilities as provided in Guide YVL A.1. The periodic safety review shall cover the processing and storage of operational waste. **[**2019-12-15 **]**

609. The periodic safety review of a nuclear facility shall be conducted during its decommissioning in compliance with the licence conditions, and in any event no later than 10 years of the date when a comparable comprehensive safety review was last conducted. **[**2019-12-15 **]**

610. The periodic safety review shall include assessments of the nuclear facility's safety status and its preservation, as well as potential development targets with due consideration given to the results of the monitoring programmes specified in requirements 502 and 503. Detailed requirements for the content of the periodic safety assessment are provided in Guide YVL A.1. **[**2019-12-15 **]**

7 Licence procedures and documents to be submitted to the Radiation and Nuclear Safety Authority

7.1 Processing and storage of operational waste

701. Waste management facilities and systems constructed in the immediate vicinity of a new nuclear power plant or other nuclear facility may be treated as parts of the plant or facility concerned. Documents pertaining to the waste management facilities or systems constructed in the immediate vicinity of an operating nuclear facility may be presented as amendments or additions to the corresponding documents pertaining to the nuclear facility concerned, if the construction of the facility or system can be carried out under the operating licence of that nuclear facility. **[**2013-11-15 **]**

702. When a construction licence for a processing and storage facility for operational waste is applied for, the documents specified in YVL A.1 shall be submitted to STUK for approval where applicable.
Additions to the respective documents shall be submitted to STUK for approval insofar as the intention is to enlarge the processing and storage facility under the terms and conditions of an existing operating licence. Additionally, a report discussing the potential impact of the foreseen enlargement work on the safety of existing nuclear facilities shall be submitted to STUK for approval. **[**2019-12-15 **]**

703. When an operating licence for a processing and storage facility for operational waste is applied for, the documents specified in YVL A.1 shall be submitted to STUK for approval where applicable. shall be submitted to STUK for approval where applicable.
Additions to the respective documents shall be submitted to STUK for approval insofar as the intention is to commission a major enlargement of the processing and storage facility under the terms and conditions of an existing operating licence. The commissioning of such facilities is subjected to the Radiation and Nuclear Safety Authority’s approval as provided in Section 20 of the Nuclear Energy Act. **[**2019-12-15 **]**

7.2 Decommissioning of a nuclear facility

704. Removed. **[**2019-12-15 **]**

705. Removed. **[**2019-12-15 **]**

706. According to Section 7 g (3) of the Nuclear Energy Act, *when the operation of a nuclear facility has been terminated, the licence applicant shall be liable to ensure that the nuclear facility is decommissioned in accordance with the terms of the licence referred to in section 20 a, the safety requirements and the plan approved by the Radiation and Nuclear Safety Authority.* **[**2019-12-15 **]**

707. Moved to para. 801. **[**2019-12-15 **]**

708. STUK shall be notified of the permanent shutdown of a nuclear facility without delay. A plan for the measures necessary for ensuring the safety of the facility shall also be presented in this connection. If the operation of a nuclear facility complex is continued in part, the licence holder shall, within a period of two years, submit to STUK for approval a plan for bringing the closed nuclear facility to a state of monitored storage. **[**2013-11-15 **]**

709. When applying for a decommissioning licence holder of a nuclear facility, the licence holder shall submit to STUK for approval the documents referred to in Section 36 a of the Nuclear Energy Decree. The final decommissioning plan and the other documents referred to in Section 36 a of the Nuclear Energy Decree shall be kept up-to-date during the decommissioning of the facility. **[**2019-12-15 **]**

710. The commencement of different stages of the decommissioning is subject to STUK's approval pursuant to Section 112 of the Nuclear Energy Decree following the procedures specified in Guide YVL A.1. **[**2019-12-15 **]**

711. The licence holder shall report the progress of the decommissioning to STUK on a regular basis. **[**2019-12-15 **]**

712. According to Section 84(1) of the Nuclear Energy Decree, a licence holder with a waste management obligation shall apply for an order on the expiry of his waste management obligation with the Ministry of Employment and the Economy when the decommissioning of the nuclear facility has been completed. According to Section 33(2) of the Nuclear Energy Act, a prerequisite for the expiry of the waste management obligation is that STUK has confirmed that the quantity of radioactive materials remaining in the buildings and soil of the facility site complies with the requirements specified under the Act, and that the other measures referred to in Section 32 of the Nuclear Energy Act have been duly completed. **[**2019-12-15 **]**

713. When filing an application for an order on the expiry of the waste management obligation referred to in requirement 712, the licence holder under a waste management obligation shall submit to STUK a summary of the implementation of the decommissioning and an application for the clearance of the site and any buildings therein referred to in requirement 718. **[**2013-11-15 **]**

714. When the decommissioning of a nuclear facility has been brought to completion in an acceptable manner as provided in requirement 712, the licence holder shall notify STUK of the cessation of the use of nuclear energy in accordance with Section 120 of the Nuclear Energy Decree. **[**2019-12-15 **]**

7.3 Clearance

715. The procedures to be used in the general clearance of waste shall be proposed to STUK for approval prior to the commencement of operations. The application shall include a description of the origin, characteristics and accumulation rate of waste, as well as the methods used in activity determinations. When STUK has approved the application, waste can be removed from the controlled area as it accumulates. **[**2013-11-15 **]**

716. A case-specific clearance is subject to an application for the transfer of waste as provided in Section 48 of the Nuclear Energy Decree in cases where the waste will be transferred to another holder, or corresponding documents submitted to STUK in cases where the waste is not transferred to another holder. The application for the transfer of waste shall include, in addition to the information required under Section 48 of the Nuclear Energy Decree, a description of the origin and characteristics of the waste, the methods used in activity determinations, the method used in the processing or disposal of the waste, and the radiation exposure arising as a result of the clearance of the waste. **[**2019-12-15 **]**

717. STUK's decision on a case-specific clearance may pertain to a single batch of waste, or it may be valid for an indefinite term in cases where waste arises on a constant basis and its processing or disposal method remains unchanged. **[**2019-12-15 **]**

718. When the decommissioning of a nuclear facility has been brought to completion and all waste has been removed from the site, the licence holder under a waste management obligation shall submit to STUK for approval an application for the clearance of the site and any buildings therein so as to allow the verification referred to in Section 33(2) of the Nuclear Energy Act to be made. In case of a general procedure, the application shall state the results of the survey referred to in requirement 427 demonstrating that the surface activity contamination

levels specified in requirement 415 are not exceeded. In case of a case-specific procedure, the application shall also include a report demonstrating that the dose constraints specified in requirement 309 are not exceeded in the future use of the site and its buildings. **[**2019-12-15 **]**

8 Safety oversight by the Radiation and Nuclear Safety Authority

801. STUK oversees the design, construction, commissioning and operation of the processing and storage facility for operational waste and the decommissioning of nuclear facilities in accordance with Guides YVL A.1 and YVL A.5. **[**2019-12-15 **]**

802. If the intention is to enlarge the processing and storage facility under the terms and conditions of an existing operating licence, STUK reviews and approve the additions to the documents concerning the construction licence referred to in Guide YVL A.1. **[**2019-12-15 **]**

803. If the intention is to commission a major expansion of the processing and storage facility under the terms and conditions of an existing operating licence, STUK reviews and approve the additions to the documents concerning the operating licence referred to in Guide YVL A.1. **[**2019-12-15 **]**

804. STUK approves procedures connected to the clearance of nuclear waste and oversees the activity concentrations and amounts of cleared waste at nuclear facilities. STUK supervises that waste cleared on a case-specifically is disposed of, recycled or reused in accordance with the approved application. **[**2019-12-15 **]**

805. STUK reviews and approves the decommissioning licence application documents referred to in Section 36 a of the Nuclear Energy Decree. **[**2019-12-15 **]**

9 ANNEX A Levels for the general clearance of unlimited amounts of solid material

Radionuclide	Activity concentration (Bq/g)	Radionuclide	Activity concentration (Bq/g)	Radionuclide	Activity concentration (Bq/g)
H-3	100	Fe-59	1	Sr-89	1000
Be-7	10	Co-55*	10	Sr-90	1
C-14	1	Co-56	0,1	Sr-91*	10
F-18*	10	Co-57	1	Sr-92*	10
Na-22	0,1	Co-58	1	Y-90	1000
Na-24*	1	Co-58m*	10000	Y-91	100
Si-31	1000	Co-60	0,1	Y-91m*	100
P-32	1000	Co-60m*	1000	Y-92*	100
P-33	1000	Co-61*	100	Y-93*	100
S-35	100	Co-62m*	10	Zr-93	10
Cl-36	1	Ni-59	100	Zr-95	1
Cl-38*	10	Ni-63	100	Zr-97*	10
K-42	100	Ni-65*	10	Nb-93m	10
K-43*	10	Cu-64*	100	Nb-94	0,1
Ca-45	100	Zn-65	0,1	Nb-95	1
Ca-47	10	Zn-69*	1000	Nb-97*	10
Sc-46	0,1	Zn-69m*	10	Nb-98*	10
Sc-47	100	Ga-72*	10	Mo-90*	10
Sc-48	1	Ge-71	10000	Mo-93	10
V-48	1	As-73	1000	Mo-99	10
Cr-51	100	As-74*	10	Mo-101*	10
Mn-51*	10	As-76*	10	Tc-96	1
Mn-52	1	As-77	1000	Tc-96m*	1000
Mn-52m*	10	Se-75	1	Tc-97	10
Mn-53	100	Br-82	1	Tc-97m	100
Mn-54	0,1	Rb-86	100	Tc-99	1
Mn-56*	10	Sr-85	1	Tc-99m*	100
Fe-52*	10	Sr-85m*	100	Ru-97	10
Fe-55	1000	Sr-87m*	100	Ru-103	1

* indicates nuclides with half-lives less than one day **[**2019-12-15 **]**

Radionuclide	Activity concentration (Bq/g)	Radionuclide	Activity concentration (Bq/g)	Radionuclide	Activity concentration (Bq/g)
Ru-105*	10	Te-132	1	Ce-144	10
Ru-106	0,1	Te-133*	10	Pr-142*	100
Rh-103m*	10000	Te-133m*	10	Pr-143	1000
Rh-105	100	Te-134*	10	Nd-147	100
Pd-103	1000	I-123	100	Nd-149*	100
Pd-109	100	I-125	100	Pm-147	1000
Ag-105	1	I-126	10	Pm-149	1000
Ag-110m	0,1	I-129	0,01	Sm-151	1000
Ag-111	100	I-130*	10	Sm-153	100
Cd-109	1	I-131	10	Eu-152	0,1
Cd-115	10	I-132*	10	Eu-152m*	100
Cd-115m	100	I-133*	10	Eu-154	0,1
In-111	10	I-134*	10	Eu-155	1
In-113m*	100	I-135*	10	Gd-153	10
In-114m	10	Cs-129	10	Gd-159*	100
In-115m*	100	Cs-131	1000	Tb-160	1
Sn-113	1	Cs-132	10	Dy-165*	1000
Sn-125	10	Cs-134	0,1	Dy-166	100
Sb-122	10	Cs-134m*	1000	Ho-166	100
Sb-124	1	Cs-135	100	Er-169	1000
Sb-125	0,1	Cs-136	1	Er-171*	100
Te-123m	1	Cs-137	0,1	Tm-170	100
Te-125m	1000	Cs-138*	10	Tm-171	1000
Te-127	1000	Ba-131	10	Yb-175	100
Te-127m	10	Ba-140	1	Lu-177	100
Te-129*	100	La-140	1	Hf-181	1
Te-129m	10	Ce-139	1	Ta-182	0,1
Te-131*	100	Ce-141	100	W-181	10
Te-131m	10	Ce-143	10	W-185	1000

* indicates nuclides with half-lives less than one day **[**2019-12-15 **]**

Radionuclide	Activity concentration (Bq/g)	Radionuclide	Activity concentration (Bq/g)	Radionuclide	Activity concentration (Bq/g)
W-187	10	Po-207*	10	Pu-243*	1000
Re-186	1000	At-211	1000	Pu-244	0,1
Re-188*	100	Ra-225	10	Am-241	0,1
Os-185	1	Ra-227	100	Am-242*	1000
Os-191	100	Th-226	1000	Am-242m	0,1
Os-191m*	1000	Th-229	0,1	Am-243	0,1
Os-193	100	Pa-230	10	Cm-242	10
Ir-190	1	Pa-233	10	Cm-243	1
Ir-192	1	U-230	10	Cm-244	1
Ir-194*	100	U-231	100	Cm-245	0,1
Pt-191	10	U-232	0,1	Cm-246	0,1
Pt-193m	1000	U-233	1	Cm-247	0,1
Pt-197*	1000	U-236	10	Cm-248	0,1
Pt-197m*	100	U-237	100	Bk-249	100
Au-198	10	U-239*	100	Cf-246	1000
Au-199	100	U-240*	100	Cf-248	1
Hg-197	100	Np-237	1	Cf-249	0,1
Hg-197m	100	Np-239	100	Cf-250	1
Hg-203	10	Np-240*	10	Cf-251	0,1
Tl-200	10	Pu-234*	100	Cf-252	1
Tl-201	100	Pu-235*	100	Cf-253	100
Tl-202	10	Pu-236	1	Cf-254	1
Tl-204	1	Pu-237	100	Es-253	100
Pb-203	10	Pu-238	0,1	Es-254	0,1
Bi-206	1	Pu-239	0,1	Es-254m	10
Bi-207	0,1	Pu-240	0,1	Fm-254*	10000
Po-203*	10	Pu-241	10	Fm-255*	100
Po-205*	10	Pu-242	0,1		

*indicates nuclides with half-lives less than one day **[**2019-12-15 **]**

10 ANNEX B Levels for the general clearance of limited amounts of material

B01. The clearance of waste for disposal in a public landfill is subject to the activity concentration levels specified in the table below that may not be exceeded in respect of the radioactivity concentration of any radionuclide averaged over a maximum of 500 kg of waste. Additionally, the activity of any radionuclide in any single item or waste package with a mass of less than 30 kg may not exceed the value obtained by multiplying the respective activity concentration limits by 30,000 g.

Table. The radionuclide group specific activity concentration and surface activity contamination levels applicable to the clearance of waste (a maximum for 100 tonnes for a single nuclear facility per year).

Radionuclide group	Activity concentration	Surface activity contamination
Alpha emitters	0,1 Bq/g	0,4 Bq/cm^2
Strong gamma and beta emitters	1 Bq/g	4 Bq/cm^2
Weak gamma and beta emitters	10 Bq/g	40 Bq/cm^2

[2019-12-15 **]**

B02. The clearance of bulky metal objects for recycling is subject to the surface activity contamination levels specified in the table below that may not be exceeded in respect of the surface activity contamination of any radionuclide averaged over a maximum of 0.1 m^2 of accessible surface area. **[**2019-12-15 **]**

B03. When the levels specified in the table are applied to several radionuclide groups, due account shall be taken of the fact that the sum of the ratios between radionuclide group specific activities and the respective maximum values shall be less than one. An equivalent rule also applies to surface activity contaminations and the levels imposed on them. **[**2019-12-15 **]**

11 ANNEX C Activity determinations of waste

C01. The activity measurements of waste are carried out for the purpose of its clearance from regulatory control and for determining the activity inventory of waste packages to be stored or disposed of. **[**2013-11-15 **]**

C02. The methods to be used in activity determinations depend on the characteristics and packing type of the waste concerned, as well as on the radionuclide composition of the waste and the evenness of its activity distribution, among other things. The following general guidelines are provided for the activity determinations of waste.

a. Dose rate and surface activity contamination measurements are suitable as redundant methods. They can be used as the principal methods when the radionuclide composition of the object being measured is known precisely enough.

b. Gamma-spectrometric measurements are particularly well-suited to objects with uneven activity distribution and varying radionuclide composition (e.g. packages of maintenance waste). The activities of radionuclides with weak or no gamma emissions shall, in this case, be estimated by indirect means, for example by means correlating to the activity of an appropriate gamma emitter with safety margins.

c. Sampling and sample analysis are suitable for waste, in which the distribution of radioactive materials is sufficiently even or whose activity distribution is known beforehand. The method can also be used for determining the correlation factors for nuclides with weak or no gamma emissions.

d. When the measurement procedures are planned, due account shall be taken of the influence of measurement geometry, self-absorption, sampling frequency and other relevant factors on the representativeness of the measurements. The measuring instruments shall be calibrated with sufficient frequency using radiation sources that are representative of the energy range being measured.

e. If the origin and radionuclide composition of the waste remains more of less constant, the activity determination can be carried out based on a statistically representative fraction of waste packages. In that case, the radionuclide-specific activities of other waste packages can be calculated based on the dose rates measured from them and the measured radionuclide compositions.

f. The contamination of waste packages shall primarily be prevented by keeping the processing and storage rooms clean. In the event that significant contamination of waste packages is suspected, their surface activity contamination shall be checked by measuring a statistically representative number of the packages prior to their transfer into the storage. **[**2019-12-15 **]**

12 References

1. Nuclear Energy Act (990/1987). **[**2013-11-15 **]**

2. Nuclear Energy Decree (161/1988). **[**2013-11-15 **]**

3. Radiation Act (859/2018). **[**2019-12-15 **]**

4. Government Decree on Ionising Radiation (1034/2018). **[**2019-12-15 **]**

5. Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018). **[**2019-12-15 **]**

6. Radiation and Nuclear Safety Authority Regulation on the Security in the Use of Nuclear Energy (STUK Y/3/2016). **[**2019-12-15 **]**

7. Radiation and Nuclear Safety Authority Regulation on the Emergency Arrangements of a Nuclear Power Plant (STUK Y/2/2018). **[**2019-12-15 **]**

8. Predisposal Management of Radioactive Waste. General Safety Requirements Part 5. IAEA Safety Standards Series No. GSR Part 5. **[**2013-11-15 **]**

9. Decommissioning of Facilities. Safety Requirements. General Safety Requirements Part6. IAEA Safety Standards Series No. GSR Part 6. **[**2019-12-15 **]**

10. Radiation Protection and Safety of Radiation Sources – International Basic Safety Standards. General Safety Requirements Part 3. IAEA Safety Standards Series No. GSR Part 3. **[**2019-12-15 **]**

11. Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018). **[**2019-12-15 **]**

12. Radiation and Nuclear Safety Authority Regulation on exemption values and clearance levels (STUK SY/1/2018) **[**2019-12-15 **]**

13. Act on the Environmental Impact Assessment Procedure (252/2017). **[**2019-12-15 **]**

Definitions

Waste package

Waste package shall refer to the entity formed by waste and the container surrounding it.

Intermediate level waste

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. (STUK Y/4/2018)

Unconditioned waste

Unconditioned waste shall refer to waste that has not been processed into its final form or packed into a waste package for storage and/or disposal.

Decommissioning

Decommissioning shall refer to the dismantling of a permanently closed nuclear facility so that no special measures are required at the facility site due to radioactive materials originating from the dismantled facility. (Nuclear Energy Act 990/1987)

Decommissioning waste

Decommissioning waste shall refer to the low and intermediate level waste arising from the dismantling of a nuclear facility.

Low level waste

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. (STUK Y/4/2018)

Anticipated operational occurrence

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. (Nuclear Energy Decree 161/1988)

Postulated accident

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 over a span of one hundred operating years, but at least once over a span of one thousand operating years; b) Class 2 postulated accidents, which can be assumed to occur less frequently than once during any one thousand operating years. (Nuclear Energy Decree 161/1988)

Packed waste

Packed waste shall refer to waste that has been conditioned into its final form for storage and/or disposal.

Clearance

Nuclear waste other than spent nuclear fuel may, regardless of its radioactive nature, be reused, recycled, recovered and disposed of in accordance with the provisions of the Waste Act (646/2011) if the amount of radioactive substances within it does not exceed the clearance level provided by the virtue of section 7 q, subsection 1, paragraph 28. (Nuclear Energy Act 990/1987 27 c §)

Annual dose

Annual dose shall refer to the sum of the effective dose arising from external radiation within the period of one year, and of the committed effective dose from the intake of radioactive substances within the same period of time. (Nuclear Energy Decree 161/1988)

Operational waste

Operational waste shall refer to the low and intermediate level waste arising from the operation of nuclear facilities.