GUIDE YVL D.3

HANDLING AND STORAGE OF NUCLEAR FUEL

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, 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 (STUK) are binding on the licensee, while preserving the licensee's right to propose an alternative procedure or solution to that provided for in the regulations. If the licensee can convincingly demonstrate that the proposed procedure or solution will implement safety standards in accordance with this Act, the Radiation and Nuclear Safety Authority (STUK) may approve a procedure or solution by which the safety level set forth is achieved.*

With regard to new nuclear facilities, this Guide shall apply as of 1 April 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.3 (15.11.2013).

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1 Introduction

101. Spent nuclear fuel assemblies removed from a nuclear reactor are highly radioactive, and they generate heat and contain nuclear materials and fission products. The safe handling and storage of nuclear fuel assemblies requires in particular that the integrity of the assemblies and the leak-tightness of the nuclear fuel rods is ensured, that any leaking nuclear fuel assemblies are isolated, that effective radiation protection arrangements are applied, that the nuclear fuel is appropriately cooled, and that the formation of critical nuclear fuel configurations are prevented. The latter safety objective, in particular, also pertains to the storage of fresh nuclear fuel. **[**2020-03-17 **]**

102. At nuclear power plants, spent nuclear fuel is initially kept in a water-filled storage pool inside the reactor building, from which it is moved inside a transfer cask into a separate interim storage facility for spent nuclear fuel. **[**2013-11-15 **]**

103. Section 6 a of the Nuclear Energy Act (990/1987) [1] stipulates that *nuclear waste generated in connection with or as a result of use of nuclear energy in Finland shall be handled, stored and permanently disposed of in Finland.* Based on Section 7 q of the Nuclear Energy Act the Radiation and Nuclear Safety Authority shall issue further regulations on technical details. According to Section 16 of the Regulation STUK Y/4/2018 [7] nuclear waste shall be packed considering operational safety and long-term safety. The Regulations STUK Y/1/2018 [4] and STUK Y/4/2018 set out requirements concerning handling, packing and storing of spent nuclear fuel and facilities performing these functions. **[**2020-03-17 **]**

104. This Guide addresses the facilities and functions referred to in paragraphs 102 and 103 and the storage of fresh nuclear fuel. The requirements in chapters 3 and 4 of the Guide apply to the demonstration of safety and the design of the handling and storage facilities for spent nuclear fuel, the requirements in the chapter 5 apply to the stages in the life cycle of the handling and storage facilities for spent nuclear fuel, and the requirements in the chapters 7 and 8 apply to the documents to be submitted to and the regulatory control exercised by STUK. The requirements are applicable to both fresh and spent nuclear fuel. **[**2020-03-17 **]**

105. The basic requirements concerning the safe use of nuclear energy are set out in the Nuclear Energy Act. The general principles for radiation protection and provisions concerning radiation work are set out in the Radiation Act (859/2018) [2]. **[**2020-03-17 **]**

106. According to Section 7 h of the Nuclear Energy Act, *the nuclear facility shall have the facilities, equipment, and other arrangements required to ensure the safe handling and storage*

of nuclear material required by the plant and any nuclear waste generated during operation. According to Section 4 of the Nuclear Energy Decree (161/1988) [3], the provisions set out in nuclear energy legislation on both nuclear material and nuclear waste are applicable to spent nuclear fuel. **[**2020-03-17 **]**

107. Pursuant to the Section 7q of the Nuclear Energy Act, the Radiation and Nuclear Safety Authority shall issue further regulations on the technical details. The Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018) shall be applied to nuclear facilities intended for the handling and storage of spent nuclear fuel that are not part of a nuclear power plant and in which the amount of spent nuclear fuel at any given time is more than 100 tonnes of uranium. The Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018) applies to nuclear facilities intended for the handling and storage of spent nuclear fuel 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. The Radiation and Nuclear Safety Authority Regulation on the Security in the Use of Nuclear Energy (STUK Y/3/2016) [3] applies to the security arrangements implemented at nuclear facilities. The Radiation and Nuclear Safety Authority Regulation on the Emergency Arrangements of a Nuclear Power Plant (STUK Y/2/2018) [6] shall be applied to nuclear facilities as required by the danger they pose. **[**2020-03-17 **]**

2 Scope of application

201. This Guide addresses

a. the following operations taking place at nuclear power plants and other nuclear facilities: the dry storage of fresh nuclear fuel, the storage of fresh and spent nuclear fuel in storage pools adjacent to a reactor, and the storage of spent nuclear fuel in separate storage facilities;

b. the transfers of nuclear fuel at the plant site and power plant area and in connection with storage and encapsulation, as well as the transfers of the transfer cask and the disposal canister;

c. the transfers of nuclear fuel between plant sites when transferring spent nuclear fuel from one licensee to another;

d. the encapsulation of spent nuclear fuel for disposal, excluding the closure of the canister (making a permanent joint);

e. encapsulated nuclear fuel;

f. the planning, design, construction, use and decommissioning of the aforementioned functions and the necessary facilities and systems. **[**2020-03-17 **]**

202. This Guide shall not be applied to the transport of spent nuclear fuel via roads referred to in the Road Traffic Act (267/1981) [14]. The scope of this Guide is limited to encapsulation solutions in which nuclear fuel assemblies are, as such, inserted into disposal canisters. **[**2020-03-17 **]**

203. Removed. **[**2020-03-17 **]**

204. The designing of the measures for handling and storage of nuclear fuel shall follow the requirements set out in the Guide YVL B.1 “Safety design of a nuclear facility”. **[**2020-03-17 **]**

205. Throughout the service lifetime of a nuclear facility, provisions shall also be made for nuclear safeguards as required under the Guide YVL D.1 “Regulatory control of nuclear safeguards”. Transport of nuclear fuel is governed by the Guide YVL D.2 “Transport of nuclear materials and nuclear waste”. The decommissioning and waste management of the nuclear facilities in the scope of the Guide YVL D.3 is subject to the Guide YVL D.4 “Predisposal management of low and intermediate level nuclear waste and decommissioning of a nuclear facility”. The disposal of nuclear waste is governed by the Guide YVL D.5 “Disposal of nuclear waste”, which presents the requirements for the safety of encapsulated nuclear fuel during the operating stage of the disposal facility. The requirements for the design, manufacture and permanent closure of the spent nuclear fuel canister are included in the Guide YVL D.7 “Release barriers of spent nuclear fuel disposal facility”. **[**2020-03-17 **]**

206. Several other YVL Guides issued by STUK are also applicable to the handling, storage, and encapsulation of nuclear fuel. This Guide contains references to the applicable Guides with the relevant paragraphs specified where practicable. The construction of nuclear facilities is addressed in the Guide YVL A.5 ”Construction and commissioning of a nuclear facility”. Nuclear security and the management of information security shall be taken into account in designing a nuclear facility. The requirements for the implementation of nuclear security are specified in the Guide YVL A.11 ”Security of a nuclear facility”, and the requirements for the management of information security are specified in the Guide YVL A.12 ”Information security management of a nuclear facility”. The requirements pertaining to the design and implementation of hoisting and transfer equipment at nuclear facilities are specified in greater detail in the Guide YVL E.11 ”Hoisting and transfer equipment of a nuclear facility”. **[**2020-03-17 **]**

3 Demonstration of compliance with safety requirements

301. Removed. **[**2020-03-17 **]**

302. Moved to para. 454. **[**2020-03-17 **]**

303. Removed. **[**2020-03-17 **]**

304. Removed. **[**2020-03-17 **]**

305. Removed. **[**2020-03-17 **]**

306. Removed. **[**2020-03-17 **]**

307. Removed. **[**2020-03-17 **]**

308. Moved to para. 309e. **[**2020-03-17 **]**

309. Removed. **[**2020-03-17 **]**

309a. According to Section 7 d of the Nuclear Energy Act, *the design of a nuclear facility shall provide for the possibility of operational occurrences and accidents. The probability of an accident must be lower, the more severe the consequences of such an accident would prove for people, the environment or property.* **[**2020-03-17 **]**

309b. Section 3 of the Regulation STUK Y/1/2018 and Section 3 of the Regulation STUK Y/4/2018 include requirements for the assessment of the safety of the nuclear fuel storage facility and encapsulation plant at the construction and operating licence phases and in connection with plant modifications. According to the requirements of the regulations, the assessment of safety shall demonstrate that the nuclear facility has been designed and implemented in accordance with the safety requirements. The safety assessment shall cover the operation of the facility in accordance with the Operating Limits and Conditions as well as any anticipated operational occurrences and accident situations. **[**2020-03-17 **]**

309c. According to Section 8 of the Regulation STUK Y/4/2018, long-term safety shall be taken into account in the design of disposal. In addition, the handling and storage of nuclear fuel shall be designed and implemented with a holistic approach to take into account any dependencies between the different stages of nuclear waste management. **[**2020-03-17 **]**

309d. According to Sections 14 and 15 of the Regulation STUK Y/1/2018 and Sections 17 and 18 of the Regulation STUK Y/4/2018, the design of a nuclear facility shall take into account the events that may cause the facility's parameters to deviate from their normal values and to endanger the integrity of fuel or other propagation barriers. Such events may be caused, for example, by a component failure, a fault in the facility's operation or automatic control or an

internal or external threat. **[**2020-03-17 **]**

309e. According to Section 14(2) of the Regulation STUK Y/1/2018 and Section 17(2) of the Regulation STUK Y/4/2018, aircraft crashes shall be taken into account in the design of the spent nuclear fuel storage facility and encapsulation plant. The Guide YVL A.11 presents detailed requirements for taking aircraft crashes into acoount in the design of these facilities. **[**2020-03-17 **]**

309f. The handling and storage of nuclear fuel shall take account of requirements 423–424 of the Guide YVL B.1 “Safety design of a nuclear power plant” concerning events to be practically eliminated. Events to be practically eliminated shall be identified and analysed. **[**2020-03-17 **]**

309g. The handling and storage of nuclear fuel shall take account of requirements related to fire protection in accordance with the Guide YVL B.8 “Fire protection at a nuclear facility”. **[**2020-03-17 **]**

309h. The analyses related to the behaviour of the spent nuclear fuel storage facility and encapsulation plant shall follow the requirements of the Guide YVL B.3 “Deterministic safety analyses for a nuclear power plant” in accordance with a separate application decision. **[**2020-03-17 **]**

310. The dispersion analyses of radioactive releases and the analyses of the radiation doses arising from the releases shall be conducted in compliance with the Guide YVL C.4 ”Assesment of radiation doses to the public in the vicinity of a nuclear facility”. **[**2020-03-17 **]**

4 Safety design

401. Removed. **[**2020-03-17 **]**

402. Removed. **[**2020-03-17 **]**

403. Removed. **[**2020-03-17 **]**

404. Moved to para. 456. **[**2020-03-17 **]**

405. Moved to para. 455. **[**2020-03-17 **]**

406. Moved to para. 463. **[**2020-03-17 **]**

407. Removed. **[**2020-03-17 **]**

408. Removed. **[**2020-03-17 **]**

409. Removed. **[**2020-03-17 **]**

410. Moved to para. 467. **[**2020-03-17 **]**

411. Moved to para. 309f. **[**2020-03-17 **]**

412. Removed. **[**2020-03-17 **]**

413. Removed. **[**2020-03-17 **]**

414. Removed. **[**2020-03-17 **]**

415. Removed. **[**2020-03-17 **]**

416. Removed. **[**2020-03-17 **]**

417. Moved to para. 489. **[**2020-03-17 **]**

418. Removed. **[**2020-03-17 **]**

419. Removed. **[**2020-03-17 **]**

420. Moved to para. 470. **[**2020-03-17 **]**

421. Moved to para. 475. **[**2020-03-17 **]**

422. Moved to para. 477a. **[**2020-03-17 **]**

423. Moved to para. 4102. **[**2020-03-17 **]**

424. Moved to para. 492. **[**2020-03-17 **]**

425. Moved to para. 496. **[**2020-03-17 **]**

426. Moved to para. 485. **[**2020-03-17 **]**

427. Removed. **[**2020-03-17 **]**

4.1 Safety classification

428. The systems, structures and components of a nuclear fuel storage facility and encapsulation plant shall be classified according to the requirements presented in Section 4 of the Regulation STUK Y/1/2018 and Section 5 of the Regulation STUK Y/4/2018. According to Section 5 of the Regulation STUK Y/4/2018, the safety classification shall take into account operational safety and long-term safety. The classifications of a nuclear fuel storage facility and encapsulation plant shall comply with the Guide YVL B.2 “Classification of systems, structures and components of a nuclear facility”. **[**2020-03-17 **]**

429. Removed. **[**2020-03-17 **]**

430. The requirements for safety classification in terms of long-term safety are presented in the Guide YVL D.5. **[**2020-03-17 **]**

431. Removed. **[**2020-03-17 **]**

432. Moved to para. 493. **[**2020-03-17 **]**

433. Moved to para. 494. **[**2020-03-17 **]**

434. Moved to para. 495. **[**2020-03-17 **]**

435. Moved to para. 471. **[**2020-03-17 **]**

436. Moved to para. 498. **[**2020-03-17 **]**

437. Moved to para. 517. **[**2020-03-17 **]**

438. Moved to para. 4100. **[**2020-03-17 **]**

439. Moved to para. 461. **[**2020-03-17 **]**

440. Moved to para. 459. **[**2020-03-17 **]**

441. Moved to para. 4103. **[**2020-03-17 **]**

442. Moved to para. 4104. **[**2020-03-17 **]**

443. Removed. **[**2020-03-17 **]**

444. Moved to para. 518. **[**2020-03-17 **]**

445. Moved to para. 468. **[**2020-03-17 **]**

446. Moved to para 519. **[**2020-03-17 **]**

447. Moved to para. 4115. **[**2020-03-17 **]**

448. Moved to para. 309g. **[**2020-03-17 **]**

449. Moved to para. 4110. **[**2020-03-17 **]**

4.2 Ageing management

450. Section 5 of the Regulation STUK Y/1/2018 and Section 6 of the Regulation STUK Y/4/2018 present requirements for ageing management. The design, construction, operation, condition monitoring and maintenance of the handling and storage of nuclear fuel 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. The Guide YVL A.8 “Ageing management of a nuclear facility” specifies the requirements concerning ageing management. **[**2020-03-17 **]**

4.3 Taking into account human factors relating to safety

451. Section 6 of the Regulation STUK Y/1/2018 and Section 7 of the Regulation STUK Y/4/2018 present requirements for the management of human factors. Human factors relating to safety shall be controlled with systematic procedures throughout the entire life cycle of the nuclear facility. **[**2020-03-17 **]**

452. In new projects, the HFE programme (Human Factors Engineering) shall be used to design the control, testing, review and maintenance of systems important to safety, with the following areas included where applicable:

1. managing the HFE programme
2. utilisation of operating experience
3. analysis and allocation of functions
4. task analyses
5. analysis of staff members and competences
6. processing of human tasks significant to safety
7. design of user interfaces
8. planning of instructions
9. planning of training programmes
10. verification and validation related to human factors
11. installation and commissioning
12. assessment and monitoring of functionality during operation.

[2020-03-17 **]**

453. For the purpose of designing nuclear power plant modifications, a HFE programme in accordance with requirement 452 shall be prepared in the extent appropriate for the modification. **[**2020-03-17 **]**

4.4 Radiation safety of workers and population

454. Chapter 2 of the Radiation Act presents the general principles of radiation protection used to limit the radiation exposure of the workers and the public in the vicinity. The maximum values for radiation exposure of workers are presented in the Government Decree on Ionizing Radiation (1034/2018) [13]. The maximum values for radiation exposure caused to the population in the vicinity of a nuclear facility due to its operation, anticipated operational occurrences or accidents are enacted in the Nuclear Energy Decree. **[**2020-03-17 **]**

455. The limitation of radiation exposure shall be taken into account during the life cycle of a nuclear facility. According to Section 7 of the Regulation STUK Y/1/2018, radiation exposure *shall be limited through layout design and component placement 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.* According to Section 16 of the Regulation STUK Y/4/2018, sufficient radiation protection shall be ensured in the handling of nuclear fuel assemblies, as well as casks and canisters containing them, using remote handling and radiation shielding. **[**2020-03-17 **]**

456. The requirements concerning the radiation protection planning of nuclear fuel storage and operations conducted in the encapsulation plant are presented in the Guides YVL C.1 "Structural radiation safety at a nuclear facility", YVL C.2 "Radiation protection and exposure monitoring of nuclear facility workers", YVL C.3 "Limitation and monitoring of radioactive releases from a nuclear facility" and YVL C.6 "Radiation monitoring at a nuclear facility". **[**2020-03-17 **]**

457. In the handling of spent nuclear fuel and in the design of transfers and facilities, the radiation protection of workers shall be taken into account with adequate safety margins in accordance with requirement 402 of the Guide YVL C.1. **[**2020-03-17 **]**

458. In defining the scope of radiation protection measures for facilities with nuclear fuel assemblies or casks or canisters containing them, it shall be assumed that the area contains the maximum amount of nuclear fuel. The burnup and cooling time shall be assumed to be conservative. **[**2020-03-17 **]**

459. The encapsulation plant for spent nuclear fuel shall be designed so that any handling room can be decontaminated for the purpose of maintenance and repair work. **[**2020-03-17 **]**

460. Requirement 411 of the Guide YVL C.1 concerning the leaktightness and decontaminability of rooms shall be taken into account in the design of room layout. **[**2020-03-17 **]**

461. The spent nuclear fuel storage facility and encapsulation plant shall have the rooms and equipment necessary for decontaminating the shipping or transfer casks used at the facility and other contaminated objects. **[**2020-03-17 **]**

462. The decontamination of components shall be implemented in accordance with requirements 418–420 of the Guide YVL C.1. **[**2020-03-17 **]**

463. The nuclear fuel storage pool shall be equipped with a pool water radioactivity monitoring system. **[**2020-03-17 **]**

463a. The nuclear fuel storage pool shall be equipped with a purification system, which can be used to remove impurities and radioactive substances from the water. **[**2020-03-17 **]**

463b. The radioactivity of the water in the storage pool for fresh nuclear fuel shall be monitored regularly if the fresh nuclear fuel contains recycled uranium. **[**2020-03-17 **]**

464. The radioactivity of the nuclear fuel storage pool shall be monitored in accordance with requirements 301 and 314 of the Guide YVL C.6. The pool water shall be purified in accordance with requirement 401 of the Guide YVL C.3. **[**2020-03-17 **]**

465. The nuclear fuel storage pool surface materials shall be such that they can be easily decontaminated. **[**2020-03-17 **]**

466. The pool surface materials shall comply with the requirements of chapter 6.8 of the Guide YVL E.6 “Buildings and structures of a nuclear facility”. **[**2020-03-17 **]**

4.5 Safety functions and provisions for ensuring them

467. In the safety design of the nuclear fuel storage, the defence in depth safety principle is followed on a plant level in accordance with Section 12 of the Regulation STUK Y/1/2018. In the safety design of the encapsulation plant, the defence in depth safety principle is followed on a plant level in accordance with Section 13 of the Regulation STUK Y/4/2018. **[**2020-03-17 **]**

468. According to Section 15 of the Regulation STUK Y/4/2018 and Section 11 of the Regulation STUK Y/1/2018, 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 deemed preferable from the safety point of view. **[**2020-03-17 **]**

4.5.1 Handling of nuclear fuel

469. According to Section 12(3) of the Regulation STUK Y/1/2018 and Section 15(4a) of the Regulation STUK Y/4/2018, damage to the cladding of the fuel rods during handling and storage must be prevented with a high degree of confidence. **[**2020-03-17 **]**

470. Transfer routes shall be kept short and lifts low. **[**2020-03-17 **]**

471. At a nuclear fuel storage facility and encapsulation plant, transfers of heavy or otherwise dangerous objects shall be avoided in areas where a dropped load or a malfunction can damage the nuclear fuel or a component or structure important to safety. **[**2020-03-17 **]**

472. The systems used for handling nuclear fuel shall be single-failure tolerant insofar as they might cause spent nuclear fuel damage or other significant radiation exposure in the event of a failure. **[**2020-03-17 **]**

473. As a result of the failure, nuclear fuel handling systems shall enter a state that is favourable from the perspective of safety. **[**2020-03-17 **]**

474. The nuclear fuel transfer device shall be equipped with safety functions in accordance with requirement 523 of the Guide YVL E.11. The grabs of hoisting device units involved in transferring the nuclear fuel shall be designed in accordance with requirement 525 of the Guide YVL E.11. **[**2020-03-17 **]**

475. If the equipment transferring a nuclear fuel transfer cask or disposal canister cannot prevent dropping, the transfer cask or disposal canister shall be able to retain its leak-tightness in the postulated drop with a high degree of confidence. **[**2020-03-17 **]**

476. It shall be possible to transfer a nuclear fuel assembly to a safe position in all situations. **[**2020-03-17 **]**

4.5.2 Nuclear fuel storage pools and nuclear fuel cooling

477. According to Section 12(1) of the Regulation STUK Y/1/2018, *when storing nuclear fuel in water pools, the cooling of the fuel shall apply redundancy, separation and diversity principles that ensure the implementation of the function even in the event of a malfunction.* Further, according to Section 12(1a) of the Regulation STUK Y/1/2018, *it shall be possible for the electrical power needed in the cooling function to be supplied from an off-site and an on-site electrical power supply system.* According to Section 12(5) of the Regulation STUK Y/1/2018, *the possibility of a severe accident shall be extremely low.* **[**2020-03-17 **]**

477a. The structures, tube connections, connections to other pools and water volume of nuclear fuel storage pools and the nuclear fuel cooling system shall be designed so as to ensure that:
a. the maximum amount of nuclear fuel generating the maximum decay heat can be cooled in all situations;
b. the coolant of the nuclear fuel storage pool shall not boil in normal conditions and operational occurrences;
c. inadvertent discharge of the storage pool or excessive water level drop to a level that would endanger nuclear fuel cooling or the necessary radiation protection is not possible; and
d. the storage pool structures withstand the thermal load of normal conditions, operational occurrences and accidents. **[**2020-03-17 **]**

478. The cooling of stored nuclear fuel shall be single-failure tolerant. **[**2020-03-17 **]**

479. It shall be possible to cool stored nuclear fuel with a cooling system that operates on the diversity principle and does not have to be single-failure tolerant. **[**2020-03-17 **]**

479a. The design of the cooling of spent nuclear fuel shall provide a secondary ultimate heat sink for decay heat removal in the event of unavailability of the primary ultimate heat sink. The secondary ultimate heat sink shall fulfil the 72-hour self-sufficiency criterion, and it does not have to be single-failure tolerant. **[**2020-03-17 **]**

480. The design of the cooling of stored nuclear fuel shall take into account common cause failures in the support systems. **[**2020-03-17 **]**

481. Accident situations in the reactor or other nuclear facilities located on the same plant site shall not endanger the cooling of the stored nuclear fuel. **[**2020-03-17 **]**

482. According to Section 12(1b) of the Regulation STUK Y/1/2018, *a nuclear facility shall have the necessary components and procedures for securing the removal of residual heat from the nuclear fuel in the storage pools for a period of three days independently of the off-site supply of electricity and water in a situation caused by a rare external event or a disruption in the on-site electrical distribution system.* **[**2020-03-17 **]**

483. The cooling of stored nuclear fuel shall be ensured during a severe reactor accident. **[**2020-03-17 **]**

484. The cooling of nuclear fuel shall be ensured in events involving a combination of failures (DEC B). The systems ensuring the cooling of stored nuclear fuel do not need to accomplish the single-failure criterion. **[**2020-03-17 **]**

485. The cooling of nuclear fuel shall be ensured in rare external events (DEC C). Measures related to ensuring the cooling and conducted at the plant site shall not require the use of vehicles during the first eight hours. Components designed for use shall be accessible even if any individual route or hatch is blocked by an external obstacle. The systems ensuring the cooling of stored nuclear fuel do not need to accomplish the single-failure criterion. **[**2020-03-17 **]**

486. The cooling of stored nuclear fuel shall be ensured in the event of loss of the plant's internal electricity distribution in accordance with requirement 451 of the Guide YVL B.1. A sufficient inventory of water and fuel and capability to recharge the DC batteries shall exist on the site to enable these arrangements for a period of 72 hours. **[**2020-03-17 **]**

4.5.3 Cooling of spent nuclear fuel in the encapsulation plant

487. According to Section 15(4) of the Regulation STUK Y/4/2018, *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.* **[**2020-03-17 **]**

487a. The encapsulation plant shall be designed so as to ensure that the maximum amount of nuclear fuel generating the maximum decay heat can be cooled in all situations. **[**2020-03-17 **]**

4.5.4 Prevention of the dispersal of radioactive material

488. Section 10 of the Regulation STUK Y/1/2018 and Section 14 of the Regulation STUK Y/4/2018 require structural defence-in-depth design in order to prevent dispersion of radioactive substances into the environment by means of successive barriers. **[**2020-03-17 **]**

489. According to Section 15(2) of the Regulation STUK Y/4/2018, *in an encapsulation facility 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.* **[**2020-03-17 **]**

490. At the encapsulation plant, the single failure criterion shall be applied for functions whose failure could result in a significant release of radioactive substances or radiation exposure of personnel at the facility. **[**2020-03-17 **]**

491. At the spent nuclear fuel storage facility, the single failure criterion shall be met in accordance with requirement 456c of the Guide YVL B.1 in functions whose purpose is to prevent the propagation of radioactive substances if the components or structures containing such substances break down or operate erroneously. **[**2020-03-17 **]**

492. The atmosphere of a handling cell in which spent nuclear fuel is handled shall have underpressure compared to the surrounding rooms whenever it is used for handling spent nuclear fuel that is not enclosed in a hermetic container. **[**2020-03-17 **]**

4.5.5 Criticality safety in the handling and storage of nuclear fuel

493. According to Section 12(4) of the Regulation STUK Y/1/2018 and Section 15(4b) of the Regulation STUK Y/4/2018, the possibility of criticality shall be extremely low. According to requirement 503 of the Guide YVL B.4 “Nuclear fuel and reactor”, structural solutions shall be used to prevent criticality of spent nuclear fuel. **[**2020-03-17 **]**

494. The requirements of the Guide YVL B.4 shall be complied with in the criticality safety of the handling and storage of nuclear fuel. **[**2020-03-17 **]**

495. Removed. **[**2020-03-17 **]**

4.5.6 Monitoring

496. According to Section 15(3) of the Regulation STUK Y/4/2018, *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.* **[**2020-03-17 **]**

497. Based on Section 15(1) of the Regulation STUK Y/4/2018, systems that provide information on the state of the nuclear fuel and operate without external power supply shall be available at the encapsulation plant for monitoring the progress of design extension conditions. **[**2020-03-17 **]**

4.6 Safety of the storage and encapsulation of nuclear fuel

498. The spent nuclear fuel storage facility and encapsulation plant shall have sufficient arrangements in place for ensuring the proper handling of nuclear fuel assemblies that are impaired, damaged, or stuck in their storage locations. **[**2020-03-17 **]**

499. In the storage of nuclear fuel, provisions shall be made for nuclear fuel assemblies or rods from which radioactive substances may leak. If necessary, it shall be possible to seal them in a gas-tight canister or container for storage. **[**2020-03-17 **]**

4100. Nuclear fuel pools and their storage capacity shall be planned so that the reactor core can be emptied of nuclear fuel. **[**2020-03-17 **]**

4101. Nuclear fuel pools and their storage capacity shall be planned so that the pools can be repaired. **[**2020-03-17 **]**

4102. Any leak of nuclear fuel storage pools shall be detected and localised with sufficient accuracy for the purpose of repair. **[**2020-03-17 **]**

4103. The encapsulation plant for spent nuclear fuel shall have arrangements in place for the repair of a sealed disposal canister or the re-encapsulation of nuclear fuel. **[**2020-03-17 **]**

4104. In accordance with Section 16(4) of the Regulation STUK Y/4/2018, acceptance criteria shall be defined for any properties of nuclear fuel for disposal that have a bearing on operational safety and the long-term safety of disposal. **[**2020-03-17 **]**

4105. When defining the acceptance criteria for nuclear fuel for disposal, at least the information specified in requirement 705 shall be considered. **[**2020-03-17 **]**

4106. A plan shall be prepared for the encapsulation of nuclear fuel assemblies which deviate from the design bases of the disposal canister. These include deformed assemblies. **[**2020-03-17 **]**

4107. Each nuclear fuel assembly in the spent nuclear fuel storage facility shall be identified on the basis of the markings made on it prior to its transfer into the encapsulation plant and at the encapsulation plant before it is sealed in a disposal canister. **[**2020-03-17 **]**

4108. Disposal canisters shall be identified on the basis of the markings made on them prior to their transfer into the disposal facility. **[**2020-03-17 **]**

4109. It shall be possible to determine the nuclear material data of nuclear fuel assemblies using the methods specified in requirement 357 of the Guide YVL D.1 and verify them using the methods specified in requirement 358. **[**2020-03-17 **]**

4.7 Transfers of spent nuclear fuel

4110. Approval of the container to be used in transferring spent nuclear fuel shall be requested from STUK, observing the provisions on the approval of systems of nuclear facilities in the Regulations STUK Y/1/2018 and STUK Y/4/2018. If the transfer cask has a B(U)F type package approval in accordance with the Regulation of the Ministry of Transport and Communications on the Transport of Dangerous Goods by Road (TRAFICOM/82133/03.04.00/2019) [15], STUK's approval is not required. **[**2020-03-17 **]**

4111. When transferring spent nuclear fuel from one licensee to another, the transfer of the responsibility for the safety of the nuclear fuel shall be determined. **[**2020-03-17 **]**

4112. For the transfer operations of spent nuclear fuel, a plan shall be prepared and submitted to STUK for approval two months before the start of the transfer operations. The plan shall be submitted to STUK for re-approval if changes take place in the transfer operations. The plan shall present

1. general information on the transfer cask
2. the equipment and accessories used in the transfer
3. the route used for the transfer and any temporary storages
4. the management of the information of the nuclear fuel to be transferred
5. radiation protection measures before and during the transfer
6. a reference to a separately approved emergency plan
7. a reference to a separately approved safety arrangement plan
8. safety instructions
9. attending to the nuclear safeguards obligations.

When transferring spent nuclear fuel from one licensee to another, the plan shall also present

1. the transfer of the responsibility for the nuclear fuel
2. a summary of procedures through which the information on the properties of the nuclear fuel assemblies to be transferred (mass, number, enrichment level, identification data, burnup, decay heat) goes to the waste records.

[2020-03-17 **]**

4113. For transfers of nuclear fuel, the requirements pertaining to security arrangements are presented in the Guide YVL A.11, those pertaining to emergency response arrangements in the Guide YVL C.5 and those pertaining to nuclear safeguards in the Guide YVL D.1. **[**2020-03-17 **]**

4.8 Monitoring and control of a nuclear waste facility

4114. In accordance with Section 16(1) of the Regulation STUK Y/1/2018 and Section 19(1) of the Regulation STUK Y/4/2018, nuclear facilities shall contain equipment that provides information regarding the state of components and systems that are important in terms of the safety of the facility. **[**2020-03-17 **]**

4115. In the design process and the regulatory control exercised by the Radiation and Nuclear Safety Authority, the control post of the spent nuclear fuel storage facility or encapsulation plant shall be perceived as a functional entity similar to a safety class 3 system. Individual control post systems shall be classified in accordance with the general classification principles. **[**2020-03-17 **]**

4116. Due consideration shall be given to human and organisational factors right from the outset when designing the control functions of the spent nuclear fuel storage facility or encapsulation plant or modifications affecting these operations. **[**2020-03-17 **]**

4117. The guidelines required in managing the control post functions and the nuclear facility and the competence of operators shall comprise an entity whose functionality shall be ensured. The operability of changes to the functions of the control post as well as significant ergonomic changes shall be verified in advance. **[**2020-03-17 **]**

4118. The control post and emergency response centre shall be protected in a way that the necessary functions can be performed without protective gear during normal operation and under accidents and threats. Due consideration shall be given to fire protection, protection against flooding, lighting, air conditioning, noise abatement, radiation protection and access control. **[**2020-03-17 **]**

4119. It shall be possible to perform all the measures required for controlling the facility in its operational states and accident conditions from within the control post. **[**2020-03-17 **]**

4120. For operational occurrences and accidents, information essential to the safety of the nuclear facility shall be clearly detectable and readable at an accessible place. **[**2020-03-17 **]**

4121. A qualification plan shall be provided for the monitoring and control posts when the application for a construction licence is filed. **[**2020-03-17 **]**

4.9 Radiation measurements and monitoring of releases of radioactive materials

4122. According to Section 24 of the Regulation STUK Y/1/2018 and Section 28 of the Regulation STUK Y/4/2018, the radiation levels of nuclear facility rooms and the activity concentrations shall be measured. The releases of radioactive substances from the facility shall be monitored, and the radiation doses to the public in the vicinity shall be assessed. More detailed requirements for the measurement of radiation levels and activity concentrations, monitoring of releases and observation of concentrations in the environment are issued in the C series of the YVL Guides. **[**2020-03-17 **]**

5 Life cycle of a nuclear facility

501. Moved to para. 506. **[**2020-03-17 **]**

502. Moved to para. 508. **[**2020-03-17 **]**

503. Moved to para. 507. **[**2020-03-17 **]**

5.1 Construction

504. Section 18 of the Regulation STUK Y/1/2018 and Section 22 of the Regulation STUK Y/4/2018 present requirements for the safety of the construction of the spent nuclear fuel storage facility and encapsulation plant. The requirements are further specified in the Guide YVL A.5. In plant modifications related to the handling and storage of nuclear fuel, the Guide YVL A.5 shall be complied with. **[**2020-03-17 **]**

5.2 Commissioning

505. In connection with the commissioning of the nuclear fuel storage facility, the licensee shall ensure, in accordance with Section 19 of the Regulation STUK Y/1/2018, *that the systems, structures and components and the nuclear facility as a whole operate as designed.* In connection with the commissioning of the encapsulation plant, the licensee shall ensure, in accordance with Section 23 of the Regulation STUK Y/4/2018, *that the systems, structures and components and the facility as a whole operate as designed and that the disposal system can be implemented.* **[**2020-03-17 **]**

506. The transport of fresh nuclear fuel to the nuclear power plant shall comply with requirement 337 of the Guide YVL A.1 “Regulatory oversight of safety in the use of nuclear energy”. **[**2020-03-17 **]**

507. Prior to commissioning, pre-operational testing of a spent nuclear fuel storage facility or encapsulation plant shall be carried out in compliance with the Guide YVL A.5. **[**2020-03-17 **]**

508. In the commencement of the use of the spent nuclear fuel storage facility and encapsulation plant, requirement 339 of the Guide YVL A.1 shall be complied with. **[**2020-03-17 **]**

5.3 Conduct of operations

509. The holder of an operating licence for a nuclear fuel storage facility or encapsulation plant shall have the documents approved by STUK as required under Section 36 of the Nuclear Energy Decree. **[**2020-03-17 **]**

510. In accordance with Section 20(3) of the Regulation STUK Y/1/2018 and Section 24(2–3) of the Regulation STUK Y/4/2018, the control and supervision of a nuclear fuel storage facility and encapsulation plant shall utilise written procedures that correspond to the existing structure and state of the facility. **[**2020-03-17 **]**

511. The operating procedures shall define the functions performed on nuclear fuel, the preconditions for performing such functions, the respective measures, responsibilities, and records. **[**2020-03-17 **]**

5.3.1 Operational Limits and Conditions

512. In accordance with Section 22 of the Regulation STUK Y/1/2018 and Section 26 of the Regulation STUK Y/4/2018, nuclear facilities shall have Operational Limits and Conditions that include the technical and administrative requirements for ensuring the nuclear facility's operation in compliance with the design bases and the assumptions of safety analyses. **[**2020-03-17 **]**

513. The handling and storage of nuclear fuel shall comply with the requirements for Operational Limits and Conditions presented in chapters 7.5 and 7.6 of the Guide YVL A.6. **[**2020-03-17 **]**

5.3.2 Operating experience and safety research

514. Section 21 of the Regulation STUK Y/1/2018 and Section 25 of the Regulation STUK Y/4/2018 present requirements for taking operating experience and safety research into account in the improvement of safety. **[**2020-03-17 **]**

515. The holder of an operating licence for a spent nuclear fuel storage facility or encapsulation plant shall have an operating experience feedback programme in place for systematic collection, analysis, and reporting of operating experiences and events at the facility and other equivalent facilities and for following safety research. **[**2020-03-17 **]**

516. The monitoring of the feedback from operating experience shall comply with the requirements of the Guide YVL A.10. **[**2020-03-17 **]**

5.3.3 Condition monitoring and maintenance

517. The spent nuclear fuel storage facility shall have the rooms and equipment necessary for the condition monitoring of nuclear fuel assemblies. **[**2020-03-17 **]**

518. The storage conditions of spent nuclear fuel shall be designed so that the condition of nuclear fuel assemblies, nuclear fuel racks or nuclear fuel storage pools will not significantly deteriorate during the storage period. By choosing suitable materials and controlling the chemical properties of the cooling water, corrosion of nuclear fuel assemblies, storage racks, and storage pool liners shall be kept as low as reasonably achievable. **[**2020-03-17 **]**

519. A nuclear fuel storage facility and encapsulation plant shall have appropriate rooms and equipment for conducting inspections of nuclear fuel. The control pursuant to the Guide YVL D.1 shall be provided for in the design of the encapsulation plant. **[**2020-03-17 **]**

520. The spent nuclear fuel storage and handling systems and the related equipment shall have a periodic testing programme in place for ensuring the reliable operation and condition of structures, systems, and components related to safety. **[**2020-03-17 **]**

521. In periodic tests of the spent nuclear fuel storage facility and encapsulation plant, the requirements of chapter 5.3. of the Guide YVL A.6 shall be complied with. **[**2020-03-17 **]**

5.4 Decommissioning of a nuclear facility

522. In accordance with Section 17 of the Regulation STUK Y/1/2018 and Section 20 of the Regulation STUK Y/4/2018, the design of a nuclear facility and its operation shall take account of the safety of the decommissioning of the facility. **[**2020-03-17 **]**

523. The holder of a decommissioning licence for a nuclear fuel storage facility or encapsulation plant shall have the documents approved by STUK as required under Section 36 a of the Nuclear Energy Decree. **[**2020-03-17 **]**

523a. In accordance with Section 20 a of the Regulation STUK Y/1/2018 and Section 24 a of the Regulation STUK Y/4/2018, the holder of the nuclear facility's decommissioning license shall ensure during decommissioning that the dismantling of the nuclear facility is implemented in conformity with the safety requirements and using approved plans and procedures. **[**2020-03-17 **]**

5.5 Emergency preparedness

524. A spent nuclear fuel storage facility and encapsulation plant shall have emergency preparedness arrangements in place the extent of which shall be commensurate with accidents considered possible and the planning of which shall be based on the Regulation STUK Y/2/2018 and the Guide YVL C.5. **[**2020-03-17 **]**

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

525. Section 25 of the Regulation STUK Y/1/2018 and Section 38 of the Regulation STUK Y/4/2018 present requirements for management, organisation and personnel in order to ensure safety. Requirements are set for the safety culture, the management system, the identification and correction of deviations, changes of plan, the management of safety and quality and ensuring competence. These requirements are further specified in the A series of the YVL Guides. **[**2020-03-17 **]**

6 Removed. (Operation of the facility)

601. Moved to para. 509. **[**2020-03-17 **]**

602. Moved to para. 510. **[**2020-03-17 **]**

603. Moved to para. 511. **[**2020-03-17 **]**

604. Removed. **[**2020-03-17 **]**

605. Removed. **[**2020-03-17 **]**

606. Moved to para. 520. **[**2020-03-17 **]**

607. Moved to para. 514. **[**2020-03-17 **]**

608. Moved to para. 4107. **[**2020-03-17 **]**

609. Removed. **[**2020-03-17 **]**

610. Moved to para. 524. **[**2020-03-17 **]**

611. Removed. **[**2020-03-17 **]**

612. Removed. **[**2020-03-17 **]**

7 Documentation to be submitted to STUK

701. The due fulfilment of the safety requirements pertaining to the nuclear facility concerned shall be demonstrated by means of documents submitted to STUK at different stages of the nuclear facility licensing process pursuant to the Nuclear Energy Decree. Requirements of the Guide YVL A.1 shall be complied with in the licensing procedures of the spent nuclear fuel storage facility and encapsulation plant. At different stages of licensing, documents shall be submitted in accordance with the requirements of chapter 6 of the Guide YVL B.1. Reporting related to spent nuclear fuel shall be performed in accordance with the requirements of the Guide YVL A.9 “Regular reporting on the operation of a nuclear facility”. **[**2020-03-17 **]**

702. The licensee shall submit to STUK a preliminary safety analysis report in connection with the construction licence application for a nuclear facility. In accordance with requirement 612 of the Guide YVL B.1, the preliminary safety analysis report shall present analyses drawn up to justify design solutions, such as deterministic analyses of postulated operational occurrences and accidents, failure tolerance and common cause failure analyses and analyses of internal and external threats. The Guide YVL B.3 presents the requirements for safety analyses in greater detail. **[**2020-03-17 **]**

703. The content of the preliminary and final safety analysis report of the spent nuclear fuel storage facility and encapsulation plant shall comply with requirements 606–612b and 617–623 of the Guide YVL B.1. In addition to said requirements, the safety analysis reports concerning the encapsulation plant shall describe the fabrication method, properties and acceptance criteria for the disposal canister. **[**2020-03-17 **]**

704. The safety analysis reports concerning the nuclear fuel storage facility and encapsulation plant shall describe the properties of the types of nuclear fuel assemblies being handled. Acceptance criteria shall be prepared for the types of nuclear fuel being handled, and plans shall be drawn up for the handling, storage and disposal of nuclear fuel assemblies that deviate from the acceptance criteria. **[**2020-03-17 **]**

705. Records shall be prepared of the spent nuclear fuel transferred to the encapsulation plant and of each disposal canister, based on which the following data can be determined to an accuracy of an individual assembly and canister:

a. the initial enrichment level, burnup, and heat generation of the nuclear fuel;

b. the activities of dominant radionuclides, including the activation products of structural parts;

c. the structural and material properties that have a bearing on the long-term safety of encapsulation or disposal; and

d. the potential leak of nuclear fuel or damage to a nuclear fuel assembly. **[**2020-03-17 **]**

706. The safety assessment reports shall be kept up-to-date as specified in the Guide YVL A.1. In addition to any plant modifications, the updates to the safety assessment reports shall address any changes in the properties or handling and storage conditions of nuclear fuel assemblies that may have a bearing on safety. **[**2013-11-15 **]**

707. In accordance with requirement A02 of Annex A to the Guide YVL A.1, the safety analysis reports shall be supplemented with topical reports the purpose of which is to clarify on what kind of experimental studies and theoretical analyses the design and planning of the facility are based. The topical reports shall, in particular, address any events and functions important to safety. **[**2020-03-17 **]**

708. The licensee shall submit to STUK the probabilistic risk assessment of the design stage in connection with the construction licence application for a nuclear facility and the probabilistic risk assessment in connection with the application for an operating licence. The requirements concerning the probabilistic risk assessment of a nuclear fuel storage facility are specified in the Guide YVL A.7 “Probabilistic risk assessment and risk management of a nuclear power plant”. **[**2020-03-17 **]**

708a. The methods used in the risk analysis of a spent nuclear fuel encapsulation plant shall be selected and applied commensurate with the risks associated with the different stages of the encapsulation process. Qualitative methods can be applied in the probabilistic risk assessment of the encapsulation plant, supplemented by quantitative analyses where necessary. **[**2020-03-17 **]**

709. Removed. **[**2020-03-17 **]**

710. The procedures closely relevant to operations specified in requirement 510 shall be submitted to STUK for information prior to the commissioning inspection as stipulated in chapter 4.6 of the Guide YVL A.1. **[**2020-03-17 **]**

710a. The updated operating procedures shall be submitted to STUK for information in accordance with requirement 703 of the Guide YVL A.6. **[**2020-03-17 **]**

711. Removed. **[**2020-03-17 **]**

8 Regulatory oversight by the Radiation and Nuclear Safety Authority

801. According to Section 11 of the Nuclear Energy Act and Section 7 of the Nuclear Energy Decree, a separate storage facility for spent nuclear fuel or encapsulation plant is a nuclear facility of considerable general significance, the construction of which is subject to a Government decision-in-principle. Section 24 of the Nuclear Energy Decree specifies the documents concerning a planned nuclear facility that shall be submitted as enclosures to the application for a decision-in-principle. **[**2020-03-17 **]**

802. STUK will process the applications related to the licensing of a spent nuclear fuel storage facility or encapsulation plant as provided for in chapter 7 of the Guide YVL B.1. **[**2013-11-15 **]**

803. STUK oversees the construction, commissioning, operation and decommissioning of the nuclear fuel storage facility and encapsulation plant in accordance with the Guides YVL A.1, YVL A.5, YVL A.6, YVL D.3, YVL D.4 and YVL E.6. **[**2020-03-17 **]**

804. STUK oversees the implementation of encapsulation to the extent it considers necessary in accordance with the Guides YVL D.3 and YVL D.7. The implementation of encapsulation comprises the verification of the fulfilment of the acceptance criteria set for the canister and nuclear fuel and the follow-up of the records kept of the canisters and nuclear fuel. **[**2020-03-17 **]**

805. As part of their international nuclear safeguards activities, the IAEA and the European Commission conduct on-site inspections in order to verify the accuracy of the information provided by the operators as provided in the Guide YVL D.1. **[**2013-11-15 **]**

9 References

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

2. Radiation Act (859/2018) [2020-03-17]

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

4. Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018). [2020-03-17]

5. Radiation and Nuclear Safety Authority Regulation on the Security in the Use of Nuclear Energy (STUK Y/3/2016). [2020-03-17]

6. Radiation and Nuclear Safety Authority Regulation on the Emergency Arrangements of a Nuclear Power Plant (STUK Y/2/2018). [2020-03-17]

7. Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018). [2020-03-17]

8. WENRA Working Group on Waste And Decommissioning (WGWD), Waste and Spent Fuel Storage Safety Reference Levels Report, version 2.2. [2020-03-17]

9. IAEA SSR-2/1, Safety of Nuclear Power Plants: Design, 2012. [2013-11-15]

10. IAEA SSR-2/2, Safety of Nuclear Power Plants: Commissioning and Operation, 2011. [2013-11-15]

11. IAEA NS-R-5, Safety of Nuclear Fuel Cycle Facilities, 2014. [2020-03-17]

12. IAEA SSG-15 Storage of Spent Nuclear Fuel, 2012. [2020-03-17]

13. Government Decree on Ionising Radiation (1034/2018). [2020-03-17]

14. Road Traffic Act (267/1981). [2020-03-17]

15. Decree of the Ministry of Transport and Communications on the Transport of Dangerous Goods by Road (TRAFICOM/82133/03.04.03.00/2019). [2020-03-17]

Definitions

System

System shall refer to a combination of components and structures that performs a specific function.

Encapsulation

Encapsulation shall refer to the operations related to spent nuclear fuel to be enclosed in a final disposal canister at an encapsulation plant.

Encapsulation plant

Encapsulation plant shall refer to a nuclear facility that is used to encapsulate spent nuclear fuel for final disposal.

Qualification

Qualification is normally used as a synonym for “validation” in YVL-guides. Qualification shall refer to confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

Validation

Validation shall refer to confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

Corrosion

Corrosion shall refer to a physical and chemical reaction between metal and its environment that introduces changes to the metal's properties and may lead to a significant reduction in the functionality of the metal, its environment, or the technical system of which they are part.

Criticality

Criticality shall refer to a state where the output and loss of neutrons, created in nuclear fission and maintaining a chain reaction, are in equilibrium so that a steady chain reaction continues. (STUK Y/1/2018)

Spent nuclear fuel

Spent nuclear fuel shall refer to nuclear material that has been used as nuclear fuel for the production of nuclear energy and that contains significant amounts of nuclear waste. (Nuclear Energy Decree 161/1988)

Operational event

Operational event shall refer to a failure, flaw or non-conformity in safety functions, systems, components, structures or an organisation's activities that has a bearing on radiation safety or nuclear safety. Operational events also include emergencies and disturbances as well as events compromising radiation safety. Operational events also include events taking place during the construction phase. Note: Operational event is a wider concept, but in YVL Guides, it shall refer to events in STUK's controlled area (radiation and nuclear safety).

Final disposal canister

Final disposal canister shall refer to a hermetic, corrosion resistant and mechanically strong container where spent nuclear fuel is enclosed.

Licensee

Licensee shall refer to the holder of a licence entitling to the use of nuclear energy. (Nuclear Energy Act 990/1987)

Redundancy

Redundancy shall refer to the use of alternative (identical or diverse) structures, systems or system components, so that any one of them can perform the required function regardless of the state of operation or failure of any other.

Normal operating conditions

Normal operating conditions shall refer to the planned operation of a nuclear facility according to the operating procedures. Normal operating conditions also include testing, plant start-up and shutdown, maintenance and the replacement of nuclear fuel. (STUK Y/1/2018)
YVL Guides also use the term normal operation, which means the same as normal operating conditions.

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)

Design extension condition

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 and which the facility is required to withstand without severe fuel failure.
(Nuclear Energy Decree 161/1988)

Accident

Accident shall refer to postulated accidents, design extension conditions and severe accidents. (Nuclear Energy Decree 161/1988)

Long-term safety

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.

Construction plan

Construction plan shall refer to the design documentation compiled for the purpose of pre-inspection conducted by STUK or an authorised inspection body.

Transfer cask

Transfer cask shall refer to a container in which spent nuclear fuel is transported within the plant site.

Design basis

Design bases shall refer to all requirements, definitions and bases for normal operational conditions and accidents that pertain to the design and operation of a plant, system and component. (Nuclear Energy Decree, 161/1988)

Probabilistic Risk Assessment, PRA

Probabilistic risk assessment (PRA) shall refer to quantitative assessments of hazards, probabilities of event sequences and adverse effects influencing the safety of a nuclear power

plant. (Nuclear Energy Decree 161/1988)

Verification

Verification shall refer to confirmation, through the provision of objective evidence, that set requirements have been fulfilled.

Auxiliary system

Auxiliary system shall refer to a system required to actuate, control, cool or operate a system executing a safety function, or otherwise maintain the conditions required by the operational prerequisites of the safety function.

System/structure/component important to safety

System/structure/component important to safety shall refer to systems, structures or components in safety classes 1, 2 and 3 and systems in class EYT/STUK.

Safety system

Safety system shall refer to a system that has been designed to execute safety functions.

Operational Limits and Conditions, OLC

The Operational Limits and Conditions (OLC) set out the technical and administrative requirements for ensuring the plant's operation in compliance with the design bases and safety analyses; the requirements for ensuring the operability of systems, structures and components important to safety; and the limitations that must be observed in the event of component failure.

External events

External events shall refer to exceptional situations or incidents occurring in the vicinity of a nuclear facility that could have a detrimental effect on the safety or operation of the plant.

Emergency arrangements

Emergency arrangements shall refer to advance preparation for accidents or events impairing safety at the nuclear facility or in its site area or other places or vehicles where nuclear energy is used. (Nuclear Energy Act 990/1987)

Failure criterion (N+1)

(N+1) failure criterion shall mean the same as the single failure criterion.
Single failure criterion (N+1) shall mean that it must be possible to perform a safety function even if any single component designed for the function fails.

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)

Nuclear material

Nuclear material shall refer to special fissionable materials and source materials, such as uranium, thorium and plutonium, suited for obtaining nuclear energy. (Nuclear Energy Act 990/1987)

Nuclear safeguards

Nuclear safeguards shall refer to regulatory control preventing the proliferation of nuclear weapons to ensure that the nuclear materials and nuclear energy are used peacefully as defined in international treaties, and to ensure that they or any technology related to them is not used to promote the proliferation of nuclear weapons.

Common cause failure

Common cause failure shall refer to a failure of two or more structures, systems and components due to the same single event or cause.

Single failure criterion

Single failure criterion (N+1) shall mean that it must be possible to perform a safety function even if any single component designed for the function fails.