Nuclear Energy Ordinance
(NEO)

of 10 December 2004 (Status as of 1 January 2022)

The Federal Council,

on the basis of Article 101, paragraph 1 of the Nuclear Energy Act of 21 March 2003[1] (NEA),

ordains:

Chapter 1 General Provisions

Art. 1[2] Nuclear materials covered by this Ordinance

[1] 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

1 SR **732.1**

2 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.

2 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

1 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.

1bis Installations outside nuclear installations in which radioactive waste is stored in order to decay in accordance with Article 117 of the Radiological Protection Ordinance of 26 April 2017[3] (RPO) are also not classified as nuclear installations.[4]

2 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.

3 SR **814.501**
4 Inserted by No I of the O of 7 Dec. 2018, in force since 1 Feb. 2019 (AS **2019** 183).

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[5] 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

5 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

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

2 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.

3 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.

4 For the design of a nuclear installation in accordance with Article 7 letter c, accidents within the meaning of paragraph 2 and accidents not triggered by natural events within the meaning of paragraph 3 must be classified by the frequency specified in Article 123 paragraph 2 RPO[6]. 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 123 paragraph 2 RPO are met.[7]

4bis For the design of a nuclear installation in accordance with Article 7 letter c, in the case of accidents triggered by natural events in accordance with paragraph 3, the assumption shall be made of a natural event with a frequency of 10^{-3} per year and a natural event with a frequency of 10^{-4} per year. In addition to a natural event triggering the accident, a separate individual error shall be assumed. It must be demonstrated that the dose resulting from a single such event for members of the public:

a. is no greater than 1 mSv in the case of a frequency of 10^{-3} per year;

b. is no greater than 100 mSv in the case of a frequency of 10^{-4} per year.[8]

5 Proof must be provided by probabilistic analysis that there is adequate protection against beyond-design-basis accidents. For this purpose, the preventive and mitigating measures in accordance with Article 7 letter d may be taken into account.[9]

6 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

1 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.

6 SR **814.501**
7 Amended by No I of the O of 7 Dec. 2018, in force since 1 Feb. 2019 (AS **2019** 183).
8 Inserted by No I of the O of 7 Dec. 2018, in force since 1 Feb. 2019 (AS **2019** 183).
9 Amended by No I of the O of 7 Dec. 2018, in force since 1 Feb. 2019 (AS **2019** 183).

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

3 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

1 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 intended 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.