Nuclear Energy Ordinance
(NEO)

of 10 December 2004 (status as of 1 February 2005)

The Federal Council,

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

ordains:

Chapter 1: General Provisions

Article 1 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 that natural uranium,
   3. Thorium,
   4. Substances that contain the cited materials in any form.

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,
   5. Substances that contain the cited materials in any form.

[2] The following are not classified as nuclear materials:

a. Uranium and thorium ores;

b. Source materials that are not used for obtaining energy by means of nuclear fission processes, namely source materials for analyses and measurements, shielding or the manufacture of industrial products, and these products themselves;

c. special fissile materials with a weight of up to 15 grams.

Article 2 Nuclear facilities covered by this Ordinance

[1] Facilities in which the following nuclear materials are obtained, produced, utilised, processed or stored are not classified as nuclear facilities:

a. Substances that contain a total of not more than 1000 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.

[2] The Federal Office of Energy (the Office) determines whether source materials meet the requirements within the meaning of paragraph 1 letter b.

Article 3 Mediation 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 mediation activities if the nuclear goods concerned are intended to meet own needs within Switzerland.

Article 4 Definitions

The definitions cited in Appendix 1 apply.

Article 5 Deep geological repository sectoral plan

The federal government specifies the objectives and criteria for the disposal of radioactive waste in deep geological repositories which are legally binding for the relevant authorities.

Article 6 Supervisory authorities

[1] The Swiss Federal Nuclear Safety Inspectorate (HSK) acts as supervisory authority with regard to nuclear safety in the enforcement of the Nuclear Energy Act (NEA).

[2] The Office acts as supervisory authority for other areas of enforcement of the NEA, in particular for security.

[3] The HSK co-ordinates the activities of the supervisory authorities.

Chapter 2: Principles of Nuclear Safety and Security

Article 7 Requirements on nuclear safety and security

The following measures must be taken in order to guarantee nuclear safety and security:

a. Established or proven high-quality processes, materials, technologies and organisational structures and procedures must be used in connection with design, construction, commissioning and operation of nuclear facilities. This applies especially to the areas of planning, manufacture, testing, operational management, surveillance, maintenance, quality assurance, evaluation of operational experience feedback, ergonomic design as well as training and further education.

b. Any deviations from normal operation should be countered as far as possible by ensuring that the behaviour of the facility is self-regulating and fault-tolerant. Wherever possible, the behaviour of the facility must be inherently safe. The term “inherently safe” is understood to mean that a given system functions safely in its own, i.e. without the support of auxiliary systems.

c. With regard to dealing with malfunctions, the facility must be designed in such a manner as to ensure that the surroundings are not exposed to impermissible radiological effects. For this purpose, the facility 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 dangerous quantities of radioactive substances might be released.

Article 8 Requirements concerning measures to prevent malfunctions

[1] Measures must be taken to prevent malfunctions in nuclear facilities that may be initiated either within (internal) or outside (external) the facility.

[2] Internal initiating events include reactivity initiated disturbance, loss of coolant, loss of heat sink, fire, flooding, mechanical damage due to component failure, damage to cladding tubes when handling fuel elements, failure of operating systems, unintentional activation or faulty functioning of safety systems, and errors committed by personnel.

[3] External initiating events include earthquake, flooding, civil or military aircraft crash, squall, lightning strike, shock wave, fire, failure of external power supply, interruption or failure of external cooling water supply.

[4] For the design of a nuclear facility in accordance with Article 7 letter c, malfunctions within the meaning of paragraphs 2 and 3 must be classified by frequency in accordance with Article 94 of the Radiological Protection Ordinance . In addition to the initiating event, an unrelated malfunction must also be assumed. Operators are obliged to demonstrate that their facility is able to meet the requirements relating to maximum radiation doses as cited in Article 94, paragraphs 2 to 5 of the above Ordinance.

[5] Operators must be able to demonstrate through probabilistic analysis that the facility meets the criterion cited 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.

[6] The Federal Department of the Environment, Transport, Energy and Communications (the Department) defines the principles for threat assessment and for associated evaluation criteria in a separate ordinance.

Article 9 Requirements on security

[1] The protection of nuclear facilities and material against sabotage, physical interference by third parties and unauthorised removal must be based on the principle of defence in depth, which encompasses structural, technical, organisational, personnel and administrative measures.

[2] The principles for security zones and barriers and for the protection of nuclear facilities, nuclear materials and radioactive waste are defined in Appendix 2.

[3] The Department defines the principles for threat assessment and for structural, technical, organisational and administrative security measures in a specific ordinance.

Article 10 Design principles for nuclear power plants

[1] The following principles apply to nuclear power plants:

a. Safety functions must also remain effective even if a malfunction should occur independently of an initiating event, and also if a component should not be available due to maintenance or repair. Such separate malfunctions include the random failure of a component that results in its incapacity to perform its intended function. Follow-up malfunctions arising from such random failures are also regarded as part of the separate malfunction.

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 frontline and support systems such as control systems and provision of energy, coolants 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 as far as possible be accessible for inspection, either in their entirety wherever possible, or otherwise to the broadest possible extent, both manually and through simulated automatic activation, including under emergency power supply.

f. Safety functions must be automated so that, in the event of malfunctions in accordance with Article 8, no safety-relevant interventions 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 additional safety margins.

h. As far as possible, systems should be designed to ensure a safety-oriented response (fail-safe design) in the event of equipment malfunctions.

i. Preference must be given to passive rather than active safety functions.

j. Work stations and procedures for the operation and maintenance of the facility 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 malfunctions in accordance with Article 7 letter d over measures to mitigate their consequences.

[2] The Swiss Federal Nuclear Safety Inspectorate specifies detailed design principles for light-water reactors in regulatory guides.

Article 11 Design principles for deep geological repositories

[1] 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;

c. Long-term geological stability.

[2] 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 graduated 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 several years.

[3] The Swiss Federal Nuclear Safety Inspectorate specifies detailed design principles for deep geological repositories in regulatory guides.

Article 12 Design principles for other nuclear facilities

[1] Article 10, paragraph 1 applies by analogy to the design of nuclear facilities other than nuclear power plants and deep geological repositories.

[2] A storage facility 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.

[3] The Swiss Federal Nuclear Safety Inspectorate specifies detailed design principles for individual types of nuclear facilities in regulatory guides.

Chapter 3: Nuclear Goods

Article 13 Responsibilities

The Office is responsible for:

a. issuing licences for handling 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.

Article 14 Licence for the export and mediation of technology

[1] A licence is required for the export and mediation of technology relating to nuclear materials.

[2] The Office is the licensing authority.

Article 15 Applications and related documentation

[1] 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.

[2] 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.

[3] 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 time of application, place of performance.

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

[4] On request, the holder of a licence for the mediation of nuclear materials must periodically provide the 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).

[5] The Office reserves the right to request additional documentation.

Article 16 Preliminary clarifications

[1] At the request of the applicant, the Office will carry out preliminary clarifications to determine whether, and under which conditions, a licence may be issued in accordance with the requirements cited in this chapter.

[2] Preliminary clarifications do not entitle the applicant to a licence.

[3] For the purpose of deciding on the issuing of a licence, any already examined preconditions are only 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.

Article 17 Diplomatic or consular offices, international organisations, bonded warehouses and areas outside customs territory

Delivery from and to diplomatic or consular offices, from and to international organisations, and from or to bonded warehouses or areas outside customs territory are equivalent to import and export activities.

Article 18 Validity

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

Article 19 Applications for exports of fundamental importance

[1] The Office decides on applications for exports of fundamental importance, in particular those which have potential political implications, in consultation with the relevant authorities within the Federal Department of Foreign Affairs, the Federal Department of Economic Affairs, the Federal Department for Defence, Civil Protection and Sport, and with the Federal Department of Justice and Police.

[2] In the event that no agreement should be reached, the Federal Council decides at the request of the Department.

Article 20 Archiving 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.

Article 21 Reporting obligation

[1] Licence holders must report to the Swiss Federal Nuclear Safety Inspectorate (HSK) in particular on the following events and findings relating to the safety of the transport of nuclear materials:

a. Exceeding of dose rate, activity or contamination limits;

b. Technical defects on transport containers subject to approval;

g. Any other events and findings that impair or may impair safety.

[2] The licence holder must report the following events and findings relating to security to the Office without delay:

a. Sabotage and attempted sabotage;

b. Bomb threats;

c. Extortion and hostage-taking;

d. Malfunctions, 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.

[3] The licence holder must submit a report on every event or finding to the HSK or to the Office. Reports to the HSK must be submitted in accordance with Appendix 6. Reports to the Office must be submitted within 30 days and classified.

Chapter 4: Nuclear facilities

Section 1: General licence

Article 22 Nuclear facilities with low hazard potential

[1] Nuclear facilities do not require a general licence if the frequency of all malfunctions 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 10-6 per annum. In the case of storage facilities and deep geological repositories, the total of activities of all nuclides to be emplaced must not exceed 10^{13} LE in accordance with Appendix 3, column 9, Radiological Protection Ordinance.

[2] The Swiss Federal Nuclear Safety Inspectorate specifies the methodology and boundary conditions for the analysis called for in paragraph 1 in separate regulatory guides.

Article 23 Application documents

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

a. Safety report and the 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 facility;
   4. Details regarding staff and organisational structure;
   5. In the case of deep geological repositories, indication of long-term safety;

b. Environmental impact report;

c. Report on compliance with area planning requirements;

d. Concept for decommissioning or for the monitoring period and closure of the facility;

e. Evidence of the management of resulting radioactive waste.

Section 2: Construction Licence and Construction of Facility

Article 24 Applications

[1] Applicants for a construction licence must demonstrate that:

a. They are able to comply with the principles cited in Articles 7 to 12;

b. In the case of construction of a new nuclear power plant, the mean core damage frequency for malfunctions (PSA) in accordance with Article 8 is not greater than 10^{-5} per annum;

c. In the case of nuclear facilities with low hazard potential, the requirements cited in Article 22 are met in full.

[2] Applicants must submit the following documentation:

a. Required documents for construction licence as indicated in Appendix 4;

b. Environmental impact report;

c. Report on compliance with area planning requirements;

d. Quality management programme for the project and construction stages;

e. Emergency protection concept;

f. Decommissioning plan or project for the monitoring period and plan for closure of the facility;

g. Report on compliance of the project with the general licence requirements.

[3] The supervisory authorities regulate the type, content, presentation and number of required application documents in regulatory guides.

Article 25 Quality management programme

[1] In their quality management programme for the project and construction stages, applicants are required to describe the organisational structure and procedures, including co-operation between themselves and contractors, and between themselves and the relevant licensing and supervisory authorities.

[2] The quality management programme must take account of the status of nuclear safety and security technology.

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

[4] The supervisory authorities specify the detailed requirements on quality management programmes in regulatory guides.

Article 26 Permits

[1] For buildings and system components that require a permit in accordance with the conditions of the construction licence, the supervisory authorities grant permits:

a. for the production of structural components, including concreted attachment elements and the installation of armouring or the assembly of steel elements, and for the methodology applied for intervention in the building shell and for subsequently installed attachment elements;

b. for the manufacture of the main mechanical components;

c. for the assembly of mechanical and electrical systems, including their control technology and for security equipment.

[2] To obtain the necessary permit, applicants must submit all the documentation necessary for the assessment as cited in Appendix 4.

[3] The supervisory authorities regulate the type, content, presentation and number of required application documents in regulatory guides.

Article 27 Building documentation

[1] 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 traceable manner at any time.

[2] All documentation must be securely archived until completion of the decommissioning, or until closure or expiry of the specified monitoring period.

[3] All modifications carried out on the facility, including decommissioning or closure, must be documented.

[4] The licence holder must hand over all documentation to the supervisory authorities after the facility has been decommissioned, or after it has been closed or the period of observation has expired to the Department.

[5] The supervisory authorities specify the detailed requirements on documentation and archiving in regulatory guides.

Section 3: Operating Licence

Article 28 Application documents

[1] Applications for an operating licence must be accompanied by the following documentation:

a. The required organisational and technical documentation as indicated in Appendix 3;

b. The required documents for an operating licence as indicated in Appendix 4;

c. Evidence of insurance cover;

d. The report on compliance of the facility with the requirements of the general licence and the construction licence.

[2] The supervisory authorities regulate the type, content, presentation and number of required application documents in regulatory guides.

Article 29 Permits

[1] The operating licence calls for 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. permanent operation in the first operating cycle;

f. the first emplacement of waste packages of a given type;

g. the emplacement of transport and storage casks with spent fuel elements or high level waste.

[2] To obtain the necessary permit, applicants must submit the documentation necessary for the assessment as cited in Appendix 4.

[3] The supervisory authorities regulate the type, content, presentation and number of required application documents in regulatory guides.

Article 30 Requirements on organisation

[1] The organisation of the facility must be structured in such a manner that it ensures internal responsibility for at least the following activities and areas:

a. Operation of the facility in all operating modes;

b. Maintenance, material and testing methods, technical support;

c. Design and monitoring of the reactor core;

d. Radiation protection and radioactive waste;

e. Water chemistry and use of auxiliary chemicals;

f. Emergency planning and preparedness;

g. Supervision and assessment of nuclear safety;

h. Security;

i. Quality assurance for services provided by contractors;

j. Training and further education of personnel;

k. Promotion of safety awareness.

[2] The licence holder must organise the personnel into units that are not too numerous, allow a clear overview and which each have a designated manager. Deputies must also be appointed for all managers.

[3] 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.

[4] The licence holder must designate a position for technical operation of the facility that is provided with the necessary competencies and resources, and that is responsible for decisions relating to safety and security.

[5] The supervisory authorities specify the detailed requirements on organisational structure in regulatory guides.

Article 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 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. Quality management systems must take account of the status of nuclear safety and security technology.

Section 4: Operation

Article 32 Maintenance, inspection and repair

[1] 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. recurring inspections;

c. recurring functional tests.

[2] Any deviations from the prescribed status must be rectified by taking the appropriate maintenance or repair measures.

[3] Appropriate procedures and equipment must be used for maintenance and repair tasks, and these must be carried out by qualified personnel.

[4] All maintenance and repair work must be documented and periodically evaluated. Programmes must be supplemented as necessary.

Article 33 Systematic safety and security assessments

[1] The licence holder must carry out systematic safety assessments for the following areas:

a. Impacts of modifications to the facility, and of events and findings, on the safety of the facility, and in particular on risk; each risk assessment must incorporate an up-to-date, plant-specific probabilistic safety assessment (PSA);

b. operational experience feedback from electrical and mechanical equipment of relevance to safety, fuel elements, safety-related structures 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.

[2] The licence holder must carry out systematic security assessments for the following areas:

a. Security concept;

b. Security measures.

[3] The supervisory authorities specify the detailed requirements on systematic safety and security assessments in regulatory guides.

Article 34 Comprehensive safety reviews for nuclear power plants

[1] 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).

[2] For this purpose the following aspects must be described and assessed:

a. safety concept;

b. operational management and behaviour;

c. deterministic analysis of safety status;

d. probabilistic safety analysis;

e. overall evaluation of safety status;

f. organisation and personnel;

[3] The Swiss Federal Nuclear Safety Inspectorate specifies the detailed requirements on periodical safety reviews in regulatory guides.

Article 35 Monitoring ageing of equipment and structures

[1] With the aid of an ageing monitoring programme, 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.

[2] The findings must be evaluated, and any necessary measures must be defined and duly implemented.

[3] With the aid of said ageing monitoring programme, the licence holder must document the inspection of the facility from the point of view of effects of ageing, and the programme must be periodically updated to keep pace with the current status of the facility.

[4] The supervisory authorities specify the methods and scope of the ageing monitoring procedure in regulatory guides.

Article 36 Monitoring scientific and technological developments, and comparing operating experience and findings with those of other facilities of a similar nature

[1] 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 facility.

[2] 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 facility. The following are of particular relevance:

a. recognised domestic and foreign technical standards;

b. regulations of the country supplying a nuclear facility, as well as of other countries, relating to nuclear technology;

c. recommendations of international bodies;

d. status of technology in nuclear facilities of a similar nature and in other relevant facilities.

[3] The licence holder must monitor operating experiences and findings of similar facilities and assess their significance for his own facility.

Article 37 Periodical reporting

[1] In accordance with Appendix 5, the licence holder must submit reports to the relevant supervisory authorities for the purpose of assessing the status and operation of the facility.

[2] The supervisory authorities regulate the type, content, presentation and number of required reports in regulatory guides.

Article 38 Reporting obligations in the area of nuclear safety

[1] The holder of an operating licence must report the following activities in particular to the Swiss Federal Nuclear Safety Inspectorate (HSK) before they are carried out:

a. planned shutdown of a reactor;

b. renewed start-up of a reactor following shutdown due to a malfunction;

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. testing of systems or components of relevance to safety.

[2] The licence holder must report the following activities to the supervisory authorities:

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

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

[3] The holder of an operating licence must report the following events and findings to the HSK:

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.

[4] The licence holder must submit to the HSK all necessary reports as indicated in Appendix 6.

[5] The HSK regulates 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 regulatory guides.

Article 39 Reporting obligations in the area of nuclear security

[1] The holder of an operating licence must report the following activities in particular to the Office before they are carried out:

a. Structural and technical modifications or new installations that require a permit from the Swiss Federal Nuclear Safety Inspectorate (HSK);

b. Security-related exercises with the involvement of military, cantonal or municipal authorities;

c. Extraordinary security-related activities.

[2] The holder of an operating licence must report the following events and findings to the Office without delay:

a. use of violence against personnel;

b. sabotage and attempted sabotage;

c. bomb threats;

d. extortion and hostage-taking;

e. malfunctions, damage to or failure of security equipment and systems that last longer than 24 hours;

f. events in and in the vicinity of the nuclear facility that are attributable to, or indicate, unauthorised interference;

g. any other events and findings that impair or may impair security.

[3] The holder of an operating licence must submit a report on every event or finding to the Office within 30 days. The report must be classified.

Article 40 Modifications that require a permit

[1] 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. power plant or operating instructions;
   2. plant emergency instructions;
   3. plant instructions governing radiation protection;
   4. technical specifications;
   5. instructions relating to security.

[2] 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 cited in Appendix 4.

[3] 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.

[4] 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 facility.

[5] The supervisory authorities regulate the type, content, presentation and number of required application documents in regulatory guides.

Article 41 Documentation

[1] The licence holder must update the organisational and technical documents in accordance with Appendix 3 throughout the entire period of operation of the nuclear facility, up to its decommissioning or closure, and must adapt them to the current status of the facility.

[2] The licence holder must at all times traceably document the operation of the facility on the basis of records in accordance with Appendix 3 and documents describing function tests and maintenance operations.

[3] All documentation must be securely archived until completion of the decommissioning, or until closure of the facility or expiry of the specified monitoring period.

[4] The licence holder must hand over all documentation to the supervisory authorities after the facility has been decommissioned, or to the Department after closure of the facility or expiry of the monitoring period.

[5] The supervisory authorities specify the detailed requirements on documentation and its archiving in regulatory guides.

Article 42 Updating of plan or project concerning decommissioning and closure

[1] Every ten years, the holder of an operating licence must review and update the plan for the decommissioning of a nuclear facility or, in the case of a deep geological repository, the project for the monitoring period and the plan for the closure.

[2] Updating is also required if:

a. significant changes have been made to the facility;

b. significant requirements have been changed that relate to decommissioning or the monitoring period and closure of the facility;

c. significant technological developments make updating necessary.

Article 43 Shutdown of a nuclear power plant

[1] The holder of an operating licence for a nuclear power plant must shut down the facility if one of the shut-down criteria in the technical specifications or power plant instructions should be fulfilled.

[2] The licence holder may only recommence operation with a reactor output of more than 5 percent after the necessary measures have been taken.

Article 44 Criteria for temporary shutdown and backfitting of nuclear reactors

[1] The holder of an operating licence must shut down the nuclear reactor 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 a malfunction in accordance with Article 8 can no longer be assured;

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.

[2] The Department specifies the methodology and boundary conditions governing the review of criteria in an ordinance.

Section 5: Decommissioning

Article 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 of reason for choice of variant;

b. description of each step and required funding, i.e. determination of radiological status of the facility, 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 identification of potential accidents during decommissioning, assessment of their frequency and radiological impacts, as well as counter-measures and any necessary emergency protection 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 facility, including those for the management of radioactive and non-radioactive waste, and the securing of the necessary financing.

Article 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 facility;

c. limits for the discharge of radioactive substances into the environment;

d. monitoring of immissions of radioactive substances and of direct radiation;

e. organisation.

Article 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 facilities after completion of the decommissioning process;

e. repeal of security measures;

f. in the case of decommissioning of nuclear power plants, disassembly of reactor vessel and its surrounding building elements.

Article 48 Reporting procedure for decommissioning

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

Article 49 Reporting obligations

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

Chapter 5: Radioactive Waste

Section 1: General

Article 50 Minimisation of radioactive waste

Nuclear facilities 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:

a. for the construction of nuclear facilities, materials must be chosen that ensure that the formation of activation products is minimal;

b. for the operation of nuclear facilities, 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.

Article 51 Categories of radioactive waste

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

a. High level radioactive waste:
   1. spent fuel elements that are no longer used;
   2. vitrified fission product solutions resulting from the reprocessing of spent fuel elements.

b. Alphatoxic 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.

Article 52 Waste management programme

[1] Those required to manage radioactive waste must include the following details 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 facilities, including details concerning:
   1. the required activities;
   2. the associated costs;
   3. the type of financing;

g. the information concept.

[2] The waste management programme must be adapted every five years.

[3] The Swiss Federal Nuclear Safety Inspectorate and the Office is responsible for reviewing and monitoring compliance with the waste management programme.

Section 2: Clearance Measurement and Conditioning

Article 53 Clearance measurement of materials

[1] Anyone intending to remove materials as being non-radioactive from controlled zones of a nuclear facility must carry out a clearance measurement with appropriate quality assurance and document it.

[2] Quantities of material weighing more than 1,000 kilograms or with a volume greater than a cubic metre must be reported to the Swiss Federal Nuclear Safety Inspectorate (HSK) at least 10 days prior to removal from the nuclear facility, and the required documentation must be submitted.

[3] The HSK specifies the detailed requirements on clearance measurement and reporting in regulatory guides.

Article 54 Conditioning

[1] 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.

[2] Conditioned waste packages must be suitable for transport, storage and disposal.

[3] Each waste package must be labelled and have 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.

[4] For the production of a conditioned waste package a type or individual approval issued by the Swiss Federal Nuclear Safety Inspectorate (HSK) is necessary.

[5] Applications must be accompanied by all documents that are necessary for assessment purposes, and these must provide details relating in particular to:

a. the conditioning procedure;

b. the waste package and its components;

c. the quality assurance;

d. the documentation.

[6] The HSK specifies the detailed requirements on conditioning and application documents in regulatory guides.

Section 3: Handling Radioactive Waste

Article 55 Powers

The Office is responsible 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.

Article 56 Application and related documentation

[1] 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.

[2] The documentation must provide the necessary information for assessing the application, including in particular:

a. details concerning the composition and properties of the radioactive waste;

b. person responsible for waste management, consignor and consignee;

c. place of origin and destination;

d. transport, in particular evidence of compliance with requirements on the carriage of dangerous goods.

Article 57 Preliminary clarifications, 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

Article 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. indication of desired validity of the licence.

Article 59 Investigation programme

The investigation programme must contain details concerning:

a. objectives of the investigations;

b. anticipated scope of the investigation;

c. starting date and expected duration of the investigation.

Article 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.

Article 61 Exemptions from licensing obligation

[1] 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 tracer experiments;

d. measurements of ground gases.

[2] 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

Article 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.

Article 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.

Article 64 Elements of a deep geological repository

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

Article 65 Test zones

[1] In test zones, the properties of the host rock of relevance to safety must be examined in depth in order to confirm the safety.

[2] Before a deep geological repository may be put into operation, the technologies of relevance to safety must be tested and their functional capacity has to 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. method of recovery of waste packages.

[3] During the operation of the repository, the sealing of caverns and galleries must be tested and its functional capacity must be ascertained.

Article 66 Pilot section

[1] In the pilot section, 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.

[2] 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.

[3] 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 type of waste and backfill material emplacement must correspond to those of the main section.

d. The pilot section must contain a small but representative quantity of waste.

Article 67 Backfilling

[1] The owner of a deep geological repository must backfill the storage caverns and galleries after the waste packages have been emplaced.

[2] Backfilling must be carried out in such a manner as to ensure that long-term safety is assured and recovery of the waste is possible without undue effort.

Article 68 Monitoring period

[1] 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.

[2] The Department orders the start of the monitoring period and specifies its duration. It may also extend this period as required.

Article 69 Closure

[1] When closing a deep geological repository, its owner must backfill all still open areas of the repository and seal the sections important for long-term safety and security.

[2] The closure project must describe the following aspects in particular:

a. backfilling and sealing of the accesses to the disposal areas;

b. transformation of the pilot section into a state suitable for long-term safety;

c. backfilling and sealing the accesses to the repository;

d. assurance of long-term safety.

[3] 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.

Article 70 Protection zone

[1] 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.

[2] After issuing the general licence, the Office requests 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 Office requests the relevant land registry to add the note, “Definitive protection zone for a deep geological repository”.

[3] 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 Office requests the relevant land registry to delete the corresponding note.

[4] The Department issues 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.

Article 71 Documentation

[1] The owner of a deep geological repository must compile documentation that is suitable for securing information about the repository over the long term.

[2] This documentation must contain the following:

a. situation and extent of underground structures;

b. inventory of disposed radioactive waste by type, quantity and disposal area;

c. design of safety barriers, including sealing of accesses;

d. basis and findings of the definitive analysis of long-term safety.

[3] The owner must hand over all documentation to the Department after closure or on expiry of the additional monitoring period.

Article 72 Utilisation of geological data

[1] 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.

[2] 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 utilisation of said data.

Chapter 6: Procedures, Information and Promotion

Article 73 Review by supervisory authorities

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

Article 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.

Article 75 Procedure for permits and for type or individual approvals

[1] 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.

[2] The supervisory authorities submit requests or applications to the relevant federal authorities for comment if deemed necessary. In such cases they also specify a reasonable deadline.

[3] 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.

[4] If a supervisory authority grants a permit that also concerns the responsibilities of another supervisory authority, the latter's consent must be obtained.

Article 76 Obligation to provide information about special events and findings relating to nuclear safety

[1] The Swiss Federal Nuclear Safety Inspectorate (HSK) notifies the general public without delay about any special events and findings in nuclear facilities:

a. that represent a hazard to the facility or its personnel, or have significant radiological impacts on the environment (events and findings of category S, according to Appendix 6);

b. that are of significance in terms of safety, but have no or only a negligible radiological impact on the environment (events and findings of category A, according to Appendix 6).

[2] In the case of special events and findings of public interest that are not covered by paragraph 1 above, HSK arranges for the provision of information to the public.

Article 77 Promotion of research, education and training

[1] Within the scope of approved credits, the supervisory authorities support projects in the area of applied research, educational activities and the training of personnel in the areas of safety and security of nuclear facilities and nuclear waste management.

[2] Their support takes the form of financial aid or the assistance provided by personnel from the Office or the Swiss Federal Nuclear Safety Inspectorate.

Chapter 7: Criminal Provisions and Final Provisions

Article 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 is liable to the penalties in accordance with Article 93 of the Nuclear Energy Act.

Article 79 Amendments to Appendices 2 and 6

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

Article 80 Repeal of previously existing legislation

The following Ordinances are repealed:

1. Ordinance of 11 July 1979 on the General Licensing Procedure for Nuclear Facilities with Site Licence;
2. Ordinance of 27 November 1989 on Preparatory Measures;
3. Atomic Energy Ordinance of 18 January 1984
4. Ordinance of 14 March 1983 on the Supervision of Nuclear Facilities.

Article 81 Amendments to existing legislation

Amendments to previously existing legislation are dealt with in Appendix 7.

Article 82 Transitional provision

For the specification of the scope of backfitting activities in nuclear facilities 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.

Article 83 Commencement

This Ordinance comes into force on 1 February 2005.

Appendix 1
(Article 4)

Technical terms

Definition of technical terms used in this Ordinance:

a. *Finding:* identification of a condition of components that may have an impact on safety but have not given rise to an event;

b. *Event:* occurrence in the operation of a facility or during transport that may have an impact on safety;

c. *Clearance measurement:* evidence in the form of a measurement that indicates that materials are no longer within the scope of application of the Radiological Protection Ordinance .

d. *Maintenance:* all measures to preserve and restore the required condition of equipment and systems, and to determine and assess their current status;

e. *Core Cooling:* 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:* the frequency per annum of damage to the reactor core caused by malfunctions as calculated with the aid of a probabilistic safety analysis;

g. *Normal operation:* status of a facility within specified operating limits and in accordance with applicable regulations;

h. *Safety classification:* classification of structures, systems and components of a nuclear facility into structural, safety and earthquake categories in line with their importance in terms of nuclear safety;

i. *Malfunction:* any condition deviating from normal operation that requires the intervention of a safety system;

j. *System:* combination of mechanical or electrical equipment that is required for performing a specific function;

k. *Technology:* specific information 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.

Appendix 2
(Article 9, paragraph 2)

Principles for the security of nuclear facilities, nuclear materials and radioactive waste

1. Technical security of nuclear facilities

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

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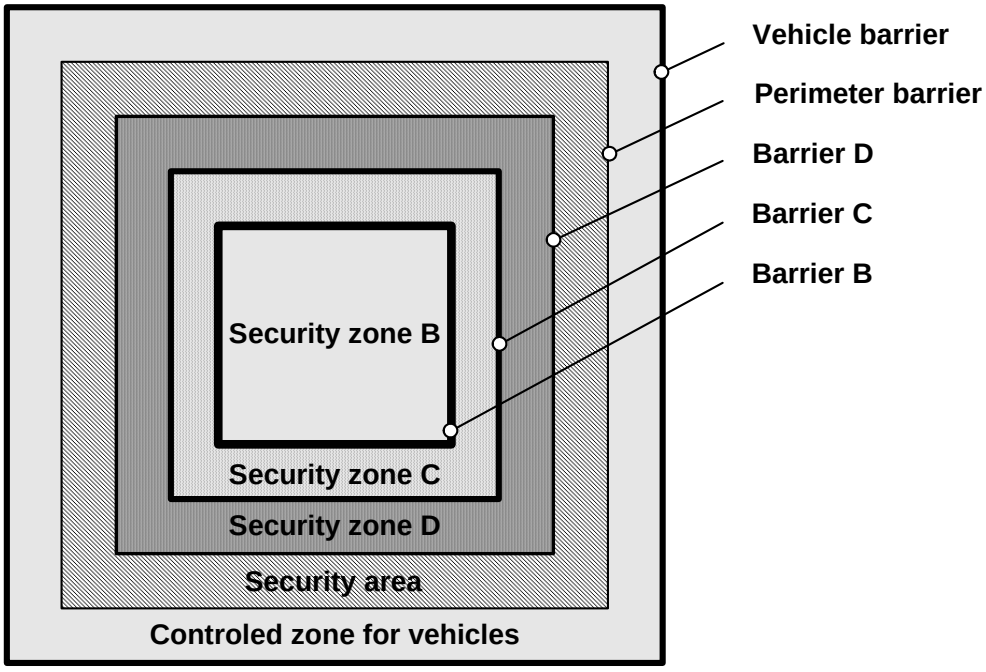

The various security barriers perform the following functions:

- 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 barrier.
- The perimeter barrier surrounds the security 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 interior. They protect and surround each zone containing safety systems and equipment.

In the case of interim storage facilities and deep geological repositories, the Office decides whether it is possible to waive any security barriers.

Security systems (e.g. central alarm stations, guard-houses) that permit access to security zones by pedestrians or vehicles 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 corps.

2. Security of nuclear materials and radioactive waste

Classification of nuclear materials and radioactive waste

Material	Form	Category		
		I	II	III
1. Plutonium[1]	Unirradiated[2]	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[2]			
	– uranium enriched to 20% ^{235}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% ^{235}U but less than 20% ^{235}U	–	10 kg or more	Less than 10 kg but more than 1 kg
	– uranium enriched above natural content, but less than 10% ^{235}U	–	–	10 kg or more
3. Uranium-233	Unirradiated[2]	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	

1 All plutonium except that with isotopic concentration exceeding 80% ^{238}Pu.
2 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 use with extremely reliable systems as follows:

Use and storage within an extremely protected zone, 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 response force. The aim of the various measures in this connection is to identify and prevent attacks, 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 response force.

Category II

Use and storage within a protected zone, 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.

Appendix 3
(Articles 28 and 41)

Plant documentation

The plant documentation of a nuclear facility comprises organisational and technical documents, plus operational records.

1. Organisational documents

Power plant or operating instructions	Power plant or operating instructions document the organisational structure and number of personnel required for safe operation, including organisational shut-down criteria.
Plant emergency instructions	Plant emergency instructions document the organisational structure and responsibilities for dealing with emergencies. Instructions for emergency teams form an integral part of these instructions.
Plant instructions governing radiation protection	Plant instructions governing radiation protection specify the duties of the holder of the operating licence with regard to protection against radiation, in particular measurement of radioactivity released into the atmosphere and protection of personnel working in the controlled zone of the nuclear facility.
Quality management manual	The quality management manual describes a comprehensive and systematic quality management system for the operation of the nuclear facility.
Regulations and directives relating to security	Regulations and directives relating to security contain general instructions concerning the security of nuclear facilities and regulations for the security corps.
Safety culture guidelines	Safety culture guidelines specify how the management staff of the nuclear facility 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 facility. 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 facility describes the current status of security measures in accordance with the requirements of the supervisory authority. Security reports must be classified.
Technical specifications	Technical specifications contain instructions for the operation of a nuclear facility and its safety systems, including technical shutdown criteria.

In-service inspection programme	A repeat test programme describes recurring tests on pressure-bearing components and systems in security categories 1 to 4.
Ageing monitoring programme	An ageing monitoring programme describes the status and monitoring of mechanical and electrical components as well as the structures of the nuclear facility.
Normal- and emergency operating procedures	These procedures govern the safe operation of the facility, both in normal operating mode and in the event of malfunctions in accordance with Article 8.
Severe Accident Management Guidelines (SAMG)	SAMG help staff deal with malfunctions and accidents that may result in the release of unacceptable amounts of radioactive substances into the atmosphere.
Current PSA	The current PSA (probabilistic safety assessment) of a nuclear power plant has to contain the following material for all relevant operating modes: a. a probabilistic analysis of malfunctions in accordance with Article 8 that may be initiated by internal or external events and as a result of which radioactive substances may be released into the atmosphere; b. a quantitative evaluation of precautionary measures to prevent such malfunctions; c. a quantitative evaluation of the risk of the release of hazardous levels of radioactive substances.
Technical descriptions	Technical descriptions contain diagrams, sketches, documentation including layout plans, building plans, maintenance schedules, lists of components, zoning plans and other documents describing the current status of the facility.

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 facility, 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 safety-relevant operating data and measurements.
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.

Appendix 4
(Articles 24, 26, 28, 29, 40)

Documentation for licences and permits, safety classification

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

Paragraph 2 lists the most important documents.

Key to table in Section 1:

G	Complete facility
R	Reactor technology
B	Building technology
S	Systems technology
M	Machine technology
E	Electrical and control technology
U	Radiation protection, waste and emergency protection
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 building approval, e.g. reactor pressure vessels, steel safety tanks, primary cycles, steam generators, pressure vessels, pressurisers, main coolant pumps
MB	Other mechanical equipment (safety categories 1 to 4)

1. Documents by type of application and by area

Area / Application for	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 building permit or permit of layout specifications	G2		B2 and B3 for 1st building section	S2 for SA	M2 for MA	E2	U2		P2
Other building permits (building or sections)			B2/B3	S2 for SB, if relevant for building section				D2	
Manufacturing permits					M2 for MB M3			D3	
Assembly permit				S2 for SB S3 for SA		E3	U3		
Operating licence	G3	R3							P3
Permit for start-up and partial or permanent operation	G4	R4	B4	S4	M4	E4	U4	D4	P4

2. Documents by area

Complete facility			
G1	G2	G3	G4
Facility concept/layout concept	Design and layout of complete facility	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 facility Hazard specifications Layout plans for complete facility 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 technology			
R1	R2	R3	R4
Layout concept	Provisional safety assessment	Definitive safety assessment	Evaluation of nuclear commissioning
Fuel element design Provisional core design Definition of malfunctions and safety limits	Definition of main background conditions Analysis of operating modes and malfunctions that determine layout, and their impacts on the facility and its surroundings	Assumptions, models concerning behaviour of radioactive substances Analysis of malfunctions and their impacts Malfunction analyses and safety specifications Commissioning programmes Definitive core design	Evaluation of commissioning tests and results

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

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

M Machine technology			
M1	M2	M3	M4
Layout concepts	Layout	Implementation	Start-up and documentation
Applicable regulations and building codes Constructive implementation Choice of material for main components	Layout specifications Overview drawings of safety-relevant components Programmes for special certificates or qualifications	Pre-test documentation of manufacturer Safety-relevant components 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 Tension analyses In-service inspection programme Construction monitoring report Maintenance programmes

E Electrical and control technology			
E1	E2	E3	E4
Principles of electrical equipment	Layout	Implementation certificates	Start-up and documentation
Applicable technology for main components and control technology Train assignment scheme Layout principles of 1E 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

U Radiation protection, waste management, emergency protection			
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 protection, 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 further education of guard personnel	Operation, testing and maintenance programmes

D Security			
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 further education	Specifications (building and layout, shafts, pipelines, ventilation, means of communication, functions and processes diagram, energy supply, test certificates) Security instructions List of duties of security personnel	Implementation plans Instructions for start-up	Test reports for security installations Test and approval records Education of security personnel Integration into security report

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 stage Training and further education concept	Organisational specifications Lists of duties Training programme for start-up Provisional operating documents, instructions, work processes	Suitability and qualifications of management staff, licensed personnel, radiation protection personnel and other employees	No. of employees Training and further education programmes for permanent operation

3. Safety classification

3.1 Safety categories

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

a. 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

b. SC 2: Equipment of systems with safety functions or of relevance to safety, that is not classified in safety category 1

c. SC 3: Equipment of support (auxiliary) systems for safety functions or of relevance to safety

d. 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 categories 1, 2 or 3

e. Unclassified equipment: equipment that is not classified in safety categories 1, 2, 3 or 4.

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

a. Category 1E: electrical equipment for mechanical systems and components classified in SC 1 to 3, and electrical and control technology safety systems;

b. Category 0E: other electrical equipment and systems that can also perform functions of relevance to safety.

3.2 Earthquake categories

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

a. EC I: mechanical equipment in safety categories 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 category 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 categories I or II are not classified for earthquakes.

3.3 Nuclear building categories

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

a. BC I: buildings in which mechanical and electrical equipment classified in earthquake category I is installed;

b. BC II: buildings in which mechanical equipment classified in earthquake category II or equipment that is not classified for earthquakes, is installed.

Appendix 5
(Article 37)

Periodical reporting

Report	Content / deadline for submission	Periodicity
Annual report on safety	Report of each nuclear facility containing a summary and an assessment of operations and safety, status of the facility, 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 the supervisory authorities, events and findings, changes and maintenance operations. Must be submitted by 1 March the following year.	Calendar year
Annual report on security	Report of each nuclear facility containing key information about the facility'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. Security reports must be submitted by 1 March the following year.	Calendar year
Quarterly report	Report of the central storage facility, deep geological repositories and Paul Scherrer Institute focusing on personal doses, dosimetry of facility and site, discharge of radioactive substances with exhaust air and waste water, surveillance of the surroundings, radioactive waste, conditioning campaigns, events and findings, changes and maintenance operations. Must be submitted by not later than the end of month after the reporting period.	Quarterly

Report	Content / deadline for submission	Periodicity
Monthly report	Report by nuclear power plants on the operation of the facility 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 facilities, activities and results of maintenance tasks. Monthly reports must be submitted by not later than the end of the following month.	Monthly
Outage report: technology	Report by nuclear power plants with description and evaluation of all measures of relevance to safety, results and findings from activities during the outage. Submission: a. initial report 4 working days prior to planned restart of facility; b. complete report by not later than 3 months after restart of the facility.	With each outage
Outage report: radiation protection	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. To be submitted not later than 3 months after restart of the facility.	With each outage
Outage report: physics	Report by nuclear power plants with the results and evaluation of physical reactor measurements for various output levels upon restart following the outage. Submission: a. results of zero-load and starting measurements prior to restart of facility above 5 percent nominal output; b. complete report by not later than 3 months after restart of the facility.	With each outage
Dosimetry report	Report by nuclear facilities with details of collective doses, dose distribution, individual doses and collective work-related doses. Dosimetry reports must be submitted by 1 March the following year.	Calendar year

Report	Content / deadline for submission	Periodicity
Report on surveillance of surroundings	Report of nuclear power plants, central storage facility, 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 facilities. 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 facilities containing a list of all radioactive sources in the facility. 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 findings and evaluation. To be submitted in accordance with the instructions of the supervisory authority.	Every 10 years
Unavailability data of systems and components	Report by nuclear power plants on the date and duration of unavailability of components in the PSA model of relevance to risk, 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 facility	Report by nuclear power plants with a list of modifications to the facility 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

Appendix 6
(Articles 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: a. classification based on the criteria cited below, summary of events or finding and current state of knowledge; b. status of facility prior to the event or at the time of the finding; c. course of the event and behaviour of the facility or type of finding; d. cause of event or origin of finding; e. immediate measures; f. enclosures.	Following each event or finding subject to reporting requirement
Report on follow-up measures	Report about events and findings, with the following content: a. follow-up measures; b. evaluation of relevance to safety; c. enclosures.	Following each event or finding subject to reporting requirement

Classification of events and findings

Events and findings must be classified in accordance with the following two scales, on the basis of their consequences in terms of safety:

1. National evaluation scale

Category S events and findings

Events and findings that represent a hazard to the facility or its personnel, or have significant radiological impacts on the environment.

Category A events and findings

Events and findings of relevance to safety, but with no, or only negligible, radiological impacts on the environment.

Category B events and findings

Events and findings of low relevance to safety. These are recorded and evaluated by the operator and the Swiss Federal Nuclear Safety Inspectorate (HSK) in order to identify any vulnerabilities at an early stage.

Category U events and findings

Events and findings of importance for regulatory supervision, but which do not meet the criteria for classification as S, A or B events and findings. These are recorded and evaluated by the operator and the HSK.

Category Ö events and findings

Events and findings of public interest that are perceivable outside the facility are also classified as Ö events and findings in addition to their safety classification (S, A, B, U).

2. International IAEA-INES evaluation scale

This scale contains 7 grades in declining order of importance, numbered from 7 to 1. Grade 0 = malfunctions without significance in terms of safety (but of relevance to safety). Malfunctions of no radiological or nuclear significance are not included on the scale (cf. INES User's Manual, IAEA, Vienna, 2001).

Grade	Designation	Criteria
7	Major accident	– Release of a major portion of the core inventory into the surroundings in the form of a mixture of short-lived and long-lived active substances (more than 10,000 TBq iodene-131 equivalent).
6	Serious accident	– Release of fission products into the surroundings (1,000 to 10,000 TBq iodene-131 equivalent).
5	Accident with off-site risk	– Release of fission products into the surroundings (100 to 1,000 TBq iodene-131 equivalent). – Severe core damage with release of a large quantity of radioactivity within the facility.
4	Accident without significant off-site risk	– Release of radioactive substances above the permitted thresholds that can result in a dose of several millisieverts for those persons most exposed outside the facility. – Partial damage to reactor core due to mechanical effects or melting. – Radiation of personnel probably strong enough to lead to death.
3	Serious incident	– Release of radioactive substances above the permitted thresholds that can result in a low dose (tenths of millisieverts) for those persons most exposed. – Radiation of personnel probably strong enough to cause radiation sickness. Severe contamination within the facility. – Malfunctions that could result in accidents due to the additional failure of safety, or a situation in which safety installations would not be able to prevent an accident if certain initiating events should occur.

Grade	Designation	Criteria
2	Incident	– Event or finding with significant failure of safety installations but with sufficient safety precautions in order to also deal with additional problems. Level 1 events and findings, but with significant problems relating to organisation or safety culture. – Event with radiation of personnel above the annual dose limit. Significant distribution of radioactivity within the facility that was not to be expected in view of layout.
1	Anomaly	– Anomaly outside the prescribed operating conditions. May be attributable to equipment failure, human error or inappropriate processes. Event or finding without direct safety consequences, but with significant problems relating to organisation or safety culture.
0	Deviation	– Events and findings for which the operating thresholds and conditions are not exceeded and that can be dealt with using suitable processes. Examples: during periodical inspections, identification of single fault in a redundant system, automatic immediate reactor shutdown with normal system behaviour, leaks within operating limits; all examples with no significant correlation with safety culture.

Reporting deadlines for events and findings relating to safety

	S event or finding	A event or finding	B event or finding	U event or finding	O event or finding
Initial notification by phone	Immediately	Immediately	24 hours[1]	24 hours[1]	Immediately
Written confirmation	As per HSK regulations	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[2]

1 Within 24 hours between 8 a.m. and 5 p.m.
2 If no monthly report is required, in quarterly or annual report.

Appendix 7
(Article 81)

Amendments to existing legislation

The following ordinances are amended as indicated:

1. Ordinance of 14 March 1983[1] on the Federal Commission for the Safety of Nuclear Facilities.

Ingress

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Article 1, paragraph 1

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Article 2

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Article 3

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Article 6

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Article 6a

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Article 8, paragraph 3

Repealed

Article 9, paragraph 1

...

Article 11, paragraph 1

...

1 SR **732.21**. The amendments listed below have been incorporated into the cited ordinance.

Article 12, paragraph 2

...

Article 15

...

Article 16, paragraph 3

Repealed

Article 17

...

Article 18

Repealed

Article 19

...

2. Ordinance of 19 October 1988[2] on Environmental Impact Reports

Appendix

Sections 21.1, 40.1 and 40.2

...

3. Radiation Protection Ordinance of 22 June 1994[3]

Article 2, paragraph 3

...

Article 6, paragraph 1c

...

2 SR **814.011**. The amendments listed below have been incorporated into the cited ordinance.

3 SR **814.501**. The amendments listed below have been incorporated into the cited ordinance.

Article 85, paragraphs 2 to 4

...

Article 87

...

Article 87a

...

Chapter 4 (Articles 88 to 92) and Chapter 5 (Article 93)
Repealed

Article 94, paragraphs 4 to 8

...

Article 96, paragraph 5bis

...

Article 101, paragraph 3

...

Article 125, paragraphs 3c and 3d

...

Article 127, paragraph 1, first sentence and sections b and d

[1] b. *Repealed*
d. ...

Article 128, paragraph 1b

...

Article 130, paragraph 2b

...

Article 136, paragraphs 4b and 4d

[4] b. ...
d. *Repealed*

Article 138, paragraphs 1 and 4

...

Appendix 1

…

4. Ordinance of 25 June 1997 on the Control of Goods[4]

Article 11, paragraph 1b, section 2

...

4 SR **946.202.1**. The amendments listed below have been incorporated into the cited ordinance.