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## **Nuclear Energy Ordinance (NEO)**

of 10 December 2004 (Status as of 1 June 2017)

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*The Federal Council,*

on the basis of Article 101, paragraph 1 of the Nuclear Energy Act of 21 March 2003<sup>1</sup> (NEA),

*ordains:*

### **Chapter 1 General Provisions**

**Art. 1<sup>2</sup>** Nuclear materials covered by this Ordinance

<sup>1</sup> Nuclear materials are:

- a. source materials:
  1. natural uranium, i.e. uranium with the mixture of isotopes that occurs in nature,
  2. depleted uranium, i.e. uranium that has a lower percentage of uranium 235 than natural uranium,
  3. thorium,
  4. the substances mentioned in numbers 1-3 above in the form of metal, alloys, chemical compounds or concentrates and other materials that contain one or more of the abovementioned substances in a concentration specified by the International Atomic Energy Agency or higher;
- b. special fissile materials:
  1. plutonium 239,
  2. uranium 233,
  3. uranium 235,
  4. enriched uranium, i.e. uranium in which the percentage of uranium 233, uranium 235 or both isotopes together is higher than that of uranium 235 in natural uranium;

AS 2005 601

<sup>1</sup> SR 732.1

<sup>2</sup> Amended by Annex 6 No II 2 of the Safeguards Ordinance of 21 March 2012, in force since 1 May 2012 (AS 2012 1703).

5. the substances mentioned in numbers 1-4 above in the form of metal, alloys, chemical compounds or concentrates and other materials that contain one or more of the abovementioned substances in a concentration specified by the International Atomic Energy Agency or higher.

<sup>2</sup> The following are not classified as nuclear materials:

- a. uranium and thorium ores;
- b. source materials and products made from source materials that are not used for obtaining energy by means of nuclear fission processes, and in particular shielding materials, sensors in measuring instruments, ceramic compounds and alloys;
- c. special fissile materials with a weight of up to 15 grams and products made from special fissile materials that are not used for obtaining energy by means of nuclear fission processes, and in particular sensors in measuring instruments and other finished products for which the recovery of the special fissile materials contained therein requires disproportionate technical effort or financial expense.

**Art. 2** Nuclear installations covered by this Ordinance

<sup>1</sup> Installations in which the following nuclear materials are obtained, produced, used, processed or stored are not classified as nuclear installations:

- a. substances that contain a total of not more than 1,000 kg of natural uranium, depleted uranium or thorium;
- b. source materials for which evidence can be provided that a sustainable chain reaction is not possible due to the chemico-physical condition of the materials and the existing operating conditions;
- c. special fissile materials that contain a total maximum of 150 grams of plutonium 239, uranium 233 or uranium 235.

<sup>2</sup> The Federal Office of Energy (the Federal Office) shall determine whether source materials meet the requirements within the meaning of paragraph 1 letter b.

**Art. 3** Brokerage activities covered by this Ordinance

Activities involving nuclear goods within the meaning of Article 3 letter k of the Nuclear Energy Act are not classified as brokerage activities if the nuclear goods concerned are intended to meet own needs within Switzerland.

**Art. 4** Definitions

The definitions in Annex 1 apply.

**Art. 5** Sectoral plan for deep geological repositories

The federal government shall specify in a sectoral plan the objectives and criteria for the disposal of radioactive waste in deep geological repositories which are legally binding for the relevant authorities.

**Art. 6<sup>3</sup>** Supervisory authorities

The supervisory authorities are:

- a. the Swiss Federal Nuclear Safety Inspectorate (ENSI) with regard to nuclear safety and security;
- b. the Federal Office for other areas of enforcement of the NEA.

**Chapter 2 Principles of Nuclear Safety and Security****Art. 7** Requirements concerning nuclear safety

The following measures must be taken in order to guarantee nuclear safety.

- a. Established or proven high-quality processes, materials, technologies and organisational structures and processes must be used in connection with design, construction, commissioning and operation of nuclear installations. This applies especially to the areas of planning, manufacture, testing, operation, surveillance, maintenance, quality assurance, evaluation of operational experience feedback, ergonomic design as well as basic and advanced training and professional development.
- b. Any deviations from normal operation should be countered as far as possible by ensuring that the behaviour of the installation is self-regulating and fault-tolerant. Wherever possible, the behaviour of the installation must be inherently safe. The term «inherently safe» is understood to mean that a given system functions safely on its own, i.e. without the support of auxiliary systems.
- c. In order to deal with accidents, the installation must be designed in such a manner as to ensure that the surroundings are not exposed to impermissible radiological effects. For this purpose, the installation must be equipped with both passive and active safety systems.
- d. Additional technical, organisational and administrative measures must be taken to prevent and mitigate the consequences if harmful quantities of radioactive substances might be released in case of an accident

<sup>3</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

**Art. 8** Requirements concerning measures to prevent accidents

<sup>1</sup> Preventive and protective measures must be taken to avoid accidents in nuclear installations that may originate either within (internal) or outside (external) the installation.

<sup>2</sup> Internal initiating events include reactivity disturbance, loss of coolant, loss of heat sink, fire, flooding, mechanical damage due to component failure, damage to cladding when handling fuel elements, failure of operating systems, unintentional activation or faulty functioning of safety systems, and mistakes made by personnel.

<sup>3</sup> External initiating events include earthquake, flooding, accidental crash of civil or military aircraft, squall, lightning strike, shock wave, fire, loss of off-site power, impairment or loss of external cooling water supply.

<sup>4</sup> For the design of a nuclear installation in accordance with Article 7 letter c, accidents within the meaning of paragraphs 2 and 3 must be classified by frequency in accordance with Article 94 of the Radiological Protection Ordinance of 22 June 1994<sup>4</sup> (RadPO). In addition to the initiating event, an unrelated single failure must also be assumed. Proof must be provided that the requirements relating to maximum radiation doses in accordance with Article 94 paragraphs 2 to 5 RadPO are met.

<sup>5</sup> Proof must be provided by probabilistic analysis that the installation meets the criterion in Article 24, paragraph 1 letter b. For this purpose, the preventive and mitigating measures in accordance with Article 7 letter d may be taken into account.

<sup>6</sup> The Federal Department of the Environment, Transport, Energy and Communications (the Department) shall define the hazard assumptions and associated evaluation criteria in an ordinance.

**Art. 9** Requirements concerning security

<sup>1</sup> The protection of nuclear installations and nuclear material against sabotage, malicious acts and unauthorised removal must be based on the principle of defence in depth, which encompasses structural, technical, organisational, personnel and administrative measures.

<sup>2</sup> The principles for security zones and barriers and for the protection of nuclear installations, nuclear materials and radioactive waste are defined in Annex 2.

<sup>3</sup> The Department shall define the principles for hazard assumptions and for structural, technical, organisational and administrative security measures in an ordinance.

**Art. 10** Basic principles for the design of nuclear power plants

<sup>1</sup> The following principles apply to nuclear power plants:

- a. Safety functions must also remain effective even if a single failure occurs independently of an initiating event, and also if a component is not available due to maintenance or repair. Such separate single failures include the random failure of a component that results in its incapacity to perform its in-

tended safety function. Subsequent failures arising from such random failures are also regarded as part of the original single failure.

- b. Wherever possible, safety functions must be implemented in accordance with the principles of redundancy and diversity. Redundancy refers to the existence of a larger number of functional devices than are required for fulfilling the intended safety function. Diversity refers to the use of different types of physical or technical principles.
- c. Redundant trains of safety systems installed for performing safety functions must as far as possible be independent of one another in terms of function and in terms of both mechanical and support systems such as instrumentation and control and provision of energy, cooling and ventilation.
- d. Each redundant train of a safety system installed for performing a safety function must as far as possible be spatially separated from the other trains.
- e. Redundant devices installed for performing safety functions must be testable, as far as possible in their entirety, or otherwise subdivided into the broadest possible subparts, both manually and through simulated automatic activation, including under emergency power supply.
- f. Safety functions must be automated so that, in the event of accidents in accordance with Article 8, no interventions important to safety by personnel are required during the first 30 minutes following the initiating event.
- g. The design of systems and components must take sufficient account of appropriate safety margins.
- h. As far as possible, systems should be designed to ensure safety-oriented system behaviour in the event of equipment failures.
- i. Preference must be given to passive rather than active safety functions.
- j. Work stations and processes for the operation and maintenance of the installation must be designed so that they take account of human capabilities and their limits.
- k. While ensuring the same degree of safety, preference must be given to measures to prevent accidents in accordance with Article 7 letter d over measures to mitigate their consequences.

<sup>2</sup> ENSI shall specify detailed design principles for light-water reactors in guidelines.<sup>5</sup>

#### **Art. 11** Design principles for deep geological repositories

<sup>1</sup> In order to guarantee long-term safety, the site for a deep geological repository must meet the following requirements:

- a. sufficient extent of suitable host rock;
- b. favourable hydro-geological conditions;

<sup>5</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

c. long-term geological stability.

<sup>2</sup> A deep geological repository must be designed to ensure that:

- a. it complies by analogy with the principles of Article 10 paragraph 1;
- b. it guarantees long-term safety through multiple passive safety barriers;
- c. steps to ease surveillance and repairs of the repository, or for the recovery of the waste, in no way impair the effectiveness of the passive safety barriers after closure of the repository;
- d. it can be closed within a period of a few years.

<sup>3</sup> ENSI shall specify detailed design principles for deep geological repositories in guidelines.<sup>6</sup>

#### **Art. 12** Design principles for other nuclear installations

<sup>1</sup> Article 10 paragraph 1 applies by analogy to the design of nuclear installations other than nuclear power plants and deep geological repositories.

<sup>2</sup> An interim storage installation for radioactive waste must be designed to ensure that:

- a. the suitability for disposal of the waste packages will not be impaired;
- b. sufficient storage capacity is available for the anticipated volume of waste.

<sup>3</sup> ENSI shall specify detailed design principles for individual types of nuclear installations in guidelines.<sup>7</sup>

### **Chapter 3 Nuclear Goods**

#### **Art. 13** Responsibilities

The Federal Office is responsible for:

- a. issuing licences for handling nuclear materials;
- a<sup>bis</sup>,<sup>8</sup> issuing licences for the export and mediation of technology relating to nuclear materials;
- b. approving the agreement concerning the return of radioactive waste or spent fuel elements in accordance with Article 9 letter d of the Nuclear Energy Act.

<sup>6</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>7</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>8</sup> Inserted by Annex 8 No I of the Goods Control Ordinance of 3 June 2016, in force since 1 July 2016 (AS **2016** 2195).

**Art. 14<sup>9</sup>** Licence procedure for the export and mediation of nuclear materials and technology relating to nuclear materials

<sup>1</sup> The Federal Office shall authorise applications for licences for the export and mediation of nuclear materials and technology relating to nuclear materials unless there is an indication that the licensing requirements in Article 7 NEA have not been met.

<sup>2</sup> It shall refuse the application if a necessary licensing requirement in Article 7 NEA has not been met.

<sup>3</sup> In other cases, it shall decide by agreement with the competent offices of the Federal Department of Foreign Affairs, the Federal Department of Economic Affairs, Education and Research and the Federal Department of Defence, Civil Protection and Sport and in consultation with the Federal Intelligence Service. If no agreement can be reached, the Federal Council shall decide based on the Department's proposal.

**Art. 15** Applications and related documentation

<sup>1</sup> Applications for a licence for the transport as well as for import, export or transit of nuclear materials must be submitted jointly by the consignor, the consignee, the carrier and the transport organiser.

<sup>2</sup> The documents must provide all the necessary information for assessing the application, including in particular:

- a. composition and properties of the material;
- b. specific technical data concerning the equipment;
- c. place of manufacture;
- d. destination and recipient;
- e. designated purpose;
- f. conditions of purchase or sale;
- g. transport, in particular evidence of compliance with the requirements on the carriage of dangerous goods.

<sup>3</sup> Documents relating to applications for licences for the mediation of nuclear materials or the export or mediation of technology concerning nuclear materials, must contain the following information:

- a. for nuclear materials, in particular details concerning:
  1. composition of the material,
  2. quantity,
  3. place of origin and destination or if unknown at the time of application, place of performance;

<sup>9</sup> Amended by Annex 8 No I of the Goods Control Ordinance of 3 June 2016, in force since 1 July 2016 (AS 2016 2195).

- b. for technology, details within the meaning of paragraph 2 letters c to f, and information about form and content of the technology.

<sup>4</sup> On request, the holder of a licence for the mediation of nuclear materials must periodically provide the Federal Office with the following details:

- a. composition of the material;
- b. quantities;
- c. place of origin and destination or if unknown at time of application, place of performance;
- d. type of underlying transaction, time of performance;
- e. contractual partner(s).

<sup>5</sup> The Federal Office reserves the right to request additional documentation.

#### **Art. 16** Preliminary clarifications

<sup>1</sup> At the request of the applicant, the Federal Office shall carry out preliminary clarifications to determine whether, and under which conditions, a licence may be issued in accordance with the requirements aforementioned in this chapter.

<sup>2</sup> Preliminary clarifications do not entitle the applicant to a licence.

<sup>3</sup> For the purpose of deciding on the issuing of a licence, any already examined preconditions shall only be assessed differently if the actual or legal circumstances have changed since the preliminary clarifications were carried out, or if new facts should come to light.

#### **Art. 17<sup>10</sup>** Diplomatic or consular offices, international organisations, bonded warehouses, duty-free bonded warehouses and areas outside customs territory

The following types of deliveries are equivalent to import and export activities:

- a. from and to diplomatic or consular offices;
- b. from and to international organisations;
- c. from or to bonded warehouses, warehouses for bulk articles, duty-free bonded warehouses or areas outside customs territory.

#### **Art. 18** Validity

Licences are valid for no longer than 12 months and may only be extended for a maximum period of 6 months.

<sup>10</sup> Amended by Annex 4 No 31 of the Customs Ordinance of 1 Nov. 2006, in force since 1 May 2007 (SR 631.01).



**Art. 19**<sup>11</sup>**Art. 20** Retention of documentation

All documents relating to licences must be retained for a period of 5 years after issue of the licence, and must be submitted to the relevant authorities on request.

**Art. 21** Reporting obligation

<sup>1</sup> Licence holders must report to ENSI in particular on the following events and findings relating to the safety of the transport of nuclear materials:<sup>12</sup>

- a. exceeding of dose rate, activity or contamination limits;
- b. technical defects on transport containers subject to approval;
- c. any other events and findings that impair or may impair safety.

<sup>2</sup> The licence holder must report the following events and findings relating to security to ENSI without delay:<sup>13</sup>

- a. sabotage and attempted sabotage;
- b. bomb threats;
- c. extortion and hostage-taking;
- d. accident, damage to or failure of security equipment and systems that last longer than 24 hours;
- e. any other events and findings that impair or may impair security.

<sup>3</sup> The licence holder must submit a report on every event or finding to ENSI or to the Federal Office. Reports on events and findings relating to safety must be made in accordance with Annex 6. Reports relating to security must be submitted within 30 days and must be classified.<sup>14</sup>

**Chapter 4 Nuclear Installations****Section 1 General Licence****Art. 22** Nuclear installations with low hazard potential

<sup>1</sup> Nuclear installations do not require a general licence if the frequency of all accidents in accordance with Article 8 paragraphs 2 and 3, with a resulting dose of more than 1 mSv for persons not occupationally exposed to radiation does not exceed 10<sup>-6</sup>

<sup>11</sup> Repealed by Annex 8 No I of the Goods Control Ordinance of 3 June 2016, with effect from 1 July 2016 (AS **2016** 2195).

<sup>12</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>13</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>14</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

per annum. In the case of interim storage installations and deep geological repositories, the total of activities of all nuclides to be emplaced must not exceed  $10^{13}$  LE in accordance with Annex 3 column 9 Radiological Protection Ordinance.<sup>15</sup>

<sup>2</sup> ENSI shall specify the methodology and boundary conditions for the accident analysis called for in paragraph 1 in guidelines.<sup>16</sup>

**Art. 23** Application documents

Applications for a general licence must be accompanied by the following documentation:

- a. safety analysis report and security report that include the following information:
  1. site characteristics,
  2. purpose and outline of project,
  3. anticipated exposure to radiation in the vicinity of the installation,
  4. important information regarding organisation and personnel,
  5. in the case of deep geological repositories, indication of long-term safety;
- b. environmental impact report;
- c. report on compliance with spatial planning requirements;
- d. concept for decommissioning, or for the monitoring period and closure;
- e. feasibility demonstration of the management and disposal of resulting radioactive waste.

**Section 2 Construction Licence and Construction of Installation**

**Art. 24** Applications

<sup>1</sup> Applicants for a construction licence must demonstrate that:

- a. they are able to comply with the principles aforementioned in Articles 7 to 12;
- b. in the case of construction of a new nuclear power plant, the mean core damage frequency for accidents in accordance with Article 8 is not greater than  $10^{-5}$  per annum;
- c. in the case of nuclear installations with low hazard potential, the requirements aforementioned in Article 22 are met.

<sup>2</sup> They must submit the following documentation:

- a. required documents for construction licence as indicated in Annex 4;

<sup>15</sup> SR **814.501**

<sup>16</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

- b. environmental impact report;
- c. report on compliance with spatial planning requirements;
- d. quality management programme for the planning and construction phase;
- e. emergency preparedness concept;
- f. decommissioning plan or project for the monitoring period and plan for closure of the installation;
- g. report on compliance of the project with the general licence requirements.

<sup>3</sup> ENSI shall regulate the type, content, presentation and number of required application documents in guidelines.<sup>17</sup>

#### **Art. 25** Quality management programme

<sup>1</sup> In their quality management programme for the planning and construction phase, applicants are required to describe the organisational structure and processes, including their co-operation with contractors, and with the relevant licensing and supervisory authorities.

<sup>2</sup> The quality management programme must take account of the state of the art of nuclear safety and security technology.

<sup>3</sup> Applicants must have their quality management programme periodically examined by external auditors – and modified where necessary – in accordance with current industry standards.

<sup>4</sup> ENSI shall specify the detailed requirements on quality management programmes in guidelines.<sup>18</sup>

#### **Art. 26** Permits

<sup>1</sup> For buildings and system components that require a permit in accordance with the conditions of the construction licence, ENSI shall grant permits:<sup>19</sup>

- a. for the construction of building structures including embedded attachment elements and the installation of reinforcement bars or the assembly of steel constructions and for the methodology applied for modifications to the original structure and subsequently installed fastening elements;
- b. for the manufacture of the main mechanical components;
- c. for the installation of mechanical and electrical systems, including their instrumentation & control and for security equipment.

<sup>2</sup> To obtain the necessary permit, applicants must submit all the documentation necessary for the assessment as aforementioned in Annex 4.

<sup>17</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>18</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>19</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>3</sup> ENSI shall regulate the type, content, presentation and number of required application documents in guidelines.<sup>20</sup>

#### **Art. 27** Construction documentation

<sup>1</sup> Licence holders must fully document the construction of buildings and the manufacture and assembly of technical equipment, as well as implemented controls and inspections in a retraceable manner at all times.

<sup>2</sup> All documentation must be securely archived until completion of the decommissioning, or until closure or expiry of the specified monitoring period.

<sup>3</sup> All modifications carried out on the installation, including decommissioning or closure, must be documented.

<sup>4</sup> The licence holder must hand over all documentation to ENSI after the installation has been decommissioned, or after it has been closed or the period of observation has expired to the Department.<sup>21</sup>

<sup>5</sup> ENSI shall specify the detailed requirements on documentation and archiving in guidelines.<sup>22</sup>

### **Section 3** Operating Licence

#### **Art. 28** Application documents

<sup>1</sup> Applications for an operating licence must be accompanied by the following documentation:

- a. the required organisational and technical documentation as indicated in Annex 3;
- b. the required documents for an operating licence as indicated in Annex 4;
- c. evidence of insurance cover;
- d. the report on compliance of the installation with the requirements of the general licence and the construction licence.

<sup>2</sup> ENSI shall regulate the type, content, presentation and number of required application documents in guidelines.<sup>23</sup>

<sup>20</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>21</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>22</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>23</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

**Art. 29** Permits

<sup>1</sup> The operating licence shall require permits for the following stages of the commissioning procedure:

- a. the first delivery of nuclear fuel;
- b. the first fuel load;
- c. the first criticality;
- d. the next stages in accordance with the commissioning programme;
- e. continuous operation in the first operating cycle;
- f. the first storage of waste packages of a given type;
- g. the storage of transport and storage casks with spent fuel elements or high level waste.

<sup>2</sup> To obtain the necessary permit, applicants must submit the documentation necessary for the assessment as aforementioned in Annex 4.

<sup>3</sup> ENSI shall regulate the type, content, presentation and number of required application documents in guidelines.<sup>24</sup>

**Art. 30** Requirements concerning organisation

<sup>1</sup> The organisation of the installation must be structured in such a manner that it ensures internal responsibility for at least the following activities and areas:

- a. operation of the installation in all operating modes;
- b. maintenance, material technology and testing methods, technical support;
- c. design and surveillance of the reactor core;
- d. radiation protection and radioactive waste;
- e. water chemistry and use of chemical additives.
- f. emergency planning and preparedness;
- g. supervision and assessment of nuclear safety;
- h. security;
- i. quality assurance for services provided by contractors;
- j. initial and continuing training of personnel;
- k. fostering of safety awareness.

<sup>2</sup> The licence holder must organise the personnel into a manageable number of organisational units which are headed by a designated manager. Deputies must also be appointed for all managers.

<sup>24</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>3</sup> The licence holder must appoint a committee that analyses events and findings that are attributable to human factors, and that proposes measures and supervises their implementation.

<sup>4</sup> The licence holder must designate a position for technical operation of the installation that is provided with the necessary competencies and resources, and that is responsible for decisions relating to safety and security.

<sup>5</sup> ENSI shall specify the detailed requirements on the organisation in guidelines.<sup>25</sup>

#### **Art. 31** Quality management system for operation

The quality management system for operation must meet the following requirements in particular:

- a. Responsibilities and competencies for processes in the organisation must be described clearly and in detail.
- b. Tasks of relevance to safety and security must be defined in a management cycle and must be systematically planned, executed, controlled, documented, internally and externally audited on a periodical basis, and adjusted as necessary.
- c. The quality management system must correspond to the state of the art of nuclear safety and security technology.

### **Section 4** Operation

#### **Art. 32** Maintenance, in-service inspection and functional testing

<sup>1</sup> The licence holder must define systematic programmes for the maintenance of safety and security equipment and must implement the measures specified therein, in particular relating to:

- a. maintenance;
- b. non-destructive in-service inspections;
- c. periodic functional tests.

<sup>2</sup> Any deviations from the target state must be rectified by taking the appropriate repair measures.

<sup>3</sup> Qualified procedures and equipment must be used for maintenance, inspection and repair tasks, and these must be carried out by qualified personnel.

<sup>4</sup> All maintenance and repair work must be documented and the outcome periodical-ly evaluated. Programmes must be supplemented as necessary.

<sup>25</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

**Art. 33** Systematic safety and security assessments

<sup>1</sup> The licence holder must carry out systematic safety assessments for the following areas:

- a. impacts of modifications to the installation, and of events and findings, on the safety of the installation, and in particular on risk; each risk assessment must incorporate an up-to-date, plant-specific probabilistic safety analysis (PSA);
- b. operational experience feedback from electrical and mechanical equipment important to safety, fuel elements, structures important to safety and water chemistry;
- c. radiation protection and radioactive waste;
- d. organisation and personnel;
- e. emergency planning;
- f. criteria in accordance with Article 44 paragraph 1.

<sup>2</sup> The licence holder must carry out systematic security assessments for the following areas:

- a. security concept;
- b. physical protection measures.

<sup>3</sup> ENSI shall specify the detailed requirements on systematic safety and security assessments in guidelines.<sup>26</sup>

**Art. 34<sup>27</sup>** Comprehensive safety reviews for nuclear power plants

<sup>1</sup> The holder of an operating licence for a nuclear power plant must carry out a comprehensive safety review every 10 years (Periodic Safety Review, PSR).

<sup>2</sup> For this purpose it must:

- a. explain and evaluate the safety concept;
- b. conduct a deterministic analysis of the safety status and a PSR;
- c. explain and evaluate the overall safety status;
- d. explain and evaluate whether the organisation of the plant and its personnel satisfy safety requirements.

<sup>3</sup> The PSR documents must be submitted to ENSI two years at the latest before the end of any operating decade.

<sup>4</sup> For the period following the fourth operating decade, proof of safety for long-term operations in accordance with Article 34a must also be submitted as part of the PSR.

<sup>26</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>27</sup> Amended by No I of the O of 26 April 2017, in force since 1 June 2017 (AS **2017** 2829).

<sup>5</sup> ENSI shall specify the detailed requirements on periodical safety reviews in guidelines. It made provide relief for nuclear power plants for the period following that in which they are finally taken out of service or exempt them entirely from the obligation to submit a PSR.

**Art. 34a<sup>28</sup>** Proof of safety for long-term operations

<sup>1</sup> Proof of safety for long-term operations shall comprise the following information in particular:

- a. the basic period of operation;
- b. proof that the design limits for the parts of the plant technically of safety relevance will not be reached during the planned period of operation;
- c. the backfitting and technical or organisational improvements planned for the following operating decade;
- d. the measures intended to guarantee sufficient numbers of staff with the required expertise for the planned period of operation.

<sup>2</sup> ENSI shall specify the detailed requirements on proof of safety for long-term operations in guidelines.

**Art. 35** Ageing management

<sup>1</sup> With the aid of a programme for managing ageing, the licence holder must systematically monitor the ageing of all systems, structures and components, the functions and integrity of which are of importance with regard to safety and security.

<sup>2</sup> The results must be evaluated, and any necessary measures must be defined and duly implemented.

<sup>3</sup> With the aid of the said programme for managing ageing, the licence holder must document the inspection of the installation from the point of view of the effects of ageing, and the programme must be periodically updated in accordance with the current status of the installation.

<sup>4</sup> ENSI shall specify the methods and scope of the ageing management programme in guidelines.<sup>29</sup>

**Art. 36** Monitoring the state of the art in science and technology and the operating experience in comparable installations

<sup>1</sup> The licence holder must monitor field-related scientific developments, especially findings obtained from research activities, and must examine the extent to which conclusions may be drawn therefrom concerning safety and security of the licence holder's installation.

<sup>28</sup> Inserted by No 1 of the O of 26 April 2017, in force since 1 June 2017 (AS **2017** 2829).

<sup>29</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).



<sup>2</sup> The licence holder must monitor technological developments, including those relating to organisation and personnel, and must examine the extent to which conclusions may be drawn therefrom concerning the safety and security of the licence holder's installation. The following are of particular relevance:

- a. recognised domestic and foreign technical standards;
- b. regulations of the country supplying the nuclear installation, as well as of other countries, relating to nuclear technology;
- c. recommendations of international bodies;
- d. state of the art in nuclear installations of a similar nature and in other relevant installations.

<sup>3</sup> The licence holder must monitor operating experiences and findings of similar installations and assess their significance for his own installation.

**Art. 37** Periodical reporting

<sup>1</sup> In accordance with Annex 5, the licence holder must submit reports to ENSI for the purpose of assessing the status and operation of the installation.<sup>30</sup>

<sup>2</sup> ENSI shall regulate the type, content, presentation and number of required reports in guidelines.<sup>31</sup>

**Art. 38<sup>32</sup>** Reporting obligations in the area of nuclear safety

<sup>1</sup> Holders of an operating licence must report the following activities in particular to ENSI before they are carried out:

- a. planned shutdown of a reactor;
- b. restart of a reactor following shutdown due to an accident;
- c. work with an anticipated collective dose exceeding 50 mSv;
- d. planned non-routine discharge of radioactivity into the environment;
- e. change of activated carbon in emergency filters of ventilation systems;
- f. planning and execution of emergency exercises;
- g. experiments on systems or components important to safety.

<sup>2</sup> They must report the following activities to ENSI:

- a. modifications of systems that are not subject to licence or permit;

<sup>30</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>31</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>32</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

- b. changes in the content of documentation within the meaning of Articles 27 and 41.

<sup>3</sup> They must report the following events and findings to ENSI:

- a. any events that impair or may impair safety;
- b. any other events of public interest;
- c. findings that may impair safety but have not given rise to an event.

<sup>4</sup> They must submit to ENSI all necessary reports as indicated in Annex 6.

<sup>5</sup> ENSI shall regulate the reporting procedure in accordance with paragraphs 1 and 2 and the method of classification of events and findings in accordance with paragraph 3 in guidelines.

**Art. 39<sup>33</sup>** Reporting obligations in the area of security

<sup>1</sup> The holder of an operating licence must in particular report the following activities to ENSI before they are carried out:

- a. structural and technical modifications or new installations that require a permit from ENSI;
- b. security-related exercises with the involvement of military, cantonal or municipal authorities;
- c. extraordinary security-related activities.

<sup>2</sup> The holder of an operating licence must report the following malicious acts and findings to ENSI without delay:

- a. use of violence against personnel;
- b. sabotage and attempted sabotage;
- c. bomb threats;
- d. extortion and hostage-taking;
- e. accidents, damage to or failure of security equipment and systems that last longer than 24 hours;
- f. malicious acts in and in the vicinity of the nuclear installation that are attributable to, or indicate, unauthorised interference;
- g. any other malicious acts and findings that impair or may impair security.

<sup>3</sup> The holder of an operating licence must submit a report on every malicious act or finding to ENSI within 30 days. The report must be classified.

<sup>33</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

**Art. 40** Modifications that require a permit

<sup>1</sup> The following modifications are generally regarded as modifications that do not deviate significantly from the respective licence but which require a permit in accordance with Article 65, paragraph 3 of the Nuclear Energy Act.

- a. modifications to structures, systems and components subject to safety or security classification and to equipment relevant to safety or security, providing the existing safety or security functions are maintained or improved;
- b. the following modifications to the reactor core:
  1. modifications to the loading of the reactor core with fuel elements as part of the refuelling procedure,
  2. modifications to and repair of fuel elements and control rods,
  3. increase of permissible burn-up,
  4. modification to safety assessment methods,
  5. modification of safety criteria,
  6. increase of the proportion of uranium-plutonium-mixed-oxide fuel elements in reactor core up to a maximum of 50 percent;
- c. changes in the content of the following documents:
  1. the power plant or operating regulations,
  2. the emergency preparedness regulations,
  3. the radiation protection regulations,
  4. the technical specifications,
  5. the regulations and instructions relating to security.

<sup>2</sup> To obtain the necessary permit in accordance with paragraph 1 letters a and b, the licence holder must submit all the documentation necessary for the assessment as aforementioned in Annex 4.

<sup>3</sup> To obtain the necessary permit in accordance with paragraph 1 letter c, the licence holder must submit all the required documentation together with an explanation of the reason for the changes.

<sup>4</sup> For modifications of technical specifications, the licence holder must also explain the method and technical criteria that have been used for assessing the impacts of the modifications on the safety of the installation.

<sup>5</sup> ENSI shall regulate the type, content, presentation and number of required application documents in guidelines.<sup>34</sup>

**Art. 41** Documentation

<sup>1</sup> The licence holder must update the organisational and technical documents in accordance with Annex 3 throughout the entire period of operation of the nuclear

<sup>34</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

installation, up to its decommissioning or closure, and must adapt them to the current status of the installation.

<sup>2</sup> The licence holder must at all times traceably document the operation of the installation on the basis of records in accordance with Annex 3 and documents describing function tests and maintenance operations.

<sup>3</sup> All documentation must be securely archived until completion of the decommissioning, or until closure of the installation or expiry of the specified monitoring period.

<sup>4</sup> The licence holder must hand over all documentation to ENSI after the installation has been decommissioned, or to the Department after closure of the installation or expiry of the monitoring period.<sup>35</sup>

<sup>5</sup> ENSI shall specify the detailed requirements on documentation and its archiving in guidelines.<sup>36</sup>

**Art. 42** Updating of plan or project concerning decommissioning and closure

<sup>1</sup> Every ten years, the holder of an operating licence must review and update the plan for the decommissioning of a nuclear installation or, in the case of a deep geological repository, the project for the monitoring period and the plan for closure.

<sup>2</sup> Updating is also required if:

- a. significant changes have been made to the installation;
- b. significant requirements have been changed that relate to decommissioning, or the monitoring period and closure of the installation;
- c. significant technological developments make updating necessary.

**Art. 43** Shutdown of a nuclear power plant

<sup>1</sup> The holder of an operating licence for a nuclear power plant must shut down the installation if one of the shutdown criteria in the technical specifications or power plant regulations should be fulfilled.

<sup>2</sup> The licence holder may only resume operation with a reactor output of more than 5 percent after the necessary measures have been taken.

**Art. 44** Criteria for provisional taking out of service and backfitting of nuclear reactors

<sup>1</sup> The holder of an operating licence must take the nuclear reactor out of service and backfit it if one or more of the following technical criteria are fulfilled:

- a. events or findings indicate that core cooling in the event of an accident in accordance with Article 8 can no longer be assured;

<sup>35</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>36</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

- b. events or findings indicate that the integrity of the primary coolant system can no longer be assured;
- c. events or findings indicate that the integrity of the containment can no longer be assured.

<sup>2</sup> The Department specifies the methodology and boundary conditions governing the review of criteria in an ordinance.

## **Section 5    Decommissioning**

### **Art. 45        Project documentation**

The organisation required to carry out decommissioning must submit the following documents concerning the decommissioning project:

- a. comparison of variants for the different stages, timetable for the decommissioning operations and expected end status, including the reason for choice of variant;
- b. description of each step and required funding, i.e. determination of radiological status of the installation, disassembly, dismantling and decontamination of installations, decontamination and demolition of buildings;
- c. procedure for separating radioactive from non-radioactive waste and management of the radioactive waste;
- d. measures to protect personnel against radiation and to prevent the release of radioactive substances into the environment;
- e. security measures;
- f. accident analysis, specifically the identification of potential accidents during decommissioning, assessment of their frequency and radiological impacts, as well as counter-measures and any necessary emergency preparedness measures;
- g. evidence of availability of the required number of suitable and qualified personnel for executing and supervising decommissioning operations, and of a suitable organisational structure with clear allocation of responsibilities;
- h. quality management programme;
- i. environmental impact report;
- j. summary of all costs arising from the decommissioning of the installation, including those for the management of radioactive and non-radioactive waste, and the securing of the necessary financing.

### **Art. 46        Decommissioning order**

The decommissioning order specifies the following details:

- a. scope of decommissioning activities;

- b. the various decommissioning stages, in particular the duration of any safe enclosure of the nuclear installation;
- c. limits for the discharge of radioactive substances into the environment;
- d. monitoring of immissions of radioactive substances and of direct radiation;
- e. organisation.

**Art. 47** Permits

The decommissioning order sets forth the need for a permit especially for the following activities:

- a. procedure for the clearance measurement of resulting materials;
- b. conditioning of resulting radioactive waste;
- c. demolition of buildings after their decontamination and clearance measurement;
- d. non-nuclear use of installations after completion of the decommissioning process;
- e. repeal of security measures;
- f. in the case of decommissioning of nuclear power plants, disassembly of the reactor vessel and its surrounding building elements.

**Art. 48<sup>37</sup>** Reporting procedure for decommissioning

The organisation required to carry out decommissioning must report to ENSI once a year on the status of decommissioning of the installation, and must also submit a final report after completion of the process.

**Art. 49** Reporting obligations

Articles 38 and 39 apply by analogy to reporting obligations relating to decommissioning.

## **Chapter 5 Radioactive Waste**

### **Section 1 General**

**Art. 50** Minimisation of radioactive waste

Nuclear installations must be designed, constructed and operated in such a manner as to ensure that the lowest possible quantity of radioactive waste in terms of activity and volume arises from their operation and decommissioning. For this purpose the following requirements apply in particular:

<sup>37</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

- a. for the construction of nuclear installations, materials must be chosen that ensure that the formation of activation products is minimal;
- b. for the operation of nuclear installations, the use of consumables in the controlled zone must be kept to a minimum;
- c. materials that have been contaminated with radioactive substances must be decontaminated wherever possible and appropriate.

**Art. 51** Categories of radioactive waste

For the purpose of management and disposal, radioactive waste is classified in the following categories:

- a. high level radioactive waste:
  1. spent fuel which is no longer used,
  2. vitrified fission product solutions resulting from the reprocessing of spent fuel;
- b. alphanotoxic waste: waste in which the content of alpha emitters exceeds 20,000 becquerels per gram of conditioned waste;
- c. low and intermediate level waste: all other radioactive waste.

**Art. 52** Waste management programme

<sup>1</sup> Those required to manage radioactive waste must include the following information in the waste management programme:

- a. origin, type and quantity of radioactive waste;
- b. the required deep geological repositories, including their design concept;
- c. allocation of radioactive waste to the deep geological repositories;
- d. plan for the realisation of the deep geological repositories;
- e. duration and required capacity of central and decentral interim storage;
- f. financial plan for the waste management operations through to decommissioning of the nuclear installations, including details concerning:
  1. the activities to be carried out,
  2. the associated costs,
  3. the type of financing;
- g. the information concept.

<sup>2</sup> The waste management programme must be updated every five years.

<sup>3</sup> ENSI and the Federal Office are responsible for reviewing and monitoring compliance with the waste management programme.<sup>38</sup>

<sup>38</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

## Section 2 Clearance Measurement and Conditioning

### Art. 53 Clearance measurement of materials

<sup>1</sup> Anyone intending to remove materials as being non-radioactive from controlled zones of a nuclear installation must carry out a clearance measurement with appropriate quality assurance and document it.

<sup>2</sup> Quantities of material weighing more than 1,000 kilograms or with a volume greater than a cubic metre must be reported to ENSI at least 10 days prior to removal from the nuclear installation, and the required documentation must be submitted.<sup>39</sup>

<sup>3</sup> ENSI shall specify the detailed requirements on clearance measurement and reporting in guidelines.<sup>40</sup>

### Art. 54 Conditioning

<sup>1</sup> Radioactive waste must be conditioned as quickly as possible. The collection of non-conditioned waste for the purpose of carrying out periodical conditioning campaigns is permitted.

<sup>2</sup> Conditioned waste packages must be suitable for transport, storage and disposal.

<sup>3</sup> Each waste package must be labelled and provided with documentation that describes production, composition and properties. This documentation must be retained and handed over to the company that is to carry out the further waste management operations.

<sup>4</sup> For the production of a conditioned waste package a type or individual permit issued by ENSI is necessary.<sup>41</sup>

<sup>5</sup> Applications must be accompanied by all documents that are necessary for assessment purposes, and these must provide information relating in particular to:

- a. the conditioning procedure;
- b. the waste package and its components;
- c. the quality assurance;
- d. the documentation.

<sup>6</sup> ENSI shall specify the detailed requirements on conditioning and application documents in guidelines.<sup>42</sup>

<sup>39</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>40</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>41</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>42</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).



### **Section 3 Handling Radioactive Waste**

#### **Art. 55** Competences

The Federal Office is the competent authority for:

- a. issuing licences for handling radioactive waste;
- b. approving the agreement concerning the return of radioactive waste in accordance with Article 34 paragraph 3 letter d and paragraph 4 of the Nuclear Energy Act.

#### **Art. 56** Application and related documentation

<sup>1</sup> Applications for a licence for the transport and for the import, export or transit of radioactive waste must be submitted jointly by the consignor, the consignee, the carrier and the transport organiser.

<sup>2</sup> The documentation must provide the necessary information for assessing the application, including in particular:

- a. the composition and properties of the radioactive waste;
- b. the person responsible for waste management, consignor and consignee;
- c. the place of origin and destination;
- d. the mode of transport, in particular evidence of compliance with requirements on the carriage of dangerous goods.

#### **Art. 57** Preliminary clarifications, validity, retention of documents and reporting obligation

Articles 16, 18, 20 and 21 apply by analogy with respect to the handling of radioactive waste.

### **Section 4 Geological Investigations**

#### **Art. 58** Application documents

Applications for a licence for geological investigations must be accompanied by the following documentation:

- a. an investigation programme;
- b. a geological report;
- c. a report on the potential impacts of the investigations on the geological conditions and the environment;
- d. maps and plans;
- e. an indication of desired validity of the licence.

**Art. 59** Investigation programme

The investigation programme must contain details concerning:

- a. the objectives of the investigations;
- b. the anticipated scope of the investigations;
- c. the starting date and expected duration of the investigations.

**Art. 60** Geological report

The geological report must contain the following details:

- a. a description of the geology of the region concerned;
- b. a summary of geological investigations already carried out in the region concerned and accessible to the applicant, together with a summary of the findings obtained from such investigations;
- c. a description of the geological and hydro-geological factors that are decisive for the choice of the region concerned.

**Art. 61** Exemptions from licensing obligation

<sup>1</sup> The following geological investigations do not require a licence:

- a. seismic and other geophysical measurements, e.g. gravimetric, geoelectric and electromagnetic recordings;
- b. geological studies on the surface and in existing underground structures, including extraction of rock samples;
- c. collection of groundwater and well-water samples, measurements of wells, shallow piezometric measurements and marking tests;
- d. measurements of ground gases.

<sup>2</sup> The above exemptions remain subject to any authorisations that may be required for the activities concerned in accordance with cantonal or federal legislation.

**Section 5 Special Provisions for Deep Geological Repositories****Art. 62** Application for a general licence

In addition to the application documents in accordance with Article 23, applicants for a general licence for a deep geological repository must also submit a report containing the following information:

- a. a comparison of available options from the point of view of safety of the planned repository;
- b. an evaluation of the decisive properties for the selection of the site;
- c. the costs of the repository.

**Art. 63** Suitability criteria

The criteria to be specified in the general licence in accordance with Article 14 paragraph 1 letter f number 1 of the Nuclear Energy Act relate to:

- a. the extent of suitable host rock;
- b. the on-site hydro-geological conditions;
- c. the age of deep groundwater.

**Art. 64** Elements of a deep geological repository

A deep geological repository comprises a main installation for the emplacement of the radioactive waste, a pilot installation and test areas.

**Art. 65** Test areas

<sup>1</sup> In test areas, the properties of the host rock of relevance to safety must be examined in depth in order to confirm the safety.

<sup>2</sup> Before a deep geological repository may be put into operation, the technologies of relevance to safety must be tested and their functional capacity must be ascertained. This concerns in particular:

- a. the emplacement of backfill material;
- b. the removal of backfill material for the purpose of recovery of waste packages;
- c. the method of recovery of waste packages.

<sup>3</sup> During the operation of the repository, the sealing of caverns and galleries must be tested and its functional capacity must be ascertained.

**Art. 66** Pilot installation

<sup>1</sup> In the pilot installation, the behaviour of waste, backfill material and host rock must be monitored until the expiry of the monitoring period. During monitoring, data must be collected in order to confirm long-term safety with a view to closure.

<sup>2</sup> The obtained findings must be transferable to the processes going on in the main section. They form the basis for the decision on the closure of the repository.

<sup>3</sup> The following principles must be observed in connection with the design of the pilot section:

- a. The geological and hydro-geological conditions must be comparable to those of the main section.
- b. The pilot section must be spatially and hydraulically separated from the main section.
- c. The construction of the pilot section and the emplacement procedure of waste and backfill material must correspond to those of the main section.
- d. The pilot section must contain a small but representative quantity of waste.

**Art. 67** Backfilling

<sup>1</sup> The owner of a deep geological repository must backfill the storage caverns and galleries after the waste packages have been emplaced.

<sup>2</sup> Backfilling must be carried out in such a manner that long-term safety is assured and the recovery of the waste is possible without undue effort.

**Art. 68** Monitoring period

<sup>1</sup> The owner of a deep geological repository must describe in an up-dated project the planned measures for monitoring the repository after emplacement of the waste has been completed. He must also propose a duration for the monitoring period.

<sup>2</sup> The Department orders the start of the monitoring period and specifies its duration. It may also extend this period as required.

**Art. 69** Closure

<sup>1</sup> When closing a deep geological repository, its owner must backfill all excavations of the repository and seal the sections relevant for long-term safety and security.

<sup>2</sup> The closure project must describe the following aspects in particular:

- a. the backfilling and sealing of the accesses to the disposal areas;
- b. the transformation of the pilot section into a state suitable for long-term safety;
- c. the backfilling and sealing of the accesses to the repository;
- d. the assurance of long-term safety.

<sup>3</sup> When closing the repository, the owner must in particular ensure:

- a. that no inadmissible release of radionuclides takes place via the backfilled accesses;
- b. that the separation of water-conducting rock layers existing prior to the construction of the deep geological repository is restored over the long-term;
- c. that the marking of the deep geological repository is permanent.

**Art. 70** Protection zone

<sup>1</sup> The protection zone of a deep geological repository must be defined on the basis of the report on long-term safety submitted with the licence application. The protection zone must encompass:

- a. all parts of the repository, including accesses;
- b. the rock volumes that provide the hydraulic containment of the repository;
- c. the rock volumes that significantly contribute to the retention of radionuclides that could be released from the repository over the course of time.

<sup>2</sup> After issuing the general licence, the Federal Office shall request the relevant land registry to add the following note to the entries for the plots of land situated within

the perimeter of the protection zone: «Provisional protection zone of a deep geological repository». After issuing the operating licence, the Federal Office shall request the relevant land registry to add the note, «Definitive protection zone for a deep geological repository».

<sup>3</sup> The decision on the repeal of a provisional or definitive protection zone is made by the Department. In the event of such a decision, the Federal Office shall request the relevant land registry to delete the corresponding note.

<sup>4</sup> The Department shall issue licences for activities that affect the protection zone. A licence may only be issued if the activities concerned do not impair the long-term safety of the deep geological repository.

#### **Art. 71** Documentation

<sup>1</sup> The owner of a deep geological repository must compile documentation that is suitable for securing information about the repository over the long term.

<sup>2</sup> This documentation must contain the following:

- a. the location and extent of underground structures;
- b. an inventory of disposed radioactive waste by type, quantity and disposal area;
- c. the design of safety barriers, including sealing of accesses;
- d. the basis for and findings of the definitive analysis of long-term safety.

<sup>3</sup> The owner must hand over all documentation to the Department after closure or on expiry of the additional monitoring period.

#### **Art. 72** Use of geological data

<sup>1</sup> The findings obtained from geological investigations or during the construction of a deep geological repository must be passed on to the Swiss Federal Geological Information Centre.

<sup>2</sup> The latter and the person who is required to supply the information in accordance with paragraph 1 contractually regulate the conditions of access to and use of said data.

## **Chapter 6 Procedures, Information and Promotion**

#### **Art. 73<sup>43</sup>** Review by ENSI

ENSI shall review applications submitted for licences and approvals in accordance with Articles 49 to 63 of the Nuclear Energy Act.

<sup>43</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

**Art. 74** Deadlines for dealing with applications

The following deadlines generally apply for dealing with applications for licences and approvals in accordance with Articles 49 to 63 of the Nuclear Energy Act:

- a. from date of receipt of complete application until it is passed on to the cantons and federal authorities concerned, or until publication and presentation for public consultation: one month;
- b. from completion of instruction procedure until a decision is taken: six months.

**Art. 75** Procedure for permits and for type or individual approvals

<sup>1</sup> The following are not published or presented for public consultation:

- a. applications for permits in accordance with Articles 26, 29, 40 and 47 of this Ordinance, and Article 36, paragraph 1 letter b, Nuclear Energy Act;
- b. applications for type or individual approvals in accordance with Article 54, paragraph 4.

<sup>2</sup> ENSI shall if applicable transmit the application to the specialist departments of the Confederation for review. For this it shall set an appropriate deadline.<sup>44</sup>

<sup>3</sup> The precondition for granting a permit is that the requirements of an underlying licence or order continue to be met and that the conditions specified in the licence or order are taken into account.

<sup>4</sup> ...<sup>45</sup>

**Art. 76<sup>46</sup>** Obligation to provide information about special events and findings relating to nuclear safety

<sup>1</sup> ENSI shall notify the general public without delay of any special events and findings in nuclear installations that:

- a. represent a hazard to the installation or its personnel, or have significant radiological impacts on the environment (events and findings of category 3 or greater of the INES scale, according to Annex 6);
- b. are of significance in terms of safety, but have no or only a negligible radiological impact on the environment (events and findings of category 2 or greater of the INES scale, according to Annex 6).

<sup>2</sup> In the case of special events and findings of public interest that are not covered by paragraph 1 above, ENSI shall arrange for the provision of information to the public.

<sup>44</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

<sup>45</sup> Repealed by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, with effect from 1 Jan. 2009 (AS **2008** 5747).

<sup>46</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

**Art. 77** Promotion of research, education and training

<sup>1</sup> Within the scope of approved credits, the supervisory authorities shall support projects in the area of applied research, educational activities and the training of personnel in the areas of safety and security of nuclear installations and nuclear waste management.

<sup>2</sup> Their support shall take the form of financial aid or the assistance provided by personnel from the Federal Office or ENSI.<sup>47</sup>

**Chapter 7 Criminal Provisions and Final Provisions****Art. 78** Criminal provision

Anyone who wilfully or negligently fails to comply with the obligation to keep records in accordance with Articles 20, 27 paragraph 2 and 41 paragraph 3 shall be liable to the penalties in accordance with Article 93 of the Nuclear Energy Act.

**Art. 79** Amendments to Annexes 2 and 6

The Department may amend Annexes 2 and 6 on the basis of decisions taken by export control authorities supported by Switzerland and recommendations of the International Atomic Energy Agency.

**Art. 80** Repeal of current legislation

The following Ordinances are repealed:

1. Ordinance of 11 July 1979<sup>48</sup> on the General Licensing Procedure for Nuclear Installations with Site Licence;
2. Ordinance of 27 November 1989<sup>49</sup> on Preparatory Measures;
3. Atomic Energy Ordinance of 18 January 1984<sup>50</sup>
4. Ordinance of 14 March 1983<sup>51</sup> on the Supervision of Nuclear Installations.

**Art. 81** Amendments to current legislation

Amendments to current legislation are dealt with in Annex 7.

<sup>47</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

<sup>48</sup> [AS 1979 972]

<sup>49</sup> [AS 1989 2476]

<sup>50</sup> [AS 1984 209, 1987 546 1484, 1991 1450, 1993 901 Annex, No 10, 1994 140, 1995 4959, 1996 2243 No I 65, 1997 2128, 2002 349 Article 29]

<sup>51</sup> [AS 1983 283]

**Art. 82** Transitional provision

For the specification of the scope of backfitting activities in nuclear installations that were commissioned prior to the enactment of the Nuclear Energy Act, the requirements and principles laid down in Articles 7 to 12 must be met in accordance with Article 22 paragraph 2 letter g of the Nuclear Energy Act.

**Art. 82a<sup>52</sup>** Transitional provision to the Amendment of 26 April 2017

ENSI may on request extend the deadline for submission of the PSR with proof of safety for long-term operations in accordance with Article 34 paragraph 4 in conjunction with Article 34 paragraph 3 until the end of 2019 at the latest.

**Art. 83** Commencement

This Ordinance comes into force on 1 February 2005.

<sup>52</sup> Inserted by No I of the O of 26 April 2017, in force since 1 June 2017 (AS 2017 2829).



## Definitions

In this Ordinance:

- a. *Finding* means the identification of a condition of components that may have an impact on safety but have not given rise to an event.
- b. *Event* means an occurrence in the operation of a installation or during transport that may have an impact on safety.
- c. *Clearance measurement* means evidence in the form of a measurement that indicates that materials are no longer within the scope of application of the RadPO<sup>54</sup>.
- d. *Maintenance* means all measures to preserve and restore the required condition of equipment and systems, and to determine and assess their current status.
- e. *Core cooling* means the removal of heat from the reactor core via cooling systems in order to ensure that the design temperature of all core components is not exceeded.
- f. *Core damage frequency* means the frequency per annum of damage to the reactor core caused by accidents as calculated by a probabilistic safety analysis.
- g. *Normal operation* means the operating state within specified operating limits and in accordance with applicable regulations.
- h. *Safety classification* means the classification of structures, systems and components of a nuclear installation into building, safety and earthquake classes in line with their relevance to nuclear safety.
- i. *Accidents* means any condition deviating from normal operation that requires the intervention of a safety system.
- j. *System* means a combination of mechanical or electrical equipment that is required for performing a specific function.
- k. *Technology* means specific knowledge that is not generally accessible or does not serve the purpose of basic research in the form of technical data or technical support that is required for development, manufacture or utilisation.
- l. *Partner State* means a state that participates in international control measures that are non-binding under international law but which are supported by Switzerland.

<sup>53</sup> Revised by Annex 8 No I of the Goods Control Ordinance of 3 June 2016, in force since 1 July 2016 (AS 2016 2195).

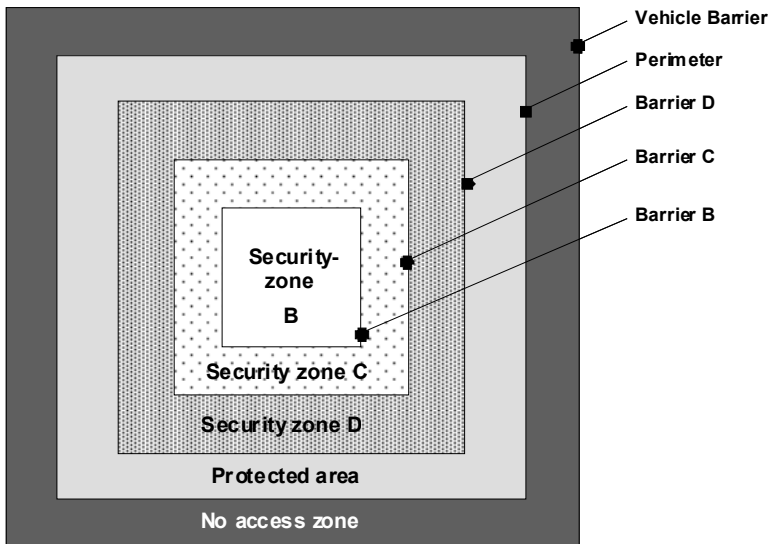
<sup>54</sup> SR 814.501

*Annex 2<sup>55</sup>*  
(Art. 9, para. 2)

## Principles for the security of nuclear installations, nuclear materials and radioactive waste

### 1. Technical security of nuclear installations

The arrangement of security zones, areas and barriers must be based on the following model:



The various security barriers perform the following functions:

- The vehicle barrier protects against attacks using vehicles and obstructs the transport of heavy arms or explosives through the no access zone to the perimeter
- The perimeter surrounds the protected area. It detects intruders, identifies the location of the attack and triggers the alarm.
- Security barriers D, C and B provide increasingly higher levels of resistance towards the inner and vital area. They protect and surround the corresponding areas containing systems and equipment important to safety.

In the case of interim storage installations and deep geological repositories, ENSI shall decide whether it is possible to waive any security barriers.

<sup>55</sup> Revised in accordance with Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

Security systems (e.g. central alarm stations, guard-houses) that permit pedestrian or vehicle access to security zones must be located behind a barrier with the same level of resistance that is required for the protection of the corresponding zone.

The level of resistance of a barrier must be maintained, and for this reason, application of the two door interlock principle is required. If by way of exception it is necessary to deviate from or deactivate this method, access must be controlled by the security guards

## 2. Security of nuclear materials and radioactive waste

### Categorisation of nuclear materials and radioactive waste

Material	Form	Category		
		I	II	III
1. Plutonium <sup>a</sup>	Unirradiated <sup>b</sup>	2 kg or more	Less than 2 kg but more than 500 g	500 g or less, but more than 15 g
2. Uranium-235	Unirradiated <sup>b</sup>			
	– uranium enriched to 20% <sup>235</sup> U or more	5 kg or more	Less than 5 kg but more than 1 kg	1 kg or less, but more than 15 g
	– uranium enriched to at least 10% <sup>235</sup> U but to less than 20% <sup>235</sup> U	–	10 kg or more	Less than 10 kg but more than 1 kg
	– uranium enriched above natural content, but to less than 10% <sup>235</sup> U	–	–	10 kg or more
3. Uranium-233	Unirradiated <sup>b</sup>	2 kg or more	Less than 2 kg but more than 500 g	500 g or less, but more than 15 g
4. Irradiated fuel			Depleted or natural uranium, thorium or low-enriched fuel (less than 10% fissile content)	
5. Radioactive waste	vitrified		High-level activity	

<sup>a</sup> All plutonium except that with isotopic concentration exceeding 80% <sup>238</sup>Pu.  
<sup>b</sup> Material not irradiated in a reactor or material irradiated in a reactor but with a radiation level of equal to or less than 1 Gy/hour at one metre unshielded.

**Category I**

Material in this category must be protected against unauthorised removal with extremely reliable systems as follows:

*Use and storage* within an highly protected inner area i.e. a protected zone for the type of material defined for category II, access to which is restricted to persons whose integrity has been verified, and which is surveyed by guard personnel who are in close contact with the relevant emergency crews. The aim of the various measures in this connection is to identify and prevent malicious acts unauthorised access and the unauthorised removal of nuclear material.

*Movement of nuclear material* in accordance with special precautionary measures for the described method for the transport of material in categories II and III, and under constant surveillance by accompanying personnel and under conditions that guarantee close contact with the relevant emergency crews.

**Category II**

*Use and storage* within a protected area access to which is monitored, i.e. a zone that is under constant surveillance by security personnel or electronic devices, and is surrounded by a physical perimeter with a limited number of adequately controlled points of access, or a zone with an equivalent level of physical protection.

*Movement of nuclear material* in accordance with special precautionary measures, including prior arrangements between sender, recipient and carrier, plus prior agreement between the legal entities subject to the jurisdiction and regulatory authorities of the country of origin and destination for cross-border transport, concerning the time, place and procedure for the transfer of responsibility for the consignment.

**Category III**

*Use and storage* within a zone, access to which is under surveillance.

*Movement of nuclear material* in accordance with special precautionary measures, including prior arrangements between sender, recipient and carrier, plus prior agreement between the legal entities subject to the jurisdiction and regulatory authorities of the country of origin and destination for cross-border transport, concerning the time, place and procedure for the transfer of responsibility for the consignment.

*Annex 3<sup>56</sup>*  
(Articles 28 and 41)

## Operational documentation

The documentation relating to the operation of a nuclear installation comprises organisational and technical documents, plus operational records.

### 1. Organisational documents

Power plant or overall operating regulations	Power plant regulations or operating regulations document the organisational and personnel requirements for safe operation, including organisational shut-down criteria.
Emergency preparedness regulations	Regulations governing emergency procedures document the organisational structure and responsibilities for dealing with emergencies. Instructions for the emergency team form an integral part of these regulations.
Radiation protection regulations	Regulations governing protection against radiation specify the duties of the holder of the operating licence with regard to radiation protection, in particular measurement of radioactivity released into the atmosphere and protection of personnel working in the controlled zone of the nuclear installation.
Quality management manual	The quality management manual describes a comprehensive and systematic quality management system for the operation of the nuclear installation.
Regulations and directives relating to security	Regulations and directives relating to security contain general instructions concerning the security of nuclear installations and regulations for the security guards
Mission statement on safety culture	The mission statement specifies how the management staff of the nuclear installation interpret and promote safety culture, and define the factors and criteria that are used for assessing its effectiveness.

### 2. Technical documents

Safety Analysis Report (SAR)	A Safety Analysis Report (SAR) describes technical and organisational aspects of the nuclear installation. It forms the basis for ongoing safety assessment. For a deep geological repository, this report specially encompasses the demonstration of long-term safety of the repository after closure.
Security report	The security report of a nuclear installation describes the current status of security measures in accordance with the requirements of ENSI. Security reports must be classified.

<sup>56</sup> Revised in accordance with Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS 2008 5747).

Technical specifications	Technical specifications contain regulations for the operation of a nuclear installation and its safety systems, including technical shutdown criteria.
In-service inspection programme	A test programme describing in-service inspections on pressure-bearing components and systems in security categories 1 to 4.
Ageing management programme	A programme for monitoring ageing describes the status and monitoring of mechanical and electrical components as well as the structures of the nuclear installation.
Normal- and emergency operating procedures	These procedures govern the safe operation of the installation, both in normal operating mode and in the event of accidents in accordance with Article 8.
Severe Accident Management Guidelines (SAMG)	SAMG help staff deal with accidents that may result in the release of unacceptable amounts of radioactive substances into the atmosphere.
Current PSA	The current plant-specific PSA (probabilistic safety analysis) of a nuclear power plant considers all relevant operating modes: <ul style="list-style-type: none"> <li>a. a probabilistic analysis of accidents in accordance with Article 8 initiated by internal or external events and as a result of which radioactive substances may be released into the atmosphere;</li> <li>b. a quantitative evaluation of preventive and mitigating measures to prevent such accidents;</li> <li>c. a quantitative evaluation of the risk of a large release of radioactive substances (release risk).</li> </ul>
Technical descriptions	Technical descriptions contain diagrams, drawings, plans, documentation of design basis including layout plans, building plans, maintenance schedules, lists of components, zoning plans and other technical documents describing the actual plant state.

### 3. Operational records

Activity logs	Activity logs provide information about the course of operations. They include operating data and measurements, key operating data of the installation, controls of on-site doses and contamination, monitoring of the surroundings and analyses of solid, liquid and gaseous substances and waste.
Shifts log	The shifts log contains the names and allocated duties of shift workers, plus significant operational events and switching operations, as well as any noted deviations from operating data and measurements important to safety.
Guard report	The guard report contains the names of guard personnel and the duties to which they are assigned, plus details of routine controls, patrol activities, unusual observations and events, and contacts with external authorities.

## **Documentation for licences and permits, safety classification**

For applications for the issue of licences and permits for nuclear installations, the documents in accordance with Sections 1 and 2 that are necessary for the assessment of each application must be submitted.

Section 2 lists the most important documents.

### **Key to table in Section 1**

G	Overall plant
R	Reactor engineering
B	Civil engineering
S	Systems engineering
M	Mechanical engineering
E	Electrical engineering and instrumentation & control
U	Radiation protection, waste and emergency preparedness
D	Security
P	Organisation and personnel
SA	Systems with safety classification 1, 2, 3 and 1E
SB	Systems with safety classification 4 and safety related OE systems
MA	Mechanical equipment with influence on initial construction permit, e.g. reactor pressure vessels, steel containments, primary piping, steam generators, pressurisers, main coolant pumps
MB	Other mechanical equipment in safety classes 1 to 4

### 1. Documents by type of application and by area

Application for \ Area	G	R	B	S	M	E	U	D	P
Construction licence or permit of concept (in the event of modifications)	G1	R1/R2	B1	S1	M1	E1	U1	D1	P1
Initial construction permit or permit for design specifications	G2		B2 and B3 for 1 <sup>st</sup> building section	S2 for SA	M2 for MA	E2	U2		P2
Other construction permits (building or sections)			B2/B3	S2 for SB, if relevant for building section				D2	
Manufacturing permits					M2 for MB M3			D3	
Installation permit				S2 for SB S3 for SA		E3	U3		
Operating licence	G3	R3							P3
Permits for commissioning and power or permanent operation	G4	R4	B4	S4	M4	E4	U4	D4	P4



## 2. Documents by area

### Overall plant

G1	G2	G3	G4
Installation concept/layout concept	Design and layout of complete installation	Documentation for operating licence	Documentation for start-up and permanent operation
Safety analysis report (SAR) for construction licence PSA for construction licence Concept for complete installation Hazard specifications Layout plans for complete installation Applicable regulations Concepts for maintenance and ageing monitoring	Construction and layout plans for buildings and main installations Specification of ambient conditions Quality management programmes of main suppliers	Commissioning programmes	Report on quality assurance during construction and evaluation of findings Results of preliminary tests and nuclear commissioning tests

### R Reactor engineering

R1	R2	R3	R4
Layout concept	Provisional safety assessment	Definitive safety assessment	Evaluation of nuclear commissioning
Fuel element design Provisional core design Definition of accidents and safety limits	Definition of main general conditions Analysis of operating modes and accidents that determine layout, and their impacts on the installation and its surroundings	Assumptions, models concerning behaviour of radioactive substances Analysis of accidents and their impacts Accident analyses and safety specifications Commissioning programmes Definitive core design	Evaluation of commissioning tests and results

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 B Civil engineering
 

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B1	B2	B3	B4
Layout concept	Building layout	Component arrangement and installation	Building documentation
Classification of buildings and structures	Layout specifications / measurement criteria	Detailed statics measurements and	Documentation relating to
Conversion of hazard specifications into engineering parameters	Assumed loads	tension tests, load bearing capacity and suitability tests	construction work
Foundation properties	Supporting framework models / preliminary calculations	Structural design	Report on quality assurance
Groundwater protection concept	Main dimensions	Formwork and shielding plans	Monitoring report
Layout concepts	Floor response spectra	Procedure test	Maintenance programmes
Requirements on shielding walls	Requirements on impermeability, groundwater protection, drainage, lightning conductors, fire prevention	Special manufacturing requirements	
	Fastening concept	Quality testing plans	

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 S Systems engineering
 

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S1	S2	S3	S4
System concepts	System design	System implementation	System start-up
System classification / concepts	Definitive system specifications, including technical data	System descriptions, including analysis of interactions	Test procedures for preliminary operation tests
Provisional system specifications	Layout plans	Logic diagram	Results of system test
System circuit diagrams	System circuit diagrams	List of electrical components	Procedures for periodical function tests of systems and components
Functions diagrams	Function diagrams		Definitive system circuit diagrams and function diagrams
List of mechanical and electrical components	List of mechanical components		
Safety assessment			
following modifications			

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M Mechanical engineering

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M1	M2	M3	M4
Layout concepts	Layout	Implementation	Start-up and documentation
Applicable regulations and standards Constructive implementation Choice of material for main components	Design specifications Overview drawings of safety-relevant components Programmes for special certificates or qualifications	Pre-test documentation of manufacturer of components important to safety for construction and manufacture Basic test programme	Results of special type and qualification tests Final documentation on component manufacture, basic test, subsequent assembly control and quality assurance Stress analyses In-service inspection programme Construction monitoring report Maintenance programmes

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E Electrical engineering and instrumentation & control

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E1	E2	E3	E4
Principles of electrical equipment	Layout	Implementation certificates	Start-up and documentation
Applicable technology for main components and instrumentation & control Train assignment scheme Layout principles of IE components Applicable regulations Qualification procedure for single and series-production parts	Specifications and data sheets Qualification criteria	Results of qualification procedures Test programmes for start-up of special components	Test results Technical documentation Report on quality assurance Maintenance programmes

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 U Radiation protection, waste management, emergency preparedness
 

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U1	U2	U3	U4
Layout criteria and concepts	Layout of radiological installations	Implementation certificate	Start-up and documentation
Concepts for radiological zones, shielding, monitoring of surroundings, surveillance of rooms, systems, monitoring of emissions, emergency preparedness, waste water Waste conditioning procedure Interim storage of waste	Layout specifications Estimate of collective dose for operation, periodic tests and revisions	Test and acceptance records Results of special tests Training and in-service training of guard personnel	Operation, testing and maintenance programmes

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 D Security
 

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D1	D2	D3	D4
Security concept	Specifications (for structures, systems, components)	Implementation documents (for security installations)	Operating documents (for start-up)
Risk analysis Project documents (site plan, building plans, construction schedule, etc.) Principles for security zones, sequence of barriers, access and escape routes, security during construction and operation, security organisation (management and communication, equipment and provision of weapons) Training and in-service training	Specifications (building and layout, shafts, pipelines, ventilation, means of communication, functions and processes diagram, energy supply, test certificates) Security regulations List of duties of security personnel	Implementation plans Regulations for start-up	Test reports for security installations Test and approval records Education of security personnel Integration into security report

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P Personnel			
P1	P2	P3	P4
Concept of organisation and deployment of personnel	Organisational structure	Qualifications	Stipulations for permanent operation
Organisational structure No. of employees Staff training and deployment during construction phase Initial training and continuing training concept	Organisational arrangements Lists of duties Training programme for start-up Provisional operating documents, internal regulations, work processes	Suitability and qualifications of management staff, licensed personnel, radiation protection personnel and other employees	No. of employees Initial training and continuing training programmes for permanent operation

### 3. Safety classification

#### 3.1 Safety classes (SC)

In view of its significance for nuclear safety and radiation protection, *mechanical equipment* is classified in four safety classes:

- SC 1: equipment in the pressure-bearing boundary of the reactor cooling system up to and including the second isolation valve, the failure of which could result in a non-isolatable loss of primary coolant;
- SC 2: equipment of systems with safety functions or important to safety, that is not classified in safety class 1;
- SC 3: equipment of support (auxiliary) systems for safety functions or important to safety;
- SC 4: equipment that contains or may contain activity and which is intended for retention, reprocessing or storage of liquid or solid radioactive substances, and is not classified in safety class 1, 2 or 3;
- Unclassified equipment: equipment that is not classified in safety class 1, 2, 3 or 4.

In view of its significance for nuclear safety, *electrical equipment* is classified in two safety classes:

- Class 1E: electrical equipment for mechanical systems and components classified in SC 1 to 3, plus electrical and instrumentation & control safety systems;
- Class 0E: other electrical equipment and systems that can also perform functions important to safety.

### 3.2 Earthquake classes (EC)

In view of its safety functions, mechanical and electrical equipment is classified in 2 earthquake classes:

- a. EC I: mechanical equipment in safety classes 1 to 3 and electrical equipment classified 1E. Safety functions and the integrity of the equipment must be assured during and after a safe shutdown earthquake (SSE);
- b. EC II: mechanical equipment classified in safety class 4. The integrity of the equipment must be assured during and after an operating basis earthquake (OBE);
- c. Equipment and structures not classified in earthquake classes I or II are not classified for earthquakes.

### 3.3 Nuclear building classes (BC)

In view of their significance for nuclear safety and radiation protection, buildings are classified in two nuclear building classes:

- a. BC I: buildings in which mechanical and electrical equipment classified in earthquake class I is installed;
- b. BC II: buildings in which mechanical equipment classified in earthquake class II or equipment that is not classified for earthquakes, is installed.

*Annex 557*  
(Art. 37)

## Periodical reporting

Report	Content / deadline for submission	Periodicity
Annual report on safety	<p>Report from each nuclear installation containing a summary and an assessment of operations and safety, operating state of the installation, site-related changes, organisational structure and personnel, radiation protection, radioactive waste, radiological situation and findings from observation of the state of the art in science and technology. It contains results of systematic safety assessments and reports on the status of pending matters with ENSI, events and findings, modifications and maintenance operations.</p> <p>Safety reports must be submitted by 1 March the following year.</p>	Calendar year
Annual report on security	<p>Report from each nuclear installation containing key information about the installation's security organisation, plus a summary of all security-related events that took place during the previous year. Provides information about personnel and security organisation, special activities by security corps, outsourcing of surveillance duties to external companies, findings relating to security during downtimes for maintenance and inspection operations, frequency and results of inspections and tests of security installations, failure of important security components, structural modifications, special events and findings, statistics for IDs for security personnel. Annual security reports must be classified.</p> <p>Security reports must be submitted by 1 March the following year.</p>	Calendar year
Quarterly report	<p>Report from the central storage installation, deep geological repositories and Paul Scherrer Institute focusing on personal doses, dosimetry of installation and site, discharge of radioactive substances with exhaust air and waste water, surveillance of the surroundings, radioactive waste, conditioning campaigns, events and findings, modifications and maintenance operations.</p> <p>Quarterly reports must be submitted by not later than the end of month after the reporting period.</p>	Quarterly

<sup>57</sup> Amended by Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate, in force since 1 Jan. 2009 (AS **2008** 5747).

Report	Content / deadline for submission	Periodicity
Monthly report	<p>Report by nuclear power plants on the operation of the installation and comparisons with previous months (trends), especially concerning operation and safety, chemistry, radiation protection, with data relating to personal dosimetry, discharge of radioactive substances, radioactive waste, events and findings, organisation, personnel and training, as well as projects, analyses, operating experience feedback, events and findings in similar installations, activities and results of maintenance tasks.</p> <p>Monthly reports must be submitted by not later than the end of the following month.</p>	Monthly
Outage report: engineering	<p>Report by nuclear power plants with description and evaluation of all measures important to safety, results and findings from activities during the outage.</p> <p>Submission:</p> <ol style="list-style-type: none"> <li>initial report 4 working days prior to planned restart of installation;</li> <li>complete report by not later than 3 months after restart of the installation.</li> </ol>	With each outage
Outage report: radiation protection	<p>Report of nuclear power plants on outage, with detailed information about radiation protection measurements and findings, an assessment by the operator and including proposals for additional measures to reduce doses.</p> <p>To be submitted not later than 3 months after restart of the installation.</p>	With each outage
Outage report: physics	<p>Report by nuclear power plants with the results and evaluation of physical reactor measurements for various output levels upon restart following the outage.</p> <p>Submission:</p> <ol style="list-style-type: none"> <li>results of zero-load and starting measurements prior to restart of installation above 5 percent nominal output;</li> <li>complete report by not later than 3 months after restart of the installation.</li> </ol>	With each outage
Dosimetry report	<p>Report by nuclear installations with details of collective doses, dose distribution, individual doses and collective work-related doses.</p> <p>Dosimetry reports must be submitted by 1 March the following year.</p>	Calendar year



Report	Content / deadline for submission	Periodicity
Report on surveillance of surroundings	Report of nuclear power plants, central storage installation, deep geological repositories and Paul Scherrer Institute concerning surveillance of the surroundings, with details concerning the discharge of radioactive substances, monitoring of radioactivity and direct radiation in the vicinity of the installations. This report may form part of the monthly or quarterly reports.  Surveillance reports must be submitted by not later than the end of month after the reporting period.	Quarterly
Report on radioactive sources	Report by nuclear installations containing a list of all radioactive sources in the installation.  Reports must be submitted by 1 March the following year.	Calendar year
Comprehensive safety review report	Report by nuclear power plants on the periodical safety review, including results and evaluation.  To be submitted in accordance with the instructions of ENSI.	Every 10 years
Unavailability data of systems and components	Report by nuclear power plants on the date and duration of unavailability of PSA-relevant components, including description of components and brief description of the cause for the unavailability.  Reports must be submitted by 1 March the following year.	Calendar year
List of PSA-relevant modifications to the installation	Report by nuclear power plants with a list of modifications to the installation that could be of relevance to the PSA but have not yet been incorporated into the PSA model.  Reports must be submitted by 1 March the following year.	Calendar year

*Annex 6*<sup>58</sup>  
(Art. 21 and 38)

## Reporting on events and findings relating to safety

Report	Contents	Periodicity
Event report	Report about events and findings, with the following content: <ol style="list-style-type: none"> <li>a. classification based on the criteria aforementioned below, summary of events or finding and current state of knowledge;</li> <li>b. status of the installation prior to the event or at the time of the finding;</li> <li>c. course of the event and behaviour of the installation or type of finding;</li> <li>d. cause of event or origin of finding;</li> <li>e. immediate measures;</li> <li>f. enclosures.</li> </ol>	Following each event or finding subject to reporting requirement
Report on follow-up measures	Report about events and findings, with the following content: <ol style="list-style-type: none"> <li>a. follow-up measures;</li> <li>b. evaluation of relevance to safety;</li> <li>c. enclosures.</li> </ol>	Following each event or finding subject to reporting requirement

## Classification of events and findings

Events and findings must be classified in accordance with the IAEA's International Nuclear Event Scale (INES), on the basis of their consequences in terms of nuclear safety. The INES contains seven grades in declining order of importance from 7 to 1. Level 0 corresponds to events without significance in terms of safety (but of relevance to safety). Events of no safety relevance are characterized «out of scale» (cf. INES User's Manual, IAEA, Vienna, 2001). Events and findings of public interest that are perceivable outside the installation are also classified as Ö events and findings in addition to their safety classification according to INES.

### 1. ...

<sup>58</sup> Revised in accordance with Annex No 12 of the O of 12 Nov. 2008 on the Swiss Federal Nuclear Safety Inspectorate (AS **2008** 5747) and Art. 20 No 3 of the Emergency Protection Ordinance of 20 Oct. 2010, in force since 1 Jan. 2011 (AS **2010** 5191).

## 2. International IAEA-INES evaluation scale

Level	Descriptor	Nature of events
7	Major accident	<ul style="list-style-type: none"> <li>– External release of a large fraction of the radioactive material in the form of a mixture of short-lived and long-lived radioactive fission products (more than 10,000 TBq iodine-131 equivalent).</li> </ul>
6	Serious accident	<ul style="list-style-type: none"> <li>– External release of radioactive material (1,000 to 10,000 TBq iodene-131 equivalent).</li> </ul>
5	Accident with off-site risk	<ul style="list-style-type: none"> <li>– External release of radioactive material (100 to 1,000 TBq iodene-131 equivalent).</li> <li>– Severe damage to reactor core with release of large quantities of radioactivity within the installation.</li> </ul>
4	Accident without significant off-site risk	<ul style="list-style-type: none"> <li>– Release of radioactive material that is above the permitted dose limits that may result in a dose of several millisieverts for those persons most exposed.</li> <li>– Partial damage to reactor core due to mechanical effects or melting.</li> <li>– Irradiation of personnel probably serious enough to lead to an acute death.</li> </ul>
3	Serious incident	<ul style="list-style-type: none"> <li>– Release of radioactive substances above the permitted dose limits resulting in a dose to the critical group of the order of a few tenths of millisieverts.</li> <li>– On-site events resulting in doses to workers sufficient to cause acute health effects and/or an event resulting in a severe spread of contamination within the installation.</li> <li>– Incidents in which a further failure of safety systems could lead to accident conditions, or a situation in which safety systems would be unable to prevent an accident if certain initiators were to occur.</li> </ul>
2	Incident	<ul style="list-style-type: none"> <li>– Event or finding with significant failure in safety provisions but with sufficient defence in depth remaining to cope with additional failures. These include events where the actual failures would be rated at level 1, but which reveal significant additional organizational inadequacies or safety culture deficiencies.</li> <li>– An event resulting in a dose to a worker exceeding a statutory annual dose limit and/or an event which leads to the presence of significant quantities of radioactivity in the installation in areas not expected by design.</li> </ul>

Level	Descriptor	Nature of events
1	Anomaly	– Anomaly beyond the authorised regime. This may be due to equipment failure, human error or procedural inadequacies. Event or finding without direct safety consequences that reveal significant inadequacies in the organisational system or safety culture.
0	Deviation	– Events and findings where operational limits and conditions are not exceeded and which are properly managed in accordance with adequate procedures.  Examples: a single random failure in a redundant system discovered during periodic inspections or tests, an automatic reactor trip proceeding normally, leakages within the operational limits; all examples with no significant correlation with safety culture.

### Reporting deadlines for events and findings relating to safety

	INES >=3 event or finding	INES 2 event or finding	INES 1 event or finding	INES 0 event or finding	Ö event or finding
Initial notification by telephone	Immediately	Immediately	24 hours <sup>a</sup>	24 hours <sup>a</sup>	Immediately
Written confirmation	As part of ENSI emergency response	Within 6 hours after initial notification	Within 6 hours after initial notification		Within 2 hours after initial notification
Event report	36 hours	10 days	10 days	30 days	
Report on follow-up measures	As required	30 days	30 days		Monthly report <sup>b</sup>

<sup>a</sup> Within 24 hours between 8 a.m. and 5 p.m.  
<sup>b</sup> If no monthly report is required, in quarterly or annual report.

## **Amendments to current legislation**

The following ordinances are amended as indicated:

...<sup>59</sup>

<sup>59</sup> The amendments may be consulted under AS 2005 601.

