IMPLEMENTING DECREE

No. 329

of 26th September 2017

On The Requirements For Nuclear Installation Design

In accordance with § 236 of Act No 263/2016, the Atomic Act, and in order to implement § 24(7), § 44(4)(a) and (b), § 45(4) and § 46(8), the State Office for Nuclear Safety lays down the following:

PART ONE

GENERAL PROVISIONS

§ 1

Subject matter

This Decree incorporates the relevant Euratom legislation[1)] and governs

a) the requirements for the contents of documentation for licensed activities,
b) the list of safety functions that must be performed by nuclear installations and classification of the functions into categories according to their impact to nuclear safety,
c) safety classes and the criteria for classifying selected equipment into these classes,
d) the method of ensuring defence-in-depth, and
e) the content of the requirements for nuclear installation design referred to in § 46(1), (2)(a), (b), (e), (g), (i), (k), (l), and (m), and (3) of the Atomic Act.

Definitions

§ 2

For the purposes of this Decree, the following definitions shall apply

a) 'practically eliminated matter' means a condition, state or event, the occurrence of which is considered physically impossible or which are, with a high degree of confidence, very unlikely,
b) 'fundamental safety function' means the safety functions ensuring fulfilment of safe utilisation of nuclear energy principles according § 45, (2) and (3) of the Atomic Act,
c) 'safe state of a nuclear installation' means the state of a nuclear installation, in which the fulfilment of fundamental safety functions is ensured on a long-term basis,
d) 'normal operation' means the state of a nuclear installation, in which the limits and conditions are kept,
e) 'abnormal operation' means the state of a nuclear installation deviating from normal operation, which is expected to occur, but does not cause any significant damage to systems, structures or components with impact to nuclear safety and after which the nuclear installation is capable of normal operations without repair,

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1) Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations.
Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations.

f) ‘operational state’ means the state of a nuclear installation, which is either normal operation or abnormal operation,
g) ‘accident conditions’ mean a state of a nuclear installation, which is not an operational state,
h) ‘design basis accident’ means accident conditions in the event of which the correct functioning of safety systems ensures that the corresponding exposure reference levels or limits are not exceeded,
i) ‘postulated initiating event’ means a deviation from normal operation, which is random, anticipated and included in the design basis and the progression of which may lead to abnormal operation or accident conditions,
j) ‘design extension conditions’ mean accident conditions triggered by scenarios more serious than design basis accident, which are taken into account in nuclear installation design,
k) ‘severe accident’ means accident conditions involving serious damage of nuclear fuel either due to serious damage to and irreversible loss of the structure of the core of the nuclear reactor or the system for nuclear fuel storing due to damage to fuel assemblies as a result of nuclear fuel melt,
l) ‘fundamental design basis’ means the design basis which, if complied with or not exceeded, ensures that no event more serious than a design basis accident will occur,
m) ‘safety system’ means the system designed to ensure reliable performance of the fundamental safety function in the event of abnormal operation or a design basis accident,
n) ‘passive function of a system, structure or component’ means the function of a system, structure or component, which does not require activation, mechanical propulsion or supplies of a medium or energy from another system in order to be performed, and
o) ‘safety limit’ means the limit value of a parameter characterising the state of a nuclear installation or other specification of a safety, technical or administrative condition beyond which nuclear safety, radiation protection or technical safety is jeopardised as a result of a failure of a system, structure or component.

§ 3

For the purposes of this Decree, the following definitions shall apply
a) ‘conservative approach’ means the method of assessing, by means of expert estimates or statistical evaluation, the impact of the uncertainties of knowledge, input data and methods and models used in such a manner that the result of the assessment of the item under consideration includes the least favourable credible variants,
b) ‘realistic approach’ means the method of assessing, by means of expert estimates or statistical evaluation, the impact of the uncertainties of knowledge, input data and methods and models used where the result represents the most probable variant,
c) ‘safety margin’ means the value expressing the difference between the safety limit and the acceptance criterion established using the conservative approach,
d) ‘environment qualification’ means the ability of a system, structure or component to meet the requirements set out by technical specifications for its function in the working environment and in conditions triggered by the characteristics of the location for the nuclear installation siting (hereinafter referred to as ‘location characteristics’),
e) ‘fuel element’ means nuclear material hermetically sealed by a cladding,
f) ‘fuel assembly’ means the set of fuel elements loaded into the nuclear reactor as a single unit and enabling the handling of nuclear fuel as determined in the nuclear installation design,

g) ‘fuel system’ means the set of fuel assemblies specified in the nuclear installation design and other components of the core needed to control reactivity and maintain the design structure of fuel assemblies in the core,
h) ‘single failure’ means an event which results in the loss of capability of a system, structure or component to perform its intended function, while the functions of other systems, structures and components are maintained; subsequent failures within the same system resulting in the loss of capability of another structure or component to perform their intended functions caused by single failure shall be considered part of this single failure,
i) ‘common-cause failure’ means the failure or malfunction of several systems, components, structures by the action of a common cause, which leads to the loss of their safety functions,
j) ‘ ‘fuel element disruption’ means the disruption of the hermetic cladding of the fuel element making the release of a radioactive substance from the fuel element possible,
k) ‘design limit’ means the acceptance criterion used to assess the capability of a nuclear installation or its structure, system or component to perform its function as intended in the nuclear installation design; design limit is, in particular, a limit set out by legislation or an acceptance criterion derived therefrom, which corresponds to the method of assessment of the capability of the nuclear installation to perform its function as intended in the nuclear installation design,
l) ‘stabilised subcritical state’ means a stabilised state of a nuclear installation achieved in abnormal operation and under accident conditions by the action of systems specified by the nuclear installation design, in which the nuclear reactor is subcritical and fundamental safety functions are ensured for the period needed to apply measures to bring the nuclear installation into a safe state,
m) ‘instrumentation and control system’ means the systems, structures and components used for measuring, evaluating and displaying the nuclear installation parameters for the needs of the nuclear installation operators and for nuclear installation control, including start-up and management of interventions necessary to ensure nuclear safety, radiation protection, radiation extraordinary event management and security,
n) ‘containment system’ means the systems, structures and components intended in the nuclear installation design to prevent the propagation of ionising radiation and release of radioactive substances from the nuclear reactor and to protect the nuclear reactor against the action of location characteristics and external threats,
o) ‘diversion means’ mean the system, structure, component or organisational measure to ensure or substitute a safety function in the event of a loss thereof due to a common-cause failure,
p) ‘alternative means’ mean the system, structure, component or organisational measure to manage design extension conditions in situations where, due to a common-cause failure, a loss of the function of the safety system or the function of the diversion means specified in the nuclear installation design may occur when ensuring fundamental safety function,
q) ‘main control room’ means the room where nuclear installation operators can oversee the operation of nuclear installations with a nuclear reactor and control them in operational states and under accident conditions.

PART TWO

COMPLIANCE WITH THE PRINCIPLES FOR THE SAFE USE OF NUCLEAR ENERGY FULFILMENT

Title I

General rules for compliance with the principles for the safe use of nuclear energy

§ 4

Safety objectives of nuclear installation design

(1) Nuclear installation design, including nuclear installation design modification, shall fulfil the following safety objectives:

a) prevent accident conditions,
b) mitigate the consequences of accident conditions, if they occur,
c) ensure that the following are practically eliminated matter
   1. a radiation accident when there is not sufficient time to implement urgent action to protect the population (hereinafter referred to as 'early radiation accident') and
   2. a radiation accident requiring urgent action to protect the population that cannot be limited in terms of location or time (hereinafter referred to as 'large radiation accident'),
d) ensure nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security when managing radioactive waste and decommissioning the nuclear installation,
e) take into account human factor impact on the function of the nuclear installation and each of its systems, structures and components with impact to nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management and security, and the impact of the nuclear installation properties on human performance, and
f) implement the processes ensuring compliance of the nuclear installation design throughout the life cycle of the nuclear installation with the current state of
   1. experience from the operation of nuclear installations,
   2. international experience,
   3. the nuclear installation with regard to ageing of its systems, structures and components, and
   4. science and technology.

(2) The design of safeguarded installations shall comply with the technical requirements concerning safeguards of the International Atomic Energy Agency arising from international treaties binding on the Czech Republic[2)].

(3) The technical requirements referred to paragraph 2 shall be understood the technical requirements for the provision for independent power supply and lighting, or for the structure

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2) Agreement between the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the European Atomic Energy Community and the International Atomic Energy Agency in implementation of Article III(1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons, promulgated under No 35/2010.
Additional Protocol to the Agreement between the Republic of Austria, the Kingdom of Belgium, the Kingdom of Denmark, the Republic of Finland, the Federal Republic of Germany, the Hellenic Republic, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of Netherlands, the Portuguese Republic, the Kingdom of Spain, the Kingdom of Sweden, the European Atomic Energy Community and the International Atomic Energy Agency, in implementation of Article III(1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons, promulgated under No 36/2010.

and its modification enabling effective inspection by the International Atomic Energy Agency of a safeguards in facility.

§ 5

Circumstances affecting nuclear installation design and operation

Nuclear installation design shall, in the context of ensuring resistance and protection of the nuclear installation against the hazards arising from the characteristics of the location for siting the nuclear installation and the occurrence of internal events and conditions, take into account

a) random failure of systems, structures and components,
b) internal event caused by
    1. the location characteristics,
    2. on-site conditions,
    3. a consequence of the nuclear installation failure and
    4. error of nuclear installation operators, and
c) the scenario induced by the combined effect of location characteristics, internal events and abnormal operation or accident conditions caused by these effects including interaction of all nuclear installations on the site location.

Application of defence-in-depth

§ 6

(1) Nuclear installation design shall, in the context of assurance of fulfilling requirements for the application of defence-in-depth, set out requirements for the nuclear installation ensuring

a) the application of defence-in-depth for all activities relevant to utilisation of nuclear energy,
b) the creation of a successively backing-up physical safety barriers series that are inserted between radioactive materials and the surroundings of the nuclear installation,
c) systems, structures and components and procedures for the application of the safety functions to protect the integrity and functionality of physical safety barriers within the individual levels of defence-in-depth and
d) the advert of a radiation extraordinary event occurrence by using physical safety barriers.

(2) For nuclear installations with a nuclear reactor, the function of physical safety barriers shall be ensured by independent systems, structures and components which are

a) fuel element cladding,
b) the pressure boundary of the primary circuit of the nuclear reactor (hereinafter referred to as the ‘primary circuit’) and
c) the containment system.

(3) The function of physical safety barriers of nuclear installations without a nuclear reactor shall be ensured by

a) packaging assemblies or
b) others systems, structures and components for
    1. the fabrication, processing, storing and manipulation with nuclear material or other radioactive substance, or
    2. radioactive waste treatment and disposal .

(4) In the context of ensuring compliance with requirements for the application of defence-in-depth, nuclear installation design shall ensure, as far as reasonably practicable, effective prevention of

a) threats to the integrity and function of physical safety barriers,
b) the loss of function of one or more physical safety barriers caused by an initiating event,
c) the loss of function of one physical safety barrier as a result of the loss of function of another physical safety barrier and
d) the loss of function of a physical safety barrier caused by operator error or error in maintenance of the nuclear installation, and
e) the loss of function of the last physical safety barrier in the event of a severe accident prior to the safety objectives referred to in § 4(c), point 1, have been met.

(5) Nuclear installation design shall, in the context of ensuring compliance with requirements for the application of defence-in-depth, set out technical and organisational measures for prevention and management of abnormal operation, design basis accidents and design extension conditions, including severe accident.

(6) As ‘reasonably practicable’ shall be taken to mean a compliance with a requirement set out in this Decree if the risk of a radiation accident due to insufficient capability of the nuclear installation to meet the safety objectives is reduced, while the reasons and conditions for exploitation of the nuclear installation do not change significantly.

§ 7

(1) The operation of a nuclear installation in the event of a loss of the safety function of a physical safety barrier may be admissible in nuclear installation design, if the risk analysis for selected operational states of the nuclear installation with respect to the existence of other physical safety barriers demonstrates that nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event t management and security are ensured.

(2) Nuclear installation design shall, in the context of ensuring compliance with requirements for the application of defence-in-depth, ensure that a failure of a system, structure or component or loss of a safety function at one level does not reduce the effectiveness of the safety functions at the subsequent levels of defence-in-depth necessary to remedy or mitigate the consequence of an initiating event.

(3) In order to create systems of subsequent defence-in-depth levels, the nuclear installation design may only use those systems, structures and components of the systems of the preceding defence-in-depth level that has been broken which

a) have not been compromised in the course of the development of the nuclear installation response to an off-site or on-site initiating event or scenario and
b) are separable from the compromised or unusable parts of the systems of the preceding defence-in-depth level that has been broken.

(4) If the procedures for managing design extension conditions in the nuclear installation design envisage the use of alternative systems and procedures comprising the application of mobile means, the nuclear installation design shall ensure the creation of connection points in the nuclear installation which

a) are physically accessible under design extension conditions,
b) make possible to adhere the radiation protection rules with regard to operating personnel and
c) provide for the planned use of mobile means.

(5) In order to manage design extension conditions, the design of nuclear installations with a nuclear reactor shall ensure reasonably practicable technical and organisational measures to achieve such robustness of the nuclear installation that

a) a severe accident, which could lead to an early radiation accident or a large radiation accident, is a practically eliminated matter and
b) a severe accident that is not included within the scope of practically eliminated matters and which could lead to a radiation accident is managed in such a manner that no protective measures stricter than those referred to in § 104(1)(a) and (b), points 2 and 3, of the Atomic Act are necessary.

(6) Nuclear installation design shall determine and evaluate reasonably practicable measures for managing a postulated severe accident corresponding to the type of the nuclear installation so that

a) the damaged and melting core and the stored nuclear fuel or nuclear material being handled are cooled and the melt from the damaged and melting core is retained,
b) the progression of the subsequent fission chain reaction is prevented and
c) the safety objectives of the design referred to in § 4(c) are met.

(7) The requirement referred to in paragraph (6) shall also be fulfilled if, using the conservative approach, it is demonstrated in the nuclear installation design documentation that the occurrence of a severe accident is a practically eliminated matter.

Requirements for selected equipment and safety functions

§ 8

(1) Nuclear installation design shall, in the context of ensuring compliance with requirements for selected equipment, set out technical specifications containing the technical requirements for the design, manufacture, assembly, checks and maintenance of selected equipment and hereafter the requirements for

a) reliable energy supply for selected equipment in all states of the nuclear installation for the management of which the selected equipment is intended in the nuclear installation design,
b) resistance of selected equipment against the working environment conditions,
c) resistance of selected equipment to the loads resulting from the nuclear installation location characteristics,
d) reliability of selected equipment in standby mode and
e) the quality assurance level for selected equipment.

(2) Nuclear installation design shall, in the context of ensuring compliance with safety functions according to their categorisation, classify systems, structures and components as

a) systems, structures and components without impact to nuclear safety,
b) systems, structures and components with impact to nuclear safety that are not selected equipment and
c) selected equipment, namely
    1. selected equipment other than safety systems and
    2. safety systems.

(3) Nuclear installation design shall, in the context of ensuring performance of safety functions in compliance with their categorisation, to subdivide safety systems according to the functions they provide into functional groups

a) protection instrumentation and control systems (hereinafter referred to as ‘protection systems’),
b) execution systems and
c) auxiliary systems.

(4) Nuclear installation design shall determine requirements for the systems referred to in paragraph (3) so that

a) protection systems monitor quantities or states of the nuclear installation important to nuclear safety and automatically activate interventions from execution systems designed to prevent hazardous or potentially hazardous conditions,
b) execution systems ensure the relevant safety functions as soon as activated by protection systems and
c) support features ensure support functions for safety functions of protection systems and execution systems.

(5) Nuclear installation design shall determine requirements for the systems referred to in paragraph (2) (c) fulfilling a passive function of the system, structure or component which is safety function Category I according the Annex 1 of this Decree so its systems, structures and components shall be designed with robustness and quality ensuring, that its failure is practically eliminated matter, including cases where any other design measure for management of design basis accident caused by their failure exists.

(6) Nuclear installation design shall determine requirements for the systems, structures and components referred to in paragraph (2)(b),

a) which are intended to reduce the impacts of a failure or malfunction of selected equipment or
b) whose failure may have a negative effect on systems, structures and components referred to in paragraph (2)(c).

(7) Nuclear installation design shall determine the requirements for selected equipment and the systems, structures and components referred to in paragraph (2)(b) intended by nuclear installation design for the prevention and management of design extension conditions so that they have

a) the capacity and characteristics to meet their purpose and
b) the environmental qualification to ensure their safety functions for the time period needed.

(8) The requirements referred to in paragraphs from (5) to (7) shall be determined in the technical specifications referred to in paragraph (1) in compliance with

a) the importance of the safety function to the performance of which the systems, structures and components contribute, and
b) the impact of a loss of function and integrity of these systems, structures and components on the performance of any safety function.

§ 9

(1) Nuclear installation design shall classify selected equipment, or parts thereof, that fulfil several safety functions into safety classes corresponding to the safety function with greatest impact to nuclear safety.

(2) Nuclear installation design shall ensure that a failure of selected equipment does not cause a failure of selected equipment classified in a higher safety class.

(3) Nuclear installation design shall classify the structures and components of support features ensuring the operability of selected equipment.

(4) The structures and components of support features shall be classified into the same safety class as that of the selected equipment the operability of which is ensured by the support system if it is demonstrated that a single failure of the supporting system structure or component will cause immediate loss of supported selected equipment safety function.

(5) Nuclear installation design shall ensure that a failure of a support system does not reduce

a) the performance of safety functions by more than one of the redundant parts of the safety system, or
b) the performance of the function of diverse means ensuring or compensating the safety function of the safety system endangered by this failure.

(6) Nuclear installation design shall specify the scope of tests or calculation procedures to verify the characteristics of selected equipment throughout the period of its design life in the environment corresponding to its operating conditions and its design function in accident conditions, in particular for :

a) stress resistance,
b) functionality,
c) reliability and
d) environmental qualification.

(7) Nuclear installation design shall determine which components, parts or elements of selected equipment are important for the performance of the safety function and classify them into safety classes.

(8) The listing of safety functions that shall be fulfilled by nuclear installation, their categorisation according to its impact to nuclear safety and the safety classes and criteria for classifying selected equipment into safety classes are specified in the Annex 1 to this Decree.

Design basis

§ 10

(1) The design basis shall determine the values of the parameters important for designing the nuclear installation and resulting requirements for nuclear installation design robustness, in particular

a) the parameters of the expected states of the nuclear installation, including the state after a postulated internal initiating event in the nuclear installation anticipated in nuclear installation design,
b) the acceptance criteria for the consequences of the states of the nuclear installation anticipated in nuclear installation design,
c) the parameters of the impact of location characteristics, the severity of which is identified in the assessment of the location for siting the nuclear installation,
d) the data from the security plan based on an analysis of the consequences of an intentional attack against the nuclear installation using an aircraft and
e) the data characterising the safety functions ensured by the systems, structures and components of the nuclear installation.

(2) The design basis shall determine

a) the categories of intensity of the imposed loads on the nuclear installation induced by location characteristics and the frequency of incidence of these loads,
b) the categories of the frequency of incidence of anticipated states of the nuclear installation,
c) requirements to environmental qualification of systems, structures and components,
d) the categories of the consequences of anticipated states of the nuclear installation and
e) the acceptance criteria relevant to the categories of the anticipated states of the nuclear installation and the consequences of these states.

(3) In the nuclear installation design process, the fundamental design basis shall be established in the context of the design basis.

(4) The fundamental design basis shall set requirements for reasonably practicable resistance of systems, structures and components of the nuclear installation with impact to nuclear safety to the location characteristics. The intensity of these location characteristics shall be determined by evaluating the location characteristics as to the frequency of their incidence at which compliance with safety objectives will be ensured.

(5) The resistance of systems, structures and components of the nuclear installation with impact to nuclear safety referred to in paragraph (4) shall ensure that, for the determined intensity of location characteristics, it is very likely that only random failures of systems, structures and components of the nuclear installation with impact to nuclear safety will occur.

§ 11

(1) The fundamental design basis shall determine the external design basis events for the location for siting the nuclear installation. These external design basis events shall be the limit value for the loads on systems, structures and components of the nuclear installation imposed by the location characteristics and the combinations thereof, at which the safety objectives of the nuclear installation design can be expected to be fulfilled with high degree of confidence.

(2) When determining external design basis events all events caused by the location characteristics included in the assessment of the location for the nuclear installation siting shall be considered.

(3) The intensity of an external design basis event shall be equal to intensity of assessed characteristic of the location with frequency of incidence equal or lower than once in 10 000 years, except for those location characteristics for which, based on the method used to assess the location for siting the nuclear installation, different incidence frequencies of the characteristic of the location and the corresponding acceptance criteria must be used.

(4) The design basis external events for the design and assessment of resistance of selected equipment and systems, structures and components with impact to nuclear safety necessary for managing accident conditions and radiation accidents shall

a) for determination of seismic resistance, to base it on the postulated peak horizontal acceleration of the subsoil under the structure that carries this system, construction or component, which shall not be less than 1/10 of gravitational acceleration and
b) for determination of resistance to accidental fall of aircraft or other objects, to base on the intensity of the effects of the fall of such an object, the frequency of the fall on the site location of which is greater than once per 10 000 000 years.

§ 12

(1) The design basis shall ensure compliance with the principles for the safe use of nuclear energy for

a) design basis external events and their very likely combinations, with the initial state of the nuclear installation and possible accompanying failures determined by application of conservative approach, that do not prevent from effective intervention of safety systems and
b) external design events and scenarios which, due to their frequency of incidence and severity, fall within the scope of design extension conditions.

(2) Compliance of nuclear installation design with the requirement referred to in paragraph (1)(a) shall be ensured

a) through resistance of selected equipment and systems, structures and components with impact to nuclear safety other than selected equipment so that they withstand with a margin the consequences of design basis external events and working environment,
b) by using passive functions of systems, structures and components to ensure safety functions, if reasonably practicable,
c) by automatic intervention from safety systems and intervention of other systems with impact to nuclear safety on the basis of interventions by operators in accordance with internal procedures in the event of a subsequent failure caused by an event referred to in paragraph (1)(a) and
d) without affecting negatively the protection against other internal events caused by external design events.

(3) When ensuring compliance with the requirement referred to in paragraph (1)(b), nuclear installation design shall

a) take into account the foreseeable possibilities of further progression and consequences of the external design event,
b) take into account the impact of the external design event on
    1. common-cause failures in redundant systems, structures and components,
    2. failures of multiple nuclear installations located in the same location for siting of nuclear installation,
    3. threats to regional infrastructure and external supply of resources and
    4. limitation of protective measures feasibility,
c) ensure sufficient capacity and means for managing accident conditions and radiation accidents caused by external design events in location for the nuclear installation siting with multiple nuclear installations expected to share supporting equipment and services,
d) include the means and procedures for the incidence of location characteristics monitoring and provision of alerts about them,
e) determine the intervention levels for monitored parameters from the location characteristics monitoring for activation of preventive measures in the nuclear installation and on-site and off-site protective measures and initiation of checks of the nuclear installation after an external design event and
f) determine measures for the personnel exchange and provision for supplies of the necessary resources in the case of long-lasting event progress .

(4) When ensuring compliance of nuclear installation design with the requirement referred to in paragraph (1)(b), external design events and the corresponding scenarios falling within the scope of design extension conditions shall be assessed and the nuclear installation design shall propose reasonably practicable measures focused to extreme events.

(5) When assessing external design events and scenarios of the events referred to in paragraph (4), an analysis shall be made

a) determining the levels of severity of external events at which the performance of basic safety functions cannot be ensured,
b) demonstrating that systems, structures and components with impact to nuclear safety that can be used for managing accident conditions have a reserve capacity until the lose of their resistance and functionality,
c) specifying the means of ensuring compliance with the principles for the safe use of nuclear energy and
d) demonstrating compliance with the requirements referred to in paragraph (3)(d) to (f).

(6) Based on the results of the analysis referred to in paragraph (5), procedures for the application of the means referred to in paragraph (5)(c) shall be determined.

Title II
Rules for compliance with the principles for the safe use of nuclear energy in the case of special activities and nuclear installations

Compliance with the principles for the safe use of nuclear energy when handling and storing nuclear fuel

§ 13

(1) Nuclear installation design shall determine requirements for compliance with the principles for the safe use of nuclear energy when handling and storing fresh and irradiated nuclear fuel for

a) fresh nuclear fuel in
   1. individual nuclear facilities for storing fresh nuclear fuel or
   2. the spaces of nuclear installations with a nuclear reactor intended for storing fresh nuclear fuel and

b) irradiated nuclear fuel in an irradiated nuclear fuel storage facility, which are areas of a nuclear installation or a storage facility for spent nuclear fuel, (hereinafter referred to as ‘irradiated nuclear fuel storage facility’), in particular an irradiated nuclear fuel storage facility with a liquid cooling medium (hereinafter referred to as ‘storage pool’) .

(2) Nuclear installation design shall, with regard to requirements for compliance with the principles for the safe use of nuclear energy when handling and storing fresh and irradiated nuclear fuel, ensure that

a) the physical safety barriers are protected by means of defence-in-depth based in particular on the inherent characteristics or passive functions of systems, structures and components,
b) periodic checks and tests of selected equipment are performed,
c) the likelihood of damage to or loss of nuclear fuel is minimised,
d) nuclear fuel is prevented from falling during transport,
e) any objects are prevented from falling on the fuel assembly and
f) the stored nuclear fuel is kept subcritical by means of suitable spatial distribution thereof or other physical means and procedures specified using the conservative approach so that the values below are not exceeded
   1. 0.95 of the effective neutron multiplication coefficient under the assumed conditions of a design basis accident or
   2. 0.98 of the effective neutron multiplication coefficient under the conditions of optimal moderation.

§ 14

(1) The design of nuclear installations with a nuclear reactor shall set requirements for compliance with the principles for the safe use of nuclear energy when handling and storing irradiated nuclear fuel in an irradiated nuclear fuel storage facility.

(2) The irradiated nuclear fuel storage facility design shall, with regard to requirements for compliance with the principles for the safe use of nuclear energy when handling and storing irradiated nuclear fuel, ensure

a) the removal of residual heat of irradiated nuclear fuel in operational states and design basis accidents,
b) sufficient capacity of the irradiated nuclear fuel storage facility allowing the handling of fuel assemblies for the needs of checks, location of damages and its repairs carrying out and unloading of nuclear fuel from the core,
c) sufficient capacity of the irradiated nuclear fuel storage facility allowing a handling of packages containing irradiated nuclear fuel or individual fuel assemblies, when decommissioning the nuclear installation with nuclear reactor or in the event of unexpected operational problems, in a manner ensuring nuclear safety and radiation protection,
d) technical means for the storage pool enabling
    1. to perform regular checks and tests to monitor the integrity of fuel elements and fuel assemblies,
    2. to store and handle defective fuel elements or damaged fuel assemblies,
    3. separated storing of irradiated nuclear fuel that does not meet the design criteria relating to irradiated nuclear fuel integrity, to the content of other radioactive materials in the fuel, to tests of fuel elements and fuel assemblies or to the possibility of repairing fuel assemblies,
    4. to check the chemical composition and content of radionuclides in the liquid medium in which irradiated nuclear fuel is stored or handled,
    5. to monitor and control the temperature and coolant levels in the storage pool and detect leakage from this pool,
    6. to keep, using operational and diverse means, the cooling capacity of the storage pool in all operational states and accident conditions of the nuclear installation such as to prevent the uncovering of fuel assemblies and
    7. to connect alternative means capable of ensuring long-term cooling of the storage pool under design extension conditions.

(3) The nuclear installation design shall determine the alternative means for handling of nuclear fuel for situations where it is not possible to use the means intended by the design for operational handling of fuel assemblies or fuel elements.

§ 15

(1) Calculation analyses used in nuclear installation design demonstrating subcriticality of nuclear fuel during storing shall, by using the conservative approach, take into account impact of

a) the geometric and material characteristic of the facility for nuclear fuel storing, in particular
    1. the geometry of this facility, including the properties of the construction materials used,
    2. the pitch between the fuel elements in the fuel assembly and
    3. the number and level of the fuel elements enrichment,

b) the presence of dissolved boron in the storage pool,
c) the burning out absorbers integrated with the fuel, taking into account
   1. the type, distribution and quantity of the integral burning out absorber and
   2. the highest neutron multiplication capacity of nuclear fuel and
d) the fuel burn-up, if
   1. its neutron multiplication factor can be assessed and
   2. it is concerned in spent nuclear fuel used in the core for at least one fuel campaign.

§ 16

Compliance with the principles for the safe use of nuclear energy at decommissioning of a nuclear installation

(1) Nuclear installation design shall set requirements for compliance with the principles for the safe use of nuclear energy when decommissioning a nuclear installation in accordance with the requirements under the decree on the requirements for the safe management of radioactive waste and on the decommissioning of nuclear installations or category III or IV workplaces.

(2) Nuclear installation design shall set the following requirements for compliance with the principles for the safe use of nuclear energy when decommissioning a nuclear installation:

a) the technical and organisational measures enabling to carry out decommissioning shall be specified,
b) the timetable for the individual methods of decommissioning shall be established,
c) requirements for the final state of the location where the nuclear installation is sited after all decommissioning activities have been completed shall be specified,
d) the quantity of the material to be managed in the course of decommissioning shall be established,
e) the methods of reducing contamination due to seepage and leaks shall be specified, in particular
   1. by limiting the number of built-in piping channels in floors and walls,
   2. by limiting the use of underground tanks, vaults and drainage channels for radioactive materials and
   3. by providing possibilities for separating of the technological systems working with radioactive and non-radioactive materials,
f) the material composition of systems, structures and components directly exposed to the neutron flux shall be such as to minimise the production of materials with induced radioactivity,
g) the chemical regimes in the primary circuit shall be such that the corroded layers of the materials in this circuit are stabilised,
h) direct or differently but suitably laid and arranged pipeline routes shall be used; their surface working shall be such as to prevent, or allow the maintenance to prevent, the deposition of radioactive or contaminated material,
i) requirements for the technical and organisational measures for carrying out the decontamination of systems, structures and components shall be specified,
j) requirements for the technical and organisational measures for reducing of the concrete contamination in the event of leakages and of the degradation processes at metal-concrete interfaces shall be specified,
k) the use of hazardous substances shall be limited to the lowest reasonably practicable level,
l) easy access to and easy disassembly of contaminated systems, structures and components shall be ensured,

m) the possibility of decontamination using remote-controlled means shall be ensured where other methods cannot be used,
n) the links with other nuclear installations sited in the same location for siting of nuclear installations shall be taken into consideration,
o) measures for the keeping of documentation and collection of operational data for the needs of decommissioning shall be specified and
p) 3D digital modelling of the nuclear installation shall be used to document and keep the record of systems, structures and components with impact on nuclear safety when decommissioning this nuclear installation.

(3) The design of a nuclear installation shall identify the systems, structures and components intended for the operation and decommissioning of the nuclear installation and exclusively for the decommissioning of the nuclear installation, and shall lay down the requirements for their use in the decommissioning of the nuclear installation.

§ 17

Compliance with the principles for the safe use of nuclear energy when managing the radioactive waste

(1) Nuclear installation design shall set requirements for the nuclear installation to ensure that radioactive waste is handled in compliance with the principles set out by the Atomic Act, the decree concerning radiation protection and security of radionuclide sources and the decree on the requirements for the safe management of radioactive waste and on the decommissioning of nuclear installations or category III or IV workplaces.

(2) Nuclear installation design shall ensure performance of fundamental safety functions using methods corresponding to the properties and manageability of radioactive waste.

(3) Nuclear installation design shall set requirements for the equipment used to manage radioactive waste before its disposal so that

a) it is accessible for the needs of maintenance and repair,
b) it is easy to decontaminate,
c) it allows for supervision of the radioactive waste management in accordance with the requirements of the decree on the requirements for the safe management of radioactive waste and on the decommissioning of nuclear installations or category III or IV workplaces,
d) it allows the removal of radioactive material deposits or sediments,
e) it allows the collection and recycling of radioactive material leaked from this facility and
f) allows a regular monitoring of quantities demonstrating proper function of the facility.

(4) Nuclear installation design shall set requirements for the facility used when processing and conditioning a radioactive waste containing explosive or flammable substances so that

a) it is resistant to the effects of explosion or fire and
b) includes a system for the monitoring of quantities that have an effect on explosivity or risk of fire and ensuring that nuclear installation operators are alerted in the event of an increased risk of explosion or fire.

§ 18

Compliance with the principles for the safe use of nuclear energy by radioactive waste storage facilities

(1) The design of a nuclear installation which is a radioactive waste storage facility, shall ensure

a) preferential use of systems, structures and components with passive system function, construction or components for ensuring basic safety functions of the radioactive waste storage facility,
b) safe handling of radioactive waste, its storage and retrieval under all foreseeable situations,
c) prevention of damage to the packaging for storing radioactive waste storage when radioactive waste or the packaging are handled,
d) that the integrity of the packaging for storing radioactive waste can be regularly checked,
e) sufficient reserve storage capacity for relocation, repackaging, inspection, maintenance, and retrieval of radioactive waste,
f) equipment of the radioactive waste storage facility with systems, structures and components to ensure its functions corresponding to the type, form, activity and quantity of the radioactive waste stored and
g) technical and organisational measures enabling regular check of the condition and equipment of the radioactive waste storage facility.

(2) The design of a nuclear installation which is a radioactive waste storage facility shall, for the purposes of storing liquid radioactive waste, ensure

a) that the storage tanks are leak-proof,
b) that the storage tanks are protected against corrosion,
c) that the storage tanks are protected against overfilling,
d) systems for monitoring the storage tank filling level,
e) that the storage tanks are placed in protective pits that can contain the volume of liquid radioactive waste from the storage tanks,
f) for protective pits
    1. that they are watertight,
    2. that leakage of radioactive waste from storage tanks is signalled and
    3. equipped with pumping equipment for its content withdrawal,
g) removal of vapours from storage tanks and protective pits and treatment thereof as radioactive waste,
h) that the content of the storage tanks and protective pits can be homogenised and removed,
i) that an empty tank with a capacity corresponding to that of the largest tank within the system is available for each storage tank system and
j) for storage in containers
    1. impermeability of the floors and walls of the radioactive waste storage facility to such a height as to prevent the release of the liquid radioactive waste into the environment even if the maximum quantity of liquid waste is leaked from the container and
    2. that the floor is sloped to a drainless impermeable protective pit.

§ 19

Compliance with the principles for the safe use of nuclear energy by radioactive waste disposal facilities

(1) The design of a nuclear installation which is a radioactive waste disposal facility shall ensure that

a) the most unfavourable properties of the disposed radioactive waste are taken into account,
b) systems, structures and components with a passive function are used as far as reasonably practicable,
c) the radioactive waste disposal facility complies with
    1. the requirements for the location characteristics in which it is sited, in accordance with the decree concerning the siting of nuclear installations,
    2. the planned quantity and properties of radioactive waste, in accordance with the decree on the requirements for the safe handling of radioactive waste and on the decommissioning of nuclear installations or category III or IV workplaces,
    3. normal operation conditions and developments in the state of the siting location and the state of the nuclear installation anticipated in the nuclear installation design in the course of its life cycle and after the radioactive waste disposal facility has been shut down,
    4. alternative scenarios of future developments in the state of the siting location and the state of the nuclear installation that could lead to operational occurrences and radiation emergencies, and
    5. the effect of ageing of the used systems, structures and components with passive function,
d) the components of the radioactive waste disposal facility are chemically and physically compatible with the disposed radioactive waste and the host environment inside this disposal facility,
e) the storage location of the radioactive waste disposal facility are protected against two-way water seepage when in operation,
f) the possibility of contact of the disposed radioactive waste with water is minimised during operation and
g) the radioactive waste disposal facility is protected against flooding or swamping, especially by rainwater or groundwater, after its closure.

(2) The design of a nuclear installation which is a radioactive waste disposal facility shall also ensure that

a) the original properties of the geological environment are preserved as far as possible when constructing the radioactive waste disposal facility,
b) there is a system for monitoring the radioactive waste disposal facility and the surrounding location to monitor
    1. the groundwater flow in the location where the radioactive waste disposal facility is sited,
    2. ingress of water into the radioactive waste disposal facility and filling of it and
    3. leakage of radionuclides from the radioactive waste disposal facility into the environment,
c) clogging or blockage of the drainage system, if part of the radioactive waste disposal facility , is prevented,
d) water which has penetrated the storage location of the radioactive waste disposal facility when filling it is removed and handled safely,

e) the correct functioning of the drainage system can be checked at least once a year throughout the period of operation and
f) the properties of the rock environment with impact to nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security and functioning of the system referred to in point (b) during the period after closure of the radioactive waste disposal facility, are preserved.

PART THREE

PREVENTION, RESISTANCE AND PROTECTION OF NUCLEAR INSTALLATIONS AGAINST INTERNAL EVENTS

§ 20

Design basis internal postulated initiating events

(1) Nuclear installation design shall determine a list of design basis internal postulated initiating events using conservative approach for which the nuclear installation resistance would be secured.

(2) The list of design basis internal postulated initiating events shall be established on the basis of an engineering judgement using deterministic and probabilistic methods of analysis or their combination.

(3) The list of design basis internal postulated initiating events shall comprise events that may

a) randomly arise during the operation of the nuclear installation in accordance with the nuclear installation design and may have a significant impact on nuclear safety of the nuclear installation or
b) be caused by events triggered by
   1. characteristics of the location or,
   2. human activity.

(4) Design basis internal postulated initiating events shall include, in particular

a) random single failure on systems, structure or component,
b) incorrect intervention by an operator or
c) a combination of design basis internal postulated initiating event according letter a) or b) and failures or events in the nuclear installation arising as a result of location characteristics taken into account in the fundamental design basis.

§ 21

Postulated initiating events and scenarios for design extension conditions

(1) Nuclear installation design shall determine a list of postulated initiating events and scenarios for design extension conditions.

(2) The list of postulated initiating events and scenarios for design extension conditions shall be established on the basis of an engineering judgement using deterministic and probabilistic methods of analysis.

(3) The list of single postulated initiating events and scenarios for design extension conditions shall comprise events that may be triggered as a result of hidden faults of nuclear installation design or location characteristics whose intensity exceeds the level of design basis external events.

(4) In the context of ensuring that the nuclear installation design can cope with design extension conditions without severe damage of nuclear fuel, the coping with postulated initiating events and scenarios for design extension conditions listed below shall be addressed technically in particular for

a) unusual concurrence of multiple initiating events that occur randomly in the states of the nuclear installation,
b) concurrence of internal initiating events triggered by particularly serious internal events or location characteristics,
c) common-cause failures on selected equipment,
d) concurrent common-cause failures on all nuclear reactors or spent nuclear fuel storage facilities, which are located in the same location for siting of nuclear installations and
e) events that can affect all nuclear installations and other installations located in the same location for siting of nuclear installations, to cause an interaction between them and affect the surrounding infrastructure.

(5) If design extension conditions corresponding to severe accident occur, the nuclear installation design shall ensure that these are managed in such a manner that the safety objectives of the nuclear installation design for coping with this type of events are fulfilled.

(6) Nuclear installation design shall ensure that there are means available during design extension conditions to keep the core and the storage pool for irradiated nuclear fuel subcritical over a long time.

(7) Nuclear installation design shall ensure that, under design extension conditions, the nuclear installation is not dependent on external supplies of energy and inputs for support of safety functions for the period during which these cannot be restored with sufficient reliability.

§ 22

Categorisation of internal postulated initiating events and scenarios

(1) The defence-in-depth concept in nuclear installation design shall be based on categorisation of internal postulated initiating events and for scenarios, which shall be determined with a respect to their anticipated frequency of occurrence and severity of the possible radiation extraordinary event with the goal to optimize the measures of radiation protection.

(2) Radiation and technical design acceptance criteria shall be specified for each category of internal postulated initiating events so that

a) initiating events with a high frequency of occurrence can result to a first-degree radiation extraordinary event or radiation incident and
b) radiation accidents shall have a very low frequency of occurrence.

(3) The radiation design acceptance criteria for each category of internal postulated initiating events and scenarios shall be specified in accordance with the requirements of the Atomic Act for optimising radiation protection of the population.

(4) The categorisation of internal postulated initiating events and scenarios shall differentiate between groups of internal postulated initiating events and scenarios with

a) a high frequency of occurrence, which means the occurrence of one or more internal postulated events of the same type over a period longer than one year of operation of the nuclear installation; only events fulfilling radiation acceptance criteria for abnormal operation may be included in this category,

b) a moderate frequency of occurrence, which means the occurrence of internal postulated initiating events of the same type over a period longer than 10 years of operation of the nuclear installation; internal postulated initiating events which meet radiation acceptance criteria for less severe design basis accidents shall be included in this category,
c) a low frequency of occurrence, which means the occurrence of internal postulated initiating events of the same type over a period longer than the lifetime of the nuclear installation; internal postulated initiating events which meet radiation acceptance criteria for of more severe design basis accidents shall be included in this category, and
d) a very low frequency of occurrence, which means the occurrence of internal postulated initiating events or scenarios over a period 100 times longer than the lifetime of the nuclear installation; internal postulated initiating events and scenarios of design extension conditions shall be included in this category.

§ 23

Ensuring prevention, resistance and protection of the nuclear installation against the effects of fire, explosion or products of combustion in the nuclear installation

(1) Nuclear installation design shall determine requirements for ensuring prevention, resistance and protection of the nuclear installation against the effects of fire, explosion or products of combustion in the nuclear installation so that systems, structures and components with impact to nuclear safety and interventions by operators of the nuclear installation necessary with regard to nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management and security are not exposed to undue risk from fire, explosion or products of combustion in the nuclear installation.

(2) Nuclear installation design shall determine requirements for ensuring prevention, resistance and protection of the nuclear installation against the effects of fire, explosion or products of combustion in the nuclear installation in accordance with the requirements of the Fire Protection Act.

(3) Nuclear installation design shall determine requirements for systems, structures and components of the nuclear installation with impact to nuclear safety so that the likelihood of fire at the site where they are located is as low as reasonably practicable.

(4) For buildings and other structures with impact to nuclear safety of nuclear installation the Study for estimation of fire hazard shall be carried out.

(5) The fire and its consequences cannot jeopardize the ability of nuclear installation to provide fundamental safety functions.

(6) Nuclear installation design shall determine requirements for fire detection and fire call systems which shall

a) detect fire on the nuclear installation site without delay,
b) notify without delay the origination of fire and its location the personnel in
    1. the main control room,
    2. the fire registration centre or similar control centre of fire brigade system and
    3. the emergency control centre,

c) allow timely information of persons on the nuclear installation site
d) be equipped with secured power supply and
e) remain functional under the conditions of fire.

(7) Nuclear installation design shall determine requirements for equipment selected from fire protection point of view and their backup so that in the event of its failure or accidental activation, the performance of the safety function of selected equipment is not affected.

(8) Nuclear installation design shall determine requirements for cables functional under the conditions of fire or fire retardant design of cabling for systems, structures and components with impact to nuclear safety including cabling in the main control room and the supplementary control room (hereinafter referred to as the ‘backup workplace’).

PART FOUR

REQUIREMENTS FOR NUCLEAR INSTALLATION DESIGN IN TERMS OF THE ASSESSMENT OF PREVENTION, RESISTANCE AND PROTECTION OF THE NUCLEAR INSTALLATION

General rules

§ 24

(1) The adequacy of prevention, resistance and protection of nuclear installations against the hazards resulting from location characteristics and external and internal impacts provided for by nuclear installation design shall be evaluated by assessing the compliance of the nuclear installation design with the requirements for nuclear installation design.

(2) The assessment of compliance of nuclear installation design with the requirements for nuclear installation design (hereinafter referred to as ‘design safety assessment’) shall be performed on basis of tests of the nuclear installation or, if this is not possible, using deterministic calculation methods.

(3) Design safety assessment shall analyse and evaluate the resistance of systems, structures and components of the nuclear installation against location characteristics and the response of the nuclear installation to design basis internal postulated initiating events and postulated initiating events and scenarios falling within the scope of design extension conditions.

(4) When executing the design safety assessment, the conservative approach shall be preferably used in the methods of this assessment and when determining safety margins.

(5) When assessing the resistance of a nuclear installation after a postulated initiating event and a scenario falling within the scope of design extension conditions has arisen, it shall be demonstrated that the safety objectives are fulfilled when the realistic approach is used for the analysis and for the setting of acceptance criteria.

(6) In the case of abnormal operation and design basis accidents, the uncertainties of the input parameters and the results of the design safety assessment shall be evaluated.

§ 25

(1) Design safety assessment shall demonstrate that

a) the design basis for the nuclear installation and its parts has been defined accurately,
b) the safety functions of the nuclear installation are being performed and the acceptance criteria for this assessment are complied with,

c) the management of abnormal operation events, design basis accidents and design extension conditions anticipated in nuclear installation design is ensured by intervention by the automatic function of safety systems and diverse means and interventions by operators specified in internal instructions,
d) the control and protection systems have been accurately set up, specifically by
   1. acceptability of the response to their intervention, including responses to planned interventions by operators, and
   2. taking accurate account of the disturbances from systems, structures and components with impact to nuclear safety, including spurious triggering of safety systems or possible errors on the part of operators.

(2) Design safety assessment shall use proven methods corresponding to the current state of science and technology.

(3) The specific 1st and 2nd level of probabilistic safety assessment referred to in the decree concerning to safety assessment requirements shall be used for the design of nuclear installations with a nuclear reactor. This probabilistic safety assessment shall demonstrate that

a) the nuclear installation design is well-balanced so that
   1. no system, structure, component, location characteristic or initiating event increases disproportionally the overall risk of a radiation accident and
   2. the risk of disruption of physical safety barriers is low and is not significantly affected by the uncertainties of the inputs used in the analysis and
b) the safety margins ensure prevention against the effects of small deviations in the parameters of the nuclear installation that can cause significant changes in its operating conditions.

§ 26

Design safety assessment for design basis internal postulated initiating events

(1) When analysing the resistance of a nuclear installation to design basis internal postulated initiating events, the design safety assessment shall

a) demonstrate that the fundamental safety functions are performed through interventions of safety systems and members of the nuclear installation personnel that guarantee a high reliability of performance of the safety functions; the functions of other systems shall be taken into account in this analysis if these can aggravate the course of the nuclear installation response after a postulated initiating event,
b) take into account the incidence of the most serious single failure of safety systems with an active safety function; if there the failure of a passive function of systems, structures and components is a practically eliminated matter, it will not need to be taken into account in this analysis,
c) verify the efficiency of the safety systems intervention when the ability of these systems to ensure a safety function is in the most unfavourable state, anticipated in the nuclear installation design for the course of the response to a design basis internal postulated initiating event; a failure of other systems, structures and components occurring as a result of a design basis internal postulated initiating event shall be considered to be part of this postulated initiating event, and
d) demonstrate that the effect of uncertainties of input parameters and calculation procedures and that of manufacturing tolerances on the result of the analyses is taken into account by conservative approach .

Design safety assessment for events of design extension conditions

§ 27

(1) Design safety assessment shall include analyses of the nuclear installation resistance to design extension conditions.

(2) When analysing the resistance of a nuclear installation under design extension conditions, safety analyses of the progression of events and scenarios chosen according to § 21 (3) and (4) shall be conducted in the context of design safety assessment.

(3) It shall be verified that effective preventive or mitigating technical and organisational measures are applied in nuclear installation design for combinations of events and scenarios chosen according to § 21(3) and (4) to ensure compliance with the principles for the safe use of nuclear energy and compliance with safety objectives.

(4) When analysing the resistance of the nuclear installation under design extension conditions in the context of design safety assessment

a) analysis presumptions established by means of a realistic approach may be used,
b) a single failure of systems, structures and components does not need to be applied, and
c) interventions from systems that are not safety systems may be considered.

§ 28

(1) Design safety assessment for the eventuality of design extension conditions shall demonstrate that systems, structures and components intended in nuclear installation design for the prevention and coping with design extension conditions have the capacity and

characteristics needed to serve their purpose and are adapted to the conditions under which they will serve to perform these functions for the necessary period of time.

(2) In the context of design safety assessment for the case of design extension conditions, analyses of the management of design extension conditions shall be conducted which shall

a) demonstrate the efficiency of the means intended by nuclear installation design for the prevention of serious damage to nuclear fuel and mitigation of the course of a severe accident,
b) specify the consequences of a radiation accident, if it occurs,
c) demonstrate resistance margins of the systems, structures and components of the nuclear installation intended for managing design extension conditions up to the load levels imposed by location characteristics and the working environment leading to modification or loss of their design characteristics,
d) take into account the configuration of the nuclear installation, the characteristics of its systems, structures and components, the operational conditions associated with selected scenarios of the design extension conditions and the feasibility of the response to the radiation extraordinary event,
e) take into account the results of the 1st and 2nd level of probabilistic safety assessment study and
f) determine the endstate of the event and the requirements for the length of the period for which the systems, structures and components needed to manage the event should function.

PART FIVE

REQUIREMENTS FOR SYSTEMS, STRUCTURES AND COMPONENTS

Title I
General requirements for systems, structures and components

Reliability of systems, structures and components and resistance to failures

§ 29

(1) The reliability of systems, structures and components with impact to nuclear safety shall be ensured through

a) a system ensuring their environmental qualification,
b) the method of ensuring resistance of the systems to failures and
c) the method of maintaining and testing them.

(2) The environmental qualification of systems, structures and components with impact to nuclear safety shall comply with the technical specifications determine out by nuclear installation design.

(3) Compliance of the characteristics of the system, structure or component with impact to nuclear safety with the requirements of technical specification shall be continuously verified and documented throughout its lifetime.

(4) Selected equipment shall reliably perform its safety functions

a) during all states of the nuclear installation, including the states anticipated in the course of testing of the installation, and
b) in the event of an expected malfunction or incorrect function of the individual systems, structures and components with impact to nuclear safety, including malfunction caused by incorrect intervention by operators.

(5) Nuclear installation design shall, by means of physical separation, functional isolation, independence and redundancy of systems and by using of diverse means, to ensure reliable performance of the safety function of selected equipment in the event of malfunction of selected equipment due to a single failure and common-cause failures.

(6) In the event of a failure or malfunction of any of its components, selected equipment shall spontaneously enter a state in which it contributes by a reasonably practicable manner to managing abnormal operation or accident conditions in the nuclear installation.

§ 30

(1) Nuclear installation design shall exclude any effects of systems, structures and components with impact to nuclear safety on the safety function of selected equipment.

(2) Nuclear installation design shall ensure automatic activation and control of safety systems or realisation of a safety function by passive function of systems, structures or components so that the intervention by operators is not necessary until 30 minutes after the initiating event has occurred.

(3) The requirement under paragraph (2) does not need to be fulfilled in cases when the earlier intervention by operators is possible. Such case shall be justified by an analysis demonstrating the possibility of earlier intervention by operators.

(4) Nuclear installation design shall determine measure to prevent malfunction of safety systems and systems ensuring nuclear safety of storage pools due to a common-cause failure which may lead to severe damage to nuclear fuel.

(5) Nuclear installation design shall determine

a) the safety limits and acceptance criteria for parameters characterising the state of the nuclear installation,
b) restrictions for operational configurations of the nuclear installation,
c) requirements for operability and settings of functional parameters of selected equipment,
d) the period needed to restore operability of selected equipment and
e) requirements for inspections and tests of selected equipment.

(6) The method of performance and frequency of the inspections and tests of selected equipment specified by nuclear installation design shall sufficiently verify its reliability and shall not lead to excessive reduction of its lifetime.

(7) Nuclear installation design shall determine requirements for calibration and validation of the function of instruments and equipment for maintenance and performance of inspections and tests of selected equipment.

§ 31

Requirements for selected equipment in the course of the life cycle of the nuclear installation

(1) Nuclear installation design shall determine the method of environmental qualification validity verification of selected equipment throughout the life cycle of nuclear installation.

(2) The method of environmental qualification validity verification of selected equipment shall determine requirements for

a) testing before commissioning of selected equipment,
b) in-service testing of selected equipment and

c) testing in the event of maintenance, modification or trial operation of selected equipment.

(3) Nuclear installation design shall, taking the conservative approach, determine the technical specifications for selected equipment so that deterioration of material properties due to ageing, including, in particular, fatigue, wear, neutron embrittlement, erosion, corrosion and other degradation mechanisms arising as a result of operation of selected equipment, is taken into account in safety margins.

Title II
Requirements for technical specifications for systems, structures and components of the nuclear reactor

Core

§ 32

(1) Nuclear installation design shall determine requirements for the core and the related cooling, control and safety systems of a nuclear installation with a nuclear reactor so that

a) the systems can, using the conservative approach for the safety assessment, ensure compliance with design limits for the core in all operational states and
b) the resulting effect of immediate responses of the core counteracts with rapid increase of reactivity in all operational states with the nuclear reactor in a critical and supercritical state.

(2) Mechanical components of the fuel system forming the core or mechanical components placed in its proximity, including their attachment, shall be implemented in nuclear installation design so that

a) these can withstand the static and dynamic effects of the processes in the nuclear reactor in all operational states,
b) in the event of a design basis accident and as far as reasonably practicable under design extension conditions, the disruption of these parts does not prevent achieving stabilised subcritical state of the nuclear reactor and efficient cooling of the core as established in the nuclear installation design.

(3) The requirements for the fuel system of the core shall be determined by nuclear installation design so that it does not become unacceptably damaged during its planned lifetime due to irradiation under the conditions in all operational states.

(4) In the fuel system design, the nuclear installation design shall, applying the conservative approach, take into account the mechanisms of deterioration of the material properties of the fuel system in the core due to

a) action of external pressure of the coolant,
b) increased internal pressure in the fuel element,
c) changes in pressures and temperatures resulting from changes of the power,
d) chemical impacts,
e) static and dynamic stresses, including stresses caused by the flow of the coolant,
f) mechanical vibrations and
g) changes in the heat transfer that may occur due to deformations or chemical impacts.

(5) Nuclear installation design shall determine acceptance criteria for nuclear fuel (hereinafter referred to as ‘fuel design criteria’) for operational states, including the tolerable radioactive release from fuel elements, which shall not be exceeded in operational states and under design basis accident conditions.

(6) Nuclear installation design shall specify the characteristics of the fuel system and the core and the operating conditions for the nuclear reactor so that

a) the conditions that may occur in the core during abnormal operation do not cause significant deterioration thereof,
b) releases of fission products from fuel elements are maintained at levels as low as reasonably practicable and
c) fuel elements and assemblies remain in place under design basis accident conditions and do not suffer damage that would prevent
   1. insertion of reactivity control system components into the core,
   2. functioning of other systems for reactivity control and shutting the reactor down, or
   3. effective cooling down of the core,
   4. subsequent handling of the fuel assemblies.

§ 33

(1) Structural design of the fuel assemblies implemented in nuclear installation design shall enable inspections of their parts.

(2) The characteristics of fuel assemblies in nuclear installation design shall be tested either experimentally or in operation of another nuclear installation, with regard to the ability of fuel assemblies to perform their design function safely.

(3) For nuclear reactors with a thermal output exceeding 50 MW, the nuclear installation design shall determine requirements for the system for monitoring of thermal output and neutron flux level and theirs distribution in the core.

(4) The system of neutron flux distribution monitoring in the core shall have the capability to detect areas in the core in which neutron flux levels and distribution could cause exceedance of fuel design criteria for the core for operational states.

(5) Structural design of the core in nuclear installation design shall allow the reactor power control system to keep neutron flux level and distribution within the limits determined in nuclear installation design in all states of the core during normal operation.

(6) The core and the related cooling, control, safety and information systems in nuclear installation design shall be such as to ensure that power oscillations in the core that could cause exceedance of fuel design criteria in operational states could be according the core design assumed as practically excluded event, or are identifiable and suppressible without delay.

Reactivity control and nuclear reactor shutdown systems

§ 34

(1) Nuclear installation design shall provide that the nuclear reactor is equipped with execution systems for reactivity control and reactor shutdown that can shut down the reactor in operational states and in the course of design basis accidents. These systems shall also keep the nuclear reactor shut down in situations causing maximum core reactivity and ensure compliance with the determined nuclear fuel design criteria.

(2) Reactivity control and nuclear reactor shutdown systems in nuclear installation design shall be made up of no less than two independent systems based on different technical principles and capable of performing their functions even in the event of a single failure.

(3) At least one of the systems referred to in paragraph (2) shall be a fast nuclear reactor shutdown system that can separately bring the nuclear reactor from operational state or a design

basis accident to a subcritical state with an adequate safety margin even in the case of a single failure of this system.

(4) At least one of the systems referred to in paragraph (2) shall be able to bring the nuclear reactor from normal operation to a subcritical state on its own and maintain the reactor in a subcritical state with an adequate safety margin if maximum core reactivity occurs.

(5) The implementation of the system referred to in paragraph (2) in nuclear installation design shall be such as to ensure that other systems of the nuclear installation cannot cause a loss of function of this system or function of its part.

(6) In abnormal operation and in the event of a design basis accident, the systems referred to in paragraph (2) shall be able to prevent each on its own, after achieving a stabilised subcritical state, the critical state of the nuclear reactor from spontaneous recurrence including the case of a single failure in these systems.

§ 35

(1) Nuclear installation design shall specify the measurement systems and tests to verify that

a) reactivity control and nuclear reactor shutdown systems can meet the requirements under § 34 and
b) reactivity control and nuclear reactor shutdown systems perform their safety functions in all operational states and in the event of a design basis accident.

(2) Nuclear installation design shall determine measures that can ensure subcriticality of the core while managing design extension conditions.

(3) Nuclear installation design shall determine reasonably practicable measures to ensure long-term subcriticality of molten core in the event of a severe accident.

Primary circuit

§ 36

(1) The requirements to primary circuit in nuclear installation design shall be determined so, that with support from other systems of the nuclear installation, the primary circuit performs the fundamental safety functions throughout its design life in all operational states and under the conditions of a design basis accident.

(2) Nuclear installation design shall determine requirements for materials and manufacturing and testing procedures for primary circuit components in a manner corresponding to the nature of the nuclear installation and in conformity with other statutory regulations.

(3) For the pressure vessel of the nuclear reactor and other primary circuit components, nuclear installation design shall, for the period of the nuclear installation’s life cycle,

a) determine requirements so as to ensure
   1. their resistance to initiation of material flaws, including rupture,
   2. low velocity of the material flaws propagation,
   3. resistance to brittle fracture of the material and
   4. that pressure vessel rupture is a practically eliminated matter,
b) specify the method of detection and monitoring of the flaws referred to in point (a) and
c) specify the method for influencing of material embrittlement.

(4) Nuclear installation design shall determine conditions for the operation and for protection of the primary circuit in operational states and for tests of this system so that an assessment of the impacts that can damage the primary circuit can be conducted and the safety limits and acceptance criteria for these tests, including design limits, can be determined.

(5) Nuclear installation design shall determine requirements for the primary circuit and its support features, control and protection systems so that the acceptance criteria referred to in paragraph (4) are

a) set by conservative approach and
b) complied with in all states of the nuclear installation anticipated in nuclear installation design.

§ 37

(1) Nuclear installation design shall provide the means for early detection of coolant leakage from the primary circuit and procedures for periodic inspections and tests of the state of the primary circuit, including the assessment of the properties of the material of the nuclear reactor vessel.

(2) The means to protect the primary circuit against over-pressurization shall be designed in nuclear installation design to ensure, that there is no radioactive release outside the nuclear installation and into the operational and working space, with the exception of justified and time-limited discharges into systems or spaces inside the containment of the nuclear reactor, which are designed for this purpose, if it is necessary for coping with accident conditions. Abnormal operation shall be managed without intervention by these means. in nuclear installation design

(3) Nuclear installation design shall be equipped with separation elements on the connecting pipelines of the primary circuit to prevent a release of coolant containing radioactive material outside the primary circuit.

(4) In order to keep the coolant in the primary circuit in sufficient quantity and to control the coolant volume changes in all operational states, nuclear installation design shall provide for a make-up system.

(5) Components placed inside the primary circuit shall be designed so that they are highly reliable and such that in the event of their failure other parts of the primary circuit are not subsequently damaged in operational states and under the conditions of a design basis accident.

§ 38

(1) Nuclear installation design shall determine requirements for core emergency cooling safety systems, which shall, in the event of a design basis accident involving disruption of the nuclear reactor coolant pressure circuit integrity and a leakage of coolant from the primary circuit, ensure the heat removal from the core to the surrounding environment for a sufficiently long period of time so that

a) the design limits for fuel element disruption are not exceeded,
b) the energy consequences of the chemical reaction between nuclear fuel and primary circuit coolant are within the acceptance criteria determined by nuclear installation design and
c) there are no changes in geometry of fuel elements, fuel assemblies or inner parts of the nuclear reactor that could affect core cooling efficiency.

(2) Nuclear installation design shall ensure that, when a postulated initiating event involving leakage of coolant from the primary circuit occurs, the efficiency of the intervention of the core emergency cooling systems is not negatively affected, in particular due to

a) inappropriate system configuration and
b) inappropriate location of the connection to the primary circuit.

(3) Nuclear installation design shall determine requirements for the emergency core cooling safety system so that periodic tests of its functionality and in-service inspections can be conducted, including tests of

a) the toughness and tightness of this system,
b) the active functions of the system components and
c) functions of this system as a whole or functions of its individual testable parts.

(4) Nuclear installation design shall determine requirements for systems for cleaning of the primary circuit coolant from impurities and radioactive materials, including the removal of corrosion and fission products, so that the acceptance criteria determined by nuclear installation design for the chemical regime of the primary circuit are complied with and its operation is possible in the event of nuclear fuel untightness accepted in nuclear installation design.

(5) Nuclear installation design shall ensure that safety system providing the removal of residual heat from the core and from the decay of fission products and of accumulated heat of components

a) perform their function independently from energy source outside the nuclear installation,
b) ensure removal of residual heat from the core after nuclear reactor shutdown and during the subsequent period so that nuclear fuel and primary circuit design limits are not breached in the event of a single failure in this system when one of the parts of this system is simultaneously inoperable due to repair and
c) ensure monitoring of its functions.

(6) The design of systems, structures and components of the primary circuit system in nuclear installation design shall provide the operators with diverse and alternative means and enable to carry out organisational measures for

a) emergency cooling of the core and removal of residual heat from the nuclear reactor in a situation where the function of the core cooling safety system has been completely lost due to a common-cause failure and
b) depressurization of the primary circuit and prevention of the core from starting to melt under high coolant pressure in accident conditions.

(7) Nuclear installation design shall provide for the system for removal of residual heat from the core and storage pool by way of diverse and alternative means so that at least one of them is effective after the occurrence of location characteristics and internal events that are more severe than those included in fundamental design basis.

§ 39

Information and control systems

(1) Nuclear installation design shall determine requirements for information and control systems allowing to monitor, measure, record, process and control operational parameters of technological and to control the processes and systems with impact to nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management and security in all states of the nuclear installation.

(2) Nuclear installation design shall provide that nuclear installations will be equipped with information systems providing, recording and processing during accident conditions the information

a) about the current state of the nuclear installation and the course of event, in particular about parameters and states of systems that may affect the progress of the fission reaction or integrity of the core, the primary circuit and the containment vessel and its related systems, and
b) allowing to predict the spreading of radioactive material and ionising radiation outside the nuclear installation to make possible to manage the response to radiation accident.

(3) Nuclear installation design shall determine requirements for the reliability of information and control systems and for the method, periodicity and quality of verification of these systems condition.

(4) Nuclear installation design shall ensure verification of the state of the information and management systems components, for which high reliability is required by the nuclear installation design, by means of

a) in-service continuous diagnostics or periodic testing, or
b) periodic testing, when the nuclear reactor is shut down, if there is no safe method of in-service testing.

(5) Nuclear installation design shall determine requirements for information means and actuators so that sufficient information about operation of the nuclear installation is constantly available to operators to be able to intervene if necessary.

(6) Nuclear installation design shall determine requirements for information and control systems so to be able to signal deviations of important operational parameters from permissible limiting values.

§ 40

Protection systems

(1) The design of nuclear installations with a nuclear reactor shall determine requirements for protection systems. The protection systems shall

a) be able to recognise abnormal operation and design basis accidents,
b) automatically activate safety systems for the management of abnormal operation and design basis accidents, including the execution system for fast nuclear reactor shutdown,
c) enable nuclear installation operators to use a backup system for manual activation of protection system interventions anticipated in nuclear installation design,
d) be separated from control systems; interconnection between protection and control systems is permissible, if it does not adversely affect nuclear safety,
e) be designed so that in the event of a conflict their interventions override the operation of control systems and interventions made by operators to an extent permitting to meet the requirement under point (f),
f) perform the automatic functions of protection systems without preventing nuclear installation operators from corrective interventions in accordance with emergency operating procedures and severe accident management guidelines,
g) be highly reliable and redundant so that a single failure does not cause a loss of the function of the protection system,
h) be designed so that a unavailability, testing or switching-out of a channel consisting of a component or one of diverse functional chains from the sensor to signal processing (hereinafter referred to as ‘channel’) does not reduce the number of operable diverse channels up to a single channel,

i) have a sufficient number of independent channels to ensure that a single failure does not cause a loss of the function of the protection system,
j) have their common processing circuits for diverse signals designed so that their failure cannot cause a loss of the function of the fast nuclear reactor shutdown system and
k) be designed so as to minimise jeopardy of protection system functions, including the event of common-cause failures in protection systems that cannot be identified in advance.

(2) Requirements for and settings of the protection system shall be specified in nuclear installation design so that the design criteria and design limits for nuclear fuel cannot be exceeded.

(3) The design of protection systems in nuclear installation design shall be such as to allow

a) periodic testing of the function of each channel while the nuclear reactor is in operation and
b) testing of common processing circuits for diverse signals when the nuclear reactor is shut down.

(4) The design of protection systems in nuclear installation design shall be such as to enable the nuclear installation operators to achieve a safe state of the nuclear installation or stabilised subcritical state when failures of the components in the protection system are detected using continuous automatic diagnostics or when conditions arise that make the protection system safety functions impossible for to be performed appropriately.

(5) If digital programmable means are used in the protection system, nuclear installation design shall determine requirements for the quality and independent assessment thereof. Where the required reliability of the designed safety functions of protection systems cannot be ensured due to low resistance of these systems to common cause failures in software, the function of the protection system shall be backed up using diverse means.

§ 41

Workplaces and systems for nuclear installation control

(1) The design of nuclear installations with a nuclear reactor shall comprise main control room design.

(2) Nuclear installation design shall provide a main control room design that

a) allows for safe access and stay of personnel and health safe environment for main control room operators in all states of the nuclear installation in which the function of the main control room is required by the nuclear installation design and
b) ensures protection of the main control room from the effects of internal events and location characteristics that may jeopardise its operability and habitability as referred to in point (a).

(3) Nuclear installation design shall determine requirements for information devices of the status of parameters and components and actuators of equipment in the main control room so that

a) they take into account the human factor and ergonomic requirements for user interface for the main control room operators,
b) main control room operators have information about
   1. the operation of the nuclear installation,
   2. automatic interventions of control and protection systems, and
   3. the results of automatic interventions of control and protection systems,
c) main control room operators can perform the activities specified in internal procedures and

d) information and control systems provide, by information devices the visual and audible warnings alerting main control room operators about the emergence or change of operational states which deviate from normal operation limits and may affect nuclear safety and radiation protection of the nuclear installation.

(4) Nuclear installation design shall determine requirements for backup workplaces and for means of the nuclear installation controlling so that in the event the main control room becomes inoperable, the necessary interventions by main control room operators in operational states, under the conditions of design basis accidents and after a design basis external event are ensured

a) for shut down the nuclear reactor,
b) to keep the nuclear reactor in a safe state,
c) to remove residual heat from the nuclear reactor and storage pool, and
d) to monitor the state of the nuclear installation.

(5) The backup workplace shall

a) as far as reasonably practicable, be physically and electrically separated from the main control room,
b) be designed so as to ensure safe access and stay of personnel in this room and health safe environment for operators of the main control room in situations for which the backup workplace is intended in nuclear installation design and
c) satisfy the requirements under paragraph (3)(b) and (c) and provide the functions of a backup workplace to the extent determined for in the nuclear installation design.

§ 42

Power supply systems

(1) For systems important for the operation of the nuclear installation, nuclear installation design shall provide a system of electricity supply sources that are independent from each other so that the possibility of a failure of power supply for systems, structures and components with impact to nuclear safety is excluded as far as reasonably practicable.

(2) Nuclear installation design shall determine requirements for electric power supply sources in accordance with paragraph (1) so that

a) systems, structures and components with impact to nuclear safety can perform the functions assigned to them,
b) systems, structures and components backing up each other are independent from each other in terms of power supply and
c) the power supply source itself has reliability and capacity to provide
    1. achievement of design limits for power supply systems in operational states and
    2. the safety functions in accordance with the requirements of nuclear installation design.

(3) The design of nuclear installations with a nuclear reactor shall determine requirements for power supply systems so that

a) it is ensured, as far as reasonably practicable, that a failure of electricity distribution system outside the nuclear installation does not affect
    1. the operational power supply system of nuclear installation,
    2. the system of auxiliary power supply for the internal power consumption of nuclear installation and
    3. the performance of fundamental safety functions,

b) an emergency power supply source is available for dedicated systems, structures and components with impact to nuclear safety, which is readily available, reliable, autonomous and testable in service (hereinafter referred to as ‘emergency power supply source’) capable of providing power for the period necessary to ensure reliable function of the systems required to manage the situations specified in the design basis,
c) the emergency power supply source can perform its safety function in the event of single failure in the system of emergency power supply sources simultaneously with a loss of of-site power supply,
d) the loading of the emergency power supply source by connecting the individual consumers is conducted by controlled manner and it cannot lead to the source overloading,
e) in a situation where the number of autonomous emergency power supply sources is lower than the number of independent redundant safety systems of the same type it does not reduce the reliability and independence of safety systems and
f) other diverse and alternative power supply sources are available supplying power to systems, structures and components intended for managing situations triggered by extreme location characteristics and internal events falling within the scope of design extension conditions, in accordance with the procedures for managing these situations determined in nuclear installation design.

(4) Nuclear installation design shall specify systems, structures and components with impact to nuclear safety for which, in order to ensure nuclear safety, continuous power supply from accumulators need to be provided. Nuclear installation design shall determine the capacity of continuous power supply by accumulators taking the conservative approach in regard to the necessary power supply period and output so that the safety functions specified in nuclear installation design are ensured until the accumulators can be recharged.

(5) Nuclear installation design shall provide that the power supply system for systems, structures and components with impact to safety be equipped with monitoring and information systems which

a) provide operators with information about the status and important electrical parameters of the power supply system and
b) can find out and localise a failure of the power supply system and its components.

(6) The design of nuclear installations with a nuclear reactor whose thermal output exceeds 50 MW, which are used for electricity generation, shall contain a design of the procedure for power supply for the internal consumption from its own turbine generator in the event that power supply from the external grid is interrupted and the output of the turbine generator cannot be transferred to the external grid.

Containment system

§ 43

(1) Nuclear installation design for nuclear installations with a nuclear reactor whose thermal output exceeds 50 MW shall comprise the design of a containment safety system capable of

a) ensuring protection of the nuclear reactor against
   1. the effects of location characteristics and
   2. man-induced events and
b) preventing radioactive release outside the nuclear installation.

(2) Nuclear installation design shall provide that the containment system consist of a hermetically sealed envelope enclosing a hermetically sealed space and protect

a) the nuclear reactor and systems, structures and components of the primary circuit and the parts of the energy conversion system inseparable from the primary circuit, and
b) objects located in the hermetically sealed space as
   1. parts of the safety systems and
   2. storage pools.

(3) Nuclear installation design shall provide that the containment system also consist of systems ensuring

a) separation of the hermetically sealed space from outer piping systems at points of its wall penetration and hermetic closing of access chambers leading to the hermetically sealed space,
b) pressure and temperature control in the hermetically sealed space,
c) handling and controlled removal of fission products, hydrogen, oxygen and other substances produced by fission reaction, during irradiation and chemical reactions in accident conditions in order to prevent their release outside the nuclear installation,
d) active protection of the hermetically sealed space against location characteristics and man-induced events, and
e) depression of and coping with severe accidents with melting of nuclear fuel in the hermetically sealed space.

(4) In order to ensure and protect the functions of the containment system, the nuclear installation design shall determine

a) acceptance criteria comprising design limits for
   1. the temperatures and pressures inside the containment vessel,
   2. tightness of the containment vessel and
   3. tolerable deformation of the containment vessel structure and
b) technical and organisational measures against exceeding the acceptance criteria set out in point (a) taken
   1. in the event of a design basis accident and under design extension conditions without serious damage to nuclear fuel for the period until measures necessary to achieve a safe state of the nuclear installation are applied and
   2. after the occurrence of a severe accident, at least for the period needed for taking measures for coping with the severe accident and radiation extraordinary event.

(5) Nuclear installation design shall comprise a design of systems for separation of the hermetically sealed space so that in the event of a design basis accident the separation of systems placed inside the hermetically sealed space from the rest of the nuclear installation is ensured using a system of testable separation elements.

§ 44

(1) Nuclear installation design shall provide that in the event of a design basis accident the containment system can limit the consequences of a detected bypass of the hermetically sealed space boundary, using the separation elements. Every piping route passing the boundary of the hermetically sealed space, which

a) forms part of the primary circuit or is connected directly with the atmosphere in the hermetically sealed space, shall be separable and equipped with two independently controllable separating elements arranged in series, one inside and the other outside the containment vessel, and

b) does not form part of the primary circuit or is not connected directly with the atmosphere in the hermetically sealed space, shall have one separating element placed outside the hermetically sealed space.

(2) Nuclear installation design shall provide for the possibility of separating the hermetically sealed space from the external environment and from systems outside the space under design extension conditions.

(3) Nuclear installation design shall determine requirements so that a severe accident in the hermetically sealed space is a practically eliminated event during an operational state with the nuclear reactor shut down and the hermetically sealed space open.

(4) Nuclear installation design shall determine requirements for pipelines and cables penetrations at the boundary of the hermetically sealed space so that

a) radioactive release from the hermetically sealed space is as limited as possible,
b) they are protected from the effects of
   1. reactive forces and
   2. failures of other components and
c) the separation valves of pipelines penetrations are placed as close as possible to the wall of the boundary of the hermetically sealed space and
   1. their state is detectable in any situation,
   2. their function is testable in normal operation, and
   3. their control is reliable and together with the power supply is backed up by redundant or diverse means.

(5) Nuclear installation design shall provide that the containment system be equipped with means allowing persons to enter the hermetically sealed space during operation with its concurrently maintained tightness.

(6) Nuclear installation design shall specify ventilation routes between the individual parts of the hermetically sealed space, which shall prevent

a) local accumulation of the explosive gases being produced and
b) damage of the hermetically sealed space boundary or equipment inside the hermetically sealed space due to pressure differences arising under accident conditions.

§ 45

(1) Nuclear installation design shall determine requirements for tightness, strength and functionality testing of the containment system and its individual parts during and after the construction of the nuclear installation, periodically during operation and after repair of its individual systems, structures and components

a) to verify compliance with acceptance criteria,
b) to detect defects, failures and levels of degradation of the individual systems, structures and components, and
c) to obtain support information for the application of corrective measures corresponding to the shortcomings detected.

(2) Nuclear installation design shall determine requirements for the safety system for removal of heat from the containment system, which shall, together with other containment systems, reduce the pressure and temperatures inside the hermetically sealed space, under accident conditions and after reaching a stabilised subcritical state of the nuclear reactor, to the level determined by nuclear installation design.

(3) Nuclear installation design shall provide that the systems referred in § 43(3)(c) can, together with other systems of the nuclear installation,

a) reduce the volume activity concentration of radionuclides in the hermetically sealed space and modify the composition and form of fission reaction products as necessary for further handling thereby and
b) monitor the volume concentration of explosive gases produced under accident conditions and reduce it so that the integrity of the hermetically sealed space is not jeopardised by combustion or explosion.

(4) Nuclear installation design shall determine requirements for diverse and alternative means and adequate procedures to protect the integrity of the containment system in the event of melting of the core that shall allow, as much as reasonably practicable,

a) to keep the core melt inside the hermetically sealed space of the containment,
b) to suppress reactivity in the core melt,
c) long-term cooling of the core melt by heat transfer to the system for the removal of heat from the containment and
d) to maintain the capability of the containment system to keep radioactive materials inside the hermetically sealed space of the containment.

(5) Covers, thermal insulation and coatings of structures and components inside the hermetically sealed space shall be designed in nuclear installation design as resistant to design basis accidents and design extension conditions and

a) shall prevent jeopardising of the safety functions of the containment systems and
b) if damaged during the states of the nuclear installation envisaged in nuclear installation design, shall not have a negative effect on containment system and on another safety systems located in the containment.

§ 46

Auxiliary and support services and systems

(1) Nuclear installation design shall determine requirements for auxiliary and support services and systems which include

a) autonomous systems for the removal of heat to the surrounding environment to ensure the function of the safety systems for the removal of residual heat from the core, the storage pool, the containment and from selected equipment and other equipment with impact to nuclear safety in operational states and in case of basic design basis accidents; these systems shall be designed so as to ensure
    1. reliable execution of the safety function by redundancy of systems, structures and components of these autonomous heat removal systems with impact to nuclear safety, including its power supply from emergency power supply sources,
    2. detection of radioactive materials penetration into the heat removal systems and
    3. equipment for preventing of radioactive release outside the nuclear installation,
b) ventilation, air-conditioning and filtration systems, which, in operational states and during design basis accidents, maintain the conditions specified in nuclear installation design in spaces where systems, structures and components with impact to nuclear safety are located, and
c) others system providing services or media for keeping systems with impact to nuclear safety operable, in particular

1. power supply,
2. water,
3. compressed air,
4. propellants,
5. lubrication or
6. industrial gases.

(2) At least one of the systems referred to in paragraph (1)(b) shall

a) prevent spreading of aerosol of radioactive materials or hazardous substances leaking from facilities in nuclear installation spaces intended for this purpose in the nuclear installation design and reduce their concentrations to a level that complies with the requirements for accessibility of the service premises of the nuclear installation,
b) prevent radioactive release outside the nuclear installation or keep this release as low as reasonably practicable,
c) ensure that the environmental conditions in nuclear installation spaces are as specified in nuclear installation design and ventilate inert and toxic gases from these spaces without disrupting the ability to control the discharge of radioactive material,
d) be equipped with sufficiently efficient filters and allow for testing of their efficiency and
e) ensure compliance of radionuclide discharges from the nuclear installation with the requirements of the Atomic Act.

§ 47

Energy conversion system

(1) Nuclear installation design shall determine requirements for the system of conversion of the steam energy produced from nuclear energy to electrical energy (hereinafter referred to as the ‘energy conversion system’) so that removal of heat from the nuclear reactor in operational states is ensured at the nuclear reactor output levels anticipated in nuclear installation design.

(2) Nuclear installation design shall determine requirements for the system of the secondary circuit of the nuclear reactor cooling (hereinafter referred to as the ‘secondary circuit’), which shall ensure steam production and exhaust and feedwater supply in the energy conversion system so that, in abnormal operation and under accident conditions, a separation of the energy conversion system from the primary circuit and from the parts of the system outside the hermetically sealed space is ensured by means of selected equipment.

(3) Nuclear installation design shall determine requirements for selected equipment which forms part of the energy conversion system so that

a) the performance of its safety functions is ensured and
b) structures and components of this system with impact to nuclear safety are protected against internal events and the location characteristics.

(4) The design of the energy conversion system in nuclear installation design shall

a) ensure monitoring of the levels of radioactive releases from the primary circuit into the energy conversion system and
b) provide for limiting a further dissemination of radioactive materials outside the energy conversion system to prevent radiation incidents or radiation accidents.

PART SIX

TECHNICAL MEANS OF ENSURING RADIATION PROTECTION

§ 48

(1) Nuclear installation design shall determine requirements for the technical means of ensuring radiation protection needed for

a) analysis of processes and activities in terms of radiation protection,
b) identification of ionising radiation sources and radioactive substances, including the activation and corrosion products being generated, and
c) supervision of ionising radiation sources and radioactive substances transport in nuclear installation systems and in the occupational environment.

(2) Nuclear installation design shall determine requirements for equipment of the nuclear installation by means enabling control of gas and liquid discharges and of radioactive waste management, including containment and storage areas.

(3) The construction materials and media of nuclear installation chosen in nuclear installation design shall ensure that the generation of activation and corrosion products is as low as reasonably practicable.

(4) The spaces of the nuclear installation shall be designed so as to

a) ensure optimization of the radiation protection,
b) prevent a release of radioactive substance from systems,
c) prevent contamination of the workplace and dispersion of radioactive substance into the atmosphere of the workplace,
d) prevent release of radioactive substance outside the nuclear installation,
e) create barriers preventing spread of radioactive material and contamination of persons and objects,
f) to classify and group the spaces of the nuclear installation according to the radiation situation in operational states and under accident conditions and mark them appropriately to prevent unintentional exposure,
g) to restrict the access of personnel to spaces with worsened radiation situation,
h) ensure that equipment which is frequently attended or maintained is preferably located in locations with a favourable radiation situation and
i) provide sufficient means and number of points with enough capacity to
    1. measure the contamination of persons and objects,
    2. decontaminate persons and objects, and
    3. decontaminate parts of the nuclear installation.

§ 49

(1) Nuclear installation design shall provide that nuclear installation be equipped with stationary and mobile means for radiation situation monitoring that can signalize an exceedance of specified monitoring levels

a) in operational states,
b) under design basis accidents and
c) as far as reasonably practicable, under design extension conditions.

(2) Nuclear installation design shall provide that stationary monitoring systems give the information about the measured values to the main control room, the radiation supervision

control room and the emergency control centre or technical support centre. Stationary monitoring systems shall ensure, in all states of the nuclear installation, the monitoring of

a) dose rates in locations with an worsened radiation situation that are normally accessible to operators,
b) activity volume concentrations of radioactive substances in the atmosphere in rooms normally accessible to operators where the established monitoring levels could be exceeded,
c) surface contamination of persons and objects at points of exit from the controlled area and
d) activity volume concentrations of radioactive substances in the systems of the nuclear installation, in particular in the gas cleaning system and the discharge system.

(3) Nuclear installation design shall provide that nuclear installation be equipped with

a) a laboratory for measuring the activity of gas and liquid samples taken from the nuclear installation systems,
b) a system for monitoring of external exposure and contamination of persons, and
c) systems for accounting discharges of radioactive material into atmosphere and water courses.

(4) Nuclear installation design shall determine requirements for monitoring of the impacts of the nuclear installation operation on the surroundings and for early detection of any radioactive releases outside the nuclear installation by monitoring

a) the dose rates at the boundary of the guarded area and in the emergency planning zone and
b) the activity of radionuclides in discharges from the nuclear installation.

(5) Nuclear installation design shall determine requirements for technical means and conditions for ensuring radiation protection so as to satisfy the requirements of the decree on radiation protection and security of radionuclide sources and the decree on radiation situation monitoring.

PART SEVEN

RADIATION EXTRAORDINARY EVENT MANAGEMENT

§ 50

(1) The design of nuclear installation with a nuclear reactor whose thermal output exceeds 100 MW shall ensure that the nuclear installation is equipped with

a) shelters,
b) an emergency control centre,
c) a technical support centre,
d) an external emergency support centre,
e) a backup technical support centre and
f) a backup emergency support centre.

(2) Nuclear installation design shall provide that the emergency control centre and technical support centre referred to in paragraph (1) be placed in shelters or special spaces of the nuclear installation.

(3) The nuclear installation design referred to in paragraph (1) shall ensure that shelters

a) are located within the nuclear installation site,

b) are seismically and functionally resistant to design basis external events and for design extension conditions, corresponding to the location characteristics evaluated taking the realistic approach in accordance with § 12(3),
c) provide protection against the effects of ionising radiation, including ionising radiation caused by a severe accident,
d) have enough capacity to shelter all personnel of the nuclear installation participating in radiation extraordinary event response management and implementation, for a duration no less than 72 hours,
e) allow for keeping record of and checking the persons entering the shelter with regard to physical protection ensuring by the physical protection control centre using a backed-up communication system,
f) allow for conducting dosimetric checks and decontamination of the persons entering the shelters,
g) provide a communication link via two independent technical systems between shelters and persons managing the response to the radiation extraordinary event at assembly points or other shelters,
h) allow for administration of first aid to persons entering the shelters,
i) are equipped with
1. filtration and ventilation equipment providing protection against the penetrating of radioactive materials,
2. an oxygen regeneration system,
3. CO2 concentration analysers,
4. backup power supply system,
5. emergency potable and non-potable water supply for a minimum duration of 72 hours,
6. emergency lighting,
7. portable radiation situation monitoring equipment,
8. personal protection equipment and a package of iodine prophylaxis for the maximum number of sheltered persons and
9. storage locations for the equipment referred to in points 5, 7 and 8.

§ 51

(1) The design of the nuclear installation referred to in § 50(1) shall ensure that the shelters or special spaces, in which the emergency control centre and technical support centre are located,

a) are permanently operable, including in the event of a complete power supply failure in the nuclear installation and under design extension conditions,
b) are habitable also under design extension conditions,
c) provide a communication link via two independent technical systems with
1. the main control room and the backup workplace, and
2. persons responding to an emergency which has occurred or a crisis situation outside the nuclear installation site referred to in other legislation and
d) provide an audiovisual communication link with
1. the main control room,
2. the backup workplace and
3. organisational units and personnel involved in radiation extraordinary event management.

(2) The nuclear installation design shall ensure that space is available in shelters for storing

a) food reserves for the maximum number of sheltered persons for at least 72 hours after the start of sheltering, in the case of shelters intended for individuals involved in radiation extraordinary event response or shelters where
   1. the emergency control centre or
   2. the technical support centre are located and
b) the means necessary for conducting interventions at the nuclear installation, in the case of shelters intended for persons involved in radiation extraordinary event response.

§ 52

The design of the nuclear installation referred to in § 50(1) shall ensure that, throughout the whole period of managing accident conditions and ensuring response to a radiation extraordinary event, the shelter is equipped to allow for

a) declaring the radiation accident and notifying the authorities concerned,
b) alerting persons on the nuclear installation site or the population in the emergency planning zone,
c) managing the evacuation of persons from the nuclear installation site,
d) keeping record of and managing the check, evaluation and regulation of exposure of individuals involved in radiation extraordinary event response at the nuclear installation site,
e) proposing to the president of the region the introduction of urgent action to protect the population in the emergency planning zone in the form of evacuation,
f) informing the authorities concerned and the persons specified in the internal emergency plan referred to in § 157(2)(h) of the Atomic Act,
g) informing the population in accordance with § 157(2)(i) of the Atomic Act,
h) managing radiation situation monitoring in the emergency planning zone in accordance with § 157(2)(j) of the Atomic Act,
i) continuous evaluating of the radiation situation monitoring results and
j) transmitting radiation situation monitoring data to the Office by means of remote access in accordance with § 157(2)(j) of the Atomic Act and in the manner referred to in § 21(1)(g), point 2, of the decree concerning the details of ensuring radiation extraordinary event management.

§ 53

The design of the nuclear installation referred to in § 50(1) shall ensure that the shelter or special space, in which the technical support centre is located,

a) is separated from the main control room and the backup workplace and
b) allow for
   1. throughout the period of managing accident conditions and ensuring radiation extraordinary event response, access by the technical support centre operators to information from sources of immediate and archive data needed for coping with accident conditions and ensuring radiation extraordinary event response,
   2. the provision of technological data and information needed to estimate the composition and activity of released radionuclides over time,
   3. the provision of data from radiation situation monitoring inside and at the boundary of the guarded location and in the emergency planning zone,

4. audiovisual monitoring of technological facilities and monitoring of interventions made in the context of response to the accident conditions and the radiation extraordinary event that have arisen at the nuclear installation, and
5. early evaluation of the state of the nuclear installation and the necessary safety functions under accident conditions.

§ 54

(1) The design of the nuclear installation referred to in § 50(1) shall ensure that the backup emergency control centre, backup technical support centre and the external emergency support centre

a) are not affected by design extension conditions which are on the nuclear installation site and
b) serve their functions in the event of occurrence of the location characteristics that could lead to a loss of functionality of the centres they are backing up.

(2) The design of the nuclear installation referred to in § 50(1) shall also ensure that the external emergency support centre

a) has its own power supply system,
b) can be equipped with
   1. means of communication,
   2. personal protective means and
   3. water and food, and,
c) throughout the period of managing accident conditions and ensuring response to a radiation extraordinary event, allows for
   1. continuous evaluation of the radiation situation that has arisen based on situation monitoring conducted in the emergency planning zone,
   2. ongoing production of forecasts of radiation situation progression in the emergency planning zone and
   3. the conduct of dosimetric checks and decontamination of persons entering the centre.

(3) The design of the nuclear installation referred to in § 50(1) shall ensure that the backup emergency control centre allows for

a) the activities of the emergency control centre to be carried out in the event the emergency control centre becomes dysfunctional or inoperable,
b) irrespective of the state of the emergency control centre and within a scope similar to that in the emergency control centre, continuous access by operators of the backup emergency control centre to data on
   1. the state of the nuclear installation and
   2. the situation on the nuclear installation site and
c) communication with all working groups involved in the management of the radiation accident.

(4) The design of the nuclear installation referred to in § 50(1) shall ensure that the backup technical support centre allows for

a) the activities of the technical support centre to be carried out in the event the technical support centre becomes dysfunctional or inoperable,
b) independently on the state of the technical support centre and within a scope similar to that in the technical support centre, continuous access by personnel of the backup technical support centre to data on the situation on the nuclear installation site and
c) communication with main control room or backup workplace operators.

PART EIGHT

SECURITY

§ 55

Nuclear installation design shall determine requirements for nuclear installation so that security is ensured in accordance with the requirements determined by the Atomic Act, the decree concerning security of nuclear installations and nuclear materials and the decree concerning radiation protection and security of radionuclide sources.

PART NINE

DOCUMENTATION FOR LICENSED ACTIVITIES

§ 56

Preliminary safety analysis report

The content of the preliminary safety analysis report is set in Annex 2 to this Decree.

§ 57

Operational safety analysis report

(1) The contents of the operational safety analysis report are laid down in Annex 3 to this Decree. The operational safety analysis report for nuclear installation without a nuclear reactor and for research nuclear installation shall contain the information referred to in Annex 3 to this Decree to the extent applicable to relevant nuclear installation.

(2) The contents of the operational safety analysis report for the first physical start-up of nuclear installation with a nuclear reactor, the first energetic start-up of nuclear installation with a nuclear reactor or the operation of nuclear installation with a nuclear reactor are further detailed in Annex 4 to this Decree.

PART TEN

FINAL PROVISIONS

§ 58

Notification

This Decree was notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 stipulating a procedure for the provision of information in the field of technical regulations and of rules on Information Society Services.

§ 59

Entry into force

This Decree enters into force on 1st November 2017.

Chairperson:
Ing. Drábová, Ph.D., m. p.

Annex 1 to Decree No 329/2017

Categories of safety functions for classifying selected equipment into safety classes

1. Safety functions and criteria for classifying selected equipment into safety classes according category of safety function for nuclear installations comprising a nuclear reactor:
   1.1. The selected equipment performing safety function of Category I, which is the passive safety function of system, structure or component pertaining to the primary circuit boundary is classified as safety class 1 selected equipment. The selected equipment which is part of the primary circuit boundary not need to fall to safety class 1, if its failure not lead to necessity of the safety systems intervention.
   1.2. Selected equipment performing active and passive safety functions of Category II, which are safety functions with highest reliability requirements shall be classified as safety class 2 selected equipment. In the case of nuclear installations with a nuclear reactor the equipment of this class is the selected equipment performing passive functions of system, structure or component, which are physical safety barriers and selected equipment with guaranteed high reliability of the safety systems active safety function performance. Such equipment includes
      1.2.1. nuclear fuel cladding,
      1.2.2. parts of the primary circuit pressure boundary not falling under safety class 1; the selected equipment which is part the primary circuit pressure boundary does not need to fall under safety class 2 if its damage does not lead to intervention of the safety systems,
      1.2.3. containment (hermetically sealed space),
      1.2.4. selected equipment performing the safety functions of the safety system of which it is part, namely the functions
         1.2.4.1. for fast shutdown of nuclear reactor as necessary to prevent the progression to accident conditions in the event of abnormal operation,
         1.2.4.2. for fast nuclear reactor shutdown needed to mitigate the consequences of design basis accidents,
         1.2.4.3. for keeping a sufficient quantity of coolant for cooling the core during design basis accidents not involving a breach of the primary circuit pressure boundary and after the causes for these accident conditions have disappeared,
         1.2.4.4. for the removal of heat from the core and to limit damage of nuclear fuel in the event of a design basis accident involving a breach of the primary circuit boundary,
         1.2.4.5. necessary for the removal of residual heat from the core during operational states and in the event of a design basis accident not involving a breach of integrity of the primary circuit boundary,
         1.2.4.6. necessary for limiting radioactive releases from the hermetically sealed envelope during accident conditions and after a stabilised subcritical state of the nuclear installation has been achieved in the event of a design basis accident,
         1.2.4.7. necessary for power supply or control of the operation of selected equipment classified in safety class 2 when it performs its safety functions,

1.2.4.8. of a protection or information part of the information and control system, if

1.2.4.8.1. the safety function is required to achieve a stabilised subcritical state, to prevent the occurrence of an accident more severe that a design basis accident and to mitigate the consequences of a design basis accident,

1.2.4.8.2. the failure or unintentional activation of the selected equipment function could lead to undesirable consequences and there is no other safety class 2 selected equipment with a function that would prevent the progression of accident conditions that are more severe than a design basis accident, or

1.2.4.8.3. the safety function would be necessary to obtain information essential for operators to carry out activities necessary to achieve a stabilised subcritical state of the nuclear installation.

1.3. Selected equipment not classified to safety class 1 or 2 performing safety functions of Category III, which are for reaching of the same safety goal expendable by other design provisions, shall be classified as safety class 3 selected equipment. In the case of nuclear installations with a nuclear reactor, these include safety functions

1.3.1. for preventing unacceptable changes in reactivity,

1.3.2. for maintaining the nuclear reactor in stabilised subcritical state after all activities that led to its shutdown and after its each shutdown,

1.3.3. for maintaining a sufficient quantity of the coolant for cooling the core of the nuclear reactor in all operational states considered in nuclear installation design,

1.3.4. for the removal of heat from safety systems into the surrounding environment, unless a loss of their function due to single failure of any structure or components of equipment performing safety function restricts the performance of the functions referred to in points 1.2.4.4 and 1.2.4.5, ,

1.3.5. for limiting radioactive release from the hermetically sealed envelope under design extension conditions,

1.3.6. for keeping the exposure of nuclear installation personnel and population below the set reference levels in the event of a radiation extraordinary event under accident conditions, including events which may result in radioactive releases and spreading of ionising radiation from sources of ionising radiation located outside the containment system,

1.3.7. for maintaining the environmental conditions necessary for the operation of safety systems and for allowing nuclear installation operators access to carry out activities important to nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security inside the nuclear installation,

1.3.8. for preventing releases of radioactive substances outside the nuclear reactor from irradiated nuclear fuel transported or stored inside the nuclear installation during operational states,

1.3.9. for removing a decay heat from irradiated nuclear fuel stored inside the nuclear installation outside the nuclear reactor,

1.3.10. for keeping subcritical the irradiated nuclear fuel stored inside the nuclear installation outside the nuclear reactor,

1.3.11. for controlling radioactive substances discharges in operational states,

1.3.12. for power supply or control of the operation of selected equipment classified in safety class 3 when it performs its safety functions,

1.3.13. for ensuring the operability of other selected equipment when it performs its safety functions, with the exception of power supplies or control of its operation,

1.3.14. for preventing or mitigating the consequences of failures of selected equipment, if these could lead to disruption of the performance of its safety functions or for limiting of consequences of these disruptions,

1.3.15. for substituting the safety functions of selected equipment classified in safety classes 2 or 3 by diverse means when its function is lost due to a common-cause failure,

1.3.16. of information and control systems that manage or enable operators to manage the operation of the nuclear installation so that the parameters of the nuclear installation are maintained within the limits determined by nuclear installation design, if

1.3.16.1. after a stabilised subcritical state of the nuclear installation has been achieved, these information and control systems are necessary to achieve and maintain a safe state of the nuclear installation or prevent an undesirable progression of accident conditions,

1.3.16.2. safety class 2 selected equipment would have to be activated to remedy the consequences of incorrect function of these information and control systems,

1.3.16.3. the function of these information and control systems significantly limits the frequency of interventions from selected equipment classified in safety class 2 when managing abnormal operation,

1.3.16.4. these information and control systems are only the tool for controlling the capability of safety class 2 selected equipment to perform the safety functions assigned to them,

1.3.16.5. the functions of these information and control systems are only the tool for control of monitored operational parameter of the nuclear installation,

1.3.16.6. these information and control systems perform other functions which

1.3.16.6.1. correspond to the technical specifications referred to in point 1.3.15,

1.3.16.6.2. are used to prevent or limit the consequences of minor releases of radionuclides outside the nuclear installation or

1.3.16.6.3. are necessary for monitoring and signalling of the occurrence and consequences of internal events and parameters of location characteristics negatively affecting the level of assurance of nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security , or

1.3.17. of structures and components of the energy conversion system, in particular the secondary circuit, a failure of which may have a negative effect on the level of assurance of nuclear safety, radiation protection and technical safety, if not classified in safety class 2 in accordance with point 1.2.4.5 and if the pressure of the working fluid at design calculation temperature 100 °C exceeds 4 MPa and the piping diameter is greater than DN200.

2. Safety functions and criteria for classifying selected equipment into safety classes according a safety function category in the case of nuclear installations for the managing of radioactive waste:

2.1. Packagings performing safety function Category II, which is safety function of physical safety barrier for storing radioactive waste originated from reprocessed nuclear fuel or storing of spent and irradiated nuclear fuel or radioactive waste originated from nuclear fuel reprocessing shall be classified as selected equipment of safety class 2.

2.2. Selected equipment performing the safety function of a physical safety barrier and selected equipment performing safety functions necessary for preventing radioactive releases or dissemination of ionising radiation into the environment and work environment during any of the states of the nuclear installation including all functions of the packaging for storing of radioactive waste from nuclear fuel reprocessing or another safety functions for radioactive waste management shall be classified as selected equipment of safety class 3.

3. Safety functions and criteria for classifying selected equipment into safety classes according a category of safety function in the case of nuclear installations for storing spent nuclear fuel:

3.1. Packagings performing the safety function of Category II which is function of a physical safety barrier in storage of spent nuclear fuel shall be classified as selected equipment of safety class 2.

3.2. Selected equipment performing the safety function Category II of ensuring subcriticality of nuclear material in a wet nuclear fuel storage facility shall be classified as selected equipment of safety class 2.

3.3. Selected equipment performing the safety function Category III of a physical safety barrier and selected equipment performing safety functions for preventing the occurrence of a radiation extraordinary event during any of the operational states of the nuclear installation estimated in the nuclear installation design, including selected equipment monitoring the parameters of packaging for storing spent and irradiated nuclear fuel proving compliance with limits and conditions, shall be classified as selected equipment of safety class 3.

4. Safety function and criteria for classifying selected equipment into safety classes according the category of safety function in the case of nuclear installations for the production, treatment and storage of radioactive or fissile material:

4.1. Selected equipment performing the safety function Category II which is the safety function of keeping nuclear material subcritical, shall be classified as selected equipment of safety class 2.

4.2. Selected equipment performing the safety function Category III, which is function of a physical barrier for preventing the occurrence of a radiation extraordinary event when producing, processing and disposing of nuclear material shall be classified as selected equipment classified of safety class 3.

5. Additional criteria for classifying selected equipment into safety classes:

5.1. Where a part of selected equipment performs a less significant safety function, it shall be classified in a safety class according to the safety function it performs.

5.2. Where more items of selected equipment can perform the same safety function simultaneously, only the item of selected equipment intended directly in nuclear installation design to perform this safety function shall be classified in a safety class according to points 1 to 4.

5.3. The boundaries of safety classes in a piping system which is selected equipment shall be set at the first separating valve, belonging to the same safety class and preventing the loss of a safety function of selected equipment due to loss of working fluid.

5.4. Electrical equipment of emergency power supply systems powering selected equipment classified in safety class 2 shall be selected equipment classified in safety class 2.This electrical equipment may also be used to power selected equipment requiring safety class 3 power supply and control, or equipment that does not need power supply and control from selected equipment, if safety class 2 selected equipment that requires power supply is protected against the consequences of its failure.

5.5. Electrical equipment of emergency power supply systems powering appliances that require power supply and control from selected equipment classified in safety class 3 shall be classified as selected equipment of safety class 3.

5.6. The supply circuit breaker of switchboards connected in a loop with other switchboards that are selected equipment classified in safety class 3, whose terminals are not connected to an appliance requiring power supply from selected equipment, shall be selected equipment classified in safety class 3. The wiring used to ensure the function of selected equipment shall be selected equipment classified in the same safety class as the selected equipment for which it is intended.

5.7. Selected equipment included among instrumentation and control systems shall be classified as selected equipment of the same safety class if intended to perform the same safety function.

5.8. Measuring circuits forming a channel with control circuits and power equipment shall be selected equipment classified in the same safety class as the control circuits and power equipment.

5.9. Where measuring or control circuits of the same channel are classified in different safety classes based on technological functions,

5.9.1. separate parts of the measuring or control channel shall be selected equipment classified in the safety class of the controlled selected equipment and

5.9.2. common parts of the measuring or control circuit shall be classified in the highest safety class of the interconnected items of selected equipment.

Annex 2 to Decree No 329/2017

Contents of the preliminary safety analysis report

The preliminary safety analysis report shall contain

1. basic information about the location characteristics for siting the nuclear installation, about the nuclear installation design and additional information updating the data in the initial safety analysis report,
2. information about compliance with the requirements for nuclear safety and nuclear installation design set out in legislation and in the documentation for the licensed activity, which is the construction of a nuclear installation; justification shall be provided for any deviations from the documentation for the licensed activity, which is the siting of a nuclear installation,
3. for systems, building and machinery structures, components and equipment, information comprising
   3.1. a description of the design of system, of building and machinery structure, component or equipment,
   3.2. the design basis for the design of system, structure or component,
   3.3. an overview of all the requirements applied in nuclear installation design for systems, buildings and machinery structures, components or equipment with regard to nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management, security and non-proliferation of nuclear weapons, and
   3.4. evidence of compliance of the nuclear installation design with the requirements under point 3.3,
4. the parameters used in nuclear installation design for the assessment of nuclear and technical safety, reliability and lifetime of the installation,
5. for the requirements referred to in point 3.3, compliance with which cannot be demonstrated in the preliminary safety analysis report,
   5.1. a description of how compliance with these requirements will be demonstrated and
   5.2. a list of documentation containing the evidence referred to in point 5.1,
6. a description of the nuclear installation,
7. a description of the basic systems of the nuclear installation,
8. a description of the processes applied and evidence of nuclear safety within the scope of the operational safety analysis report according to Annex 3 to this Decree; point 5 shall be applied to requirements, compliance with which cannot be demonstrated, otherwise, information about the future implementation of the relevant safety and technical requirements and objectives shall be provided, and
9. a description of how readiness for radiation accident response will be ensured in the emergency planning zone, if established, and assessment of whether early implementation and complete execution of all urgent protective actions is feasible under the conditions of a radiation accident on the nuclear installation, in particular with a view to the distribution of the population and presence of settlements in the emergency planning zone.

Annex 3 to Decree No 329/2017

Contents of the operational safety analysis report

The operational safety analysis report shall contain

1. updated basic information about the location characteristics for the nuclear installation siting, the nuclear installation design and additional information concerning the initial safety analysis report,
2. information about compliance with the requirements for nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security of the nuclear installation determined in the preliminary safety analysis report; justification shall be provided for any deviations from the preliminary safety analysis report,
3. up-to-date information about the systems, structures and components of the nuclear installation, comprising
   3.1. a description of the design of systems, building and machinery structures, components or equipment,
   3.2. key design basis information for the system, structure or component,
   3.3. an overview of the requirements applied in nuclear installation design for systems, building and machinery structures, components or equipment with regard to nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management, security and non-proliferation of nuclear weapons, and
   3.4. evidence of compliance of the nuclear installation design with the requirements under point 3.3,
4. a description of and justification for changes in the nuclear installation design described in the preliminary safety analysis report, including demonstration that technical design safety has been maintained,
5. an assessment of the results of inspections and tests from the stage of construction of the nuclear installation and assessment of the results of additional calculations and measurements arising from the requirements of the preliminary safety analysis report,
6. requirements to operation of the nuclear installation with respect to nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management and security, and a description and evidence of compliance with them in all operational states, in the resolution of non-compliances and operational occurrences and during maintenance and repair of the installation,
7. evaluation of the nuclear safety, radiation protection, radiation situation monitoring, security, reliability and lifetime parameters achieved and specification of the method and interval of further monitoring thereof,
8. assessment of the quality and outcomes of each process and compliance with the requirements for nuclear installation design, and
9. a description of the technical means specified in accordance with the decree concerned to details of ensuring radiation extraordinary event management, to ensure
   9.1. the announcement of a radiation extraordinary event and notification that it has occurred,
   9.2. management of and response to radiation extraordinary event,
   9.3. a communication link between the persons managing the radiation extraordinary event response and assembly points, and
   9.4. a communication link as part of the system for the organisation of assembly or sheltering of persons and their departure or evacuation from assembly points or shelter.

Annex 4 to Decree No 329/2017

Contents of the operational safety analysis report for nuclear installations with a nuclear reactor

The operational safety analysis report for the first physical start-up of nuclear installation with a nuclear reactor, the first energetic start-up of nuclear installation with a nuclear reactor or the operation of nuclear installation with a nuclear reactor shall contain

1. a description of the nuclear installation with a nuclear reactor,
2. a description of the basic systems of the nuclear installation with a nuclear reactor and
3. a description of the processes applied and evidence of nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management and security of the nuclear installation with a nuclear reactor.

The contents of the operational safety analysis report referred to points 1 to 3 shall include the following information:

1. An introductory part comprising
   a) information about the purpose, preparation and structure of the operational safety analysis report,
   b) information about the applicant and the stakeholders,
   c) a general description of the nuclear installation,
   d) a comparison with similar nuclear installations designs and a comparison with the contents of the preliminary safety analysis report,
   e) technical information about new technologies incorporated into the nuclear installation design,
   f) information about the operational states of the nuclear installation,
   g) information about the applicant's management system,
   h) a summary list of all supporting documents used to prepare the operational safety analysis report,
   i) drawings and other graphic annexes, and
   j) information about the specification and method of implementation of the requirements relating to nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management, security and non-proliferation of nuclear weapons.
2. Characteristics of the location for siting the nuclear installation, including
   a) a complex assessment of specific of the location characteristics,
   b) geographic and demographic information,
   c) information about location characteristics and events that may be induced by human activity,
   d) information about internal events that may occur on the nuclear installation site,
   e) results of the assessment of location characteristics in terms of meteorology, hydrology and geological, seismic, hydrogeological and engineering-geological conditions,
   f) information about the radiation situation in the location due to external sources of radiation,
   g) readiness for response to radiation extraordinary event in the emergency planning zone, if established, and assessment of whether early introduction and complete execution of all urgent actions to protect the population is feasible under the conditions of a radiation accident of the nuclear installation, in particular with a view to the distribution of the population and presence of settlements in the emergency planning zone, and
   h) information about monitoring of the parameters describing the location characteristics.

3. The design of systems, building and machinery structures, components and equipment, comprising information about
   a) the design basis of the nuclear installation design relating to ensuring nuclear safety,
   b) classification of systems, structures and components into safety classes,
   c) classification of the loads on systems, structures and components for specification of the method of protection
      1. in terms of seismicity,
      2. against climatic effects,
      3. against external and internal flooding,
      4. against missiles and explosions,
      5. against the dynamic effects of postulated breaches of piping systems and
      6. against earthquakes,
   d) the design of building structures in the 1st category of seismic resistance,
   e) the design of machinery systems and components,
   f) seismic and dynamic resistance of machinery, electrical equipment and information and control systems,
   g) environmental qualification,
   h) the design of piping systems and
   i) threaded couplings.

4. Nuclear reactor, comprising a summary description of the nuclear reactor and information about
   a) the nuclear fuel design,
   b) nuclear characteristics of the core,
   c) thermal and hydraulic characteristics of the core,
   d) nuclear reactor materials and
   e) the design of reactivity control systems.

5. Nuclear reactor cooling systems and subsequent systems, comprising descriptions and characteristics of
   a) the reactor core cooling system and the pressure boundary of the primary circuit,
   b) the pressure vessels of the nuclear reactor,
   c) the main circulating pumps,
   d) the steam generators,
   e) primary circuit piping,
   f) the pressure control system in the primary circuit,
   g) supports and restraints of the components of the nuclear reactor cooling system,
   h) shut-off and separation valves of the nuclear reactor cooling system,
   i) auxiliary systems of the primary circuit and
   j) requirements and measures to allow for operators to access the nuclear reactor cooling system to conduct in-service inspections and maintenance.

6. Safety systems, comprising descriptions and characteristics of
   a) the overall concept of safety systems,
   b) the containment system,
   c) the emergency core cooling systems,
   d) systems to ensure conditions for operators' activities and main control room habitability,
   e) emergency steam generator feed water supply systems,
   f) fission product removal and concentration control systems,
   g) the system of emergency removal of the steam-gas mixture from the primary circuit and
   h) other safety systems.

7. Instrumentation and control systems, comprising descriptions and characteristics of
   a) the overall concept of instrumentation and control systems,
   b) the protection system for the activation of the fast nuclear reactor shutdown system and for the activation and management of interventions from execution safety systems,
   c) systems ensuring safe shutdown of the nuclear reactor,
   d) information systems important to nuclear safety,
   e) other systems important to nuclear safety,
   f) control systems participating in nuclear safety assurance,
   g) the means and measures for diverse initiation and control of safety functions, and
   h) data transfer systems.

8. Electrical systems, comprising descriptions and characteristics of
   a) the overall concept of electrical systems,
   b) the concept of off-site electrical systems,
   c) the concept of on-site electrical systems, with separate information about
      1. emergency alternating current power supply systems and
      2. emergency direct current power supply systems.
   d) cabling and cable routes,
   e) grounding and lightning protection systems, and
   f) other electrical systems.

9. Auxiliary systems and buildings, comprising descriptions and characteristics of
   a) nuclear fuel storage and handling systems,
   b) water supply and cooling systems, including
      1. systems for cooling selected equipment,
      2. the circulating cooling water system,
      3. the demineralised water replenishment system,
      4. the system of fail-safe ultimate heat sink,
      5. potable and non-potable water supply systems and
      6. wastewater treatment and discharge systems.
   c) auxiliary operational systems, including
      1. compressed air systems,
      2. fluid and gas sample collection systems,
      3. drainage systems for the treatment of active waters,
      4. the compressed nitrogen system and
      5. hydrogen storage and distribution system,
   d) air-conditioning, heating, cooling and ventilation systems, including the ventilation systems of
      1. control rooms and backup workplaces,
      2. storage pools,
      3. auxiliary systems and radioactive workplaces,
      4. the turbine hall,
      5. the rooms of safety systems and
      6. spaces of backup diesel generators,
   e) diagnostic systems for indication of failures and non-conformities,
   f) other auxiliary systems, including
      1. fire protection systems,
      2. communication systems,
      3. auxiliary systems of diesel generators and
      4. lifting equipment, cranes and the refuelling machine,

g) buildings and structures, including
   1. foundation structures,
   2. structures and buildings of the nuclear part of the nuclear installation and
   3. other civil structures.

10. Steam and energy conversion systems, comprising descriptions and characteristics of
   a) the overall concept of the system,
   b) main steam pipelines of the system,
   c) steam generator feedwater and blowdown systems,
   d) the turbine generator, condenser and turbine auxiliary systems, and
   e) measures against rupture of the main steam pipelines and feedwater piping.

11. Management of radioactive waste, comprising descriptions and characteristics of
   a) the sources of radioactive waste,
   b) systems for the handling of liquid, gaseous and solid radioactive waste, and
   c) systems for the monitoring of the functions of radioactive waste handling systems.

12. The method of radiation protection assurance, comprising descriptions and characteristics of
   a) the operational programme for radiation protection and implementation of the principles of radiation protection optimisation,
   b) record about keeping of the sources of ionising radiation,
   c) the design solution for radiation protection and
   d) method how exposure of individuals is assessed and the principles of radiation protection assurance are applied.

13. Operational aspects, comprising descriptions of
   a) the organisational structure of the operator of the nuclear installation,
   b) the method of personnel training,
   c) the implementation of operational programmes relating to
      1. maintenance, oversight, inspections and tests,
      2. core design and nuclear fuel handling management,
      3. lifetime and ageing management,
      4. nuclear installation modification management,
      5. the operational feedback system,
      6. documentation and records, and
      7. management of outages,
   d) the system of internal regulations relating to
      1. administrative measures,
      2. normal operation and
      3. management of abnormal operation, accident conditions and other extraordinary events,
   e) methods and results of assessment of nuclear installation operational safety indicators,
   f) the system of independent assessment of the method of operational management and
   g) measures to ensure physical protection of the nuclear installation.

14. The system of preparation and implementation of inspection and test programmes during construction, commissioning and operation of the nuclear installation, comprising
   a) a description of the concept and scope of the test programmes,
   b) specific information to be included in the operational safety analysis report before the commencement of construction of the nuclear installation,
   c) information about test programmes implemented during the first physical start-up of the nuclear installation and the first energetic start-up of the nuclear installation, after

outages for nuclear fuel replacement and after implementation of modifications in nuclear installation design, and

d) information about special programmes for the selected equipment tests.

15. Safety analyses of design basis events, comprising

a) introductory general information about
   1. the input data set for the safety analyses,
   2. data related to these analyses and provided in other parts of the operational safety analysis report,
   3. the selection of postulated initiating events for analyses of design basis events,
   4. the categorisation of design basis events and their classification into groups,
   5. computer programs, models and procedures used for the analyses,
   6. the setup of safety systems and protections,
   7. acceptance criteria for each group of the analyses and
   8. the method of presentation of the results of analyses in this part of the operational safety analysis reports and

b) the results of analyses of design basis events
   1. leading to increased removal of heat from the nuclear reactor by the secondary circuit,
   2. leading to reduced removal of heat from the nuclear reactor by the secondary circuit,
   3. leading to reduced coolant flow in the primary circuit,
   4. caused by reactivity and power distribution anomalies in the core,
   5. caused by increased coolant amount in the primary circuit,
   6. caused by reduced coolant amount in the primary circuit,
   7. causing a radioactive release from subsystems or components of the nuclear installation and
   8. in the nuclear installation with the nuclear reactor shut down and in storage pools for irradiated nuclear fuel.

16. Limits and conditions, comprising information about

a) the objectives, sources and application of limits and conditions,
b) safety limits for the operation of the nuclear installation,
c) limiting settings of protection systems,
d) limiting conditions of operation,
e) requirements for carrying out operational inspections,
f) administrative measures to ensure the safe operation of the nuclear installation and
g) supporting documentation used to justify the limits and conditions.

17. The management system, comprising a description of

a) the concept and roles of the management system in each phase of the nuclear installation life cycle,
b) specific aspects of the management system,
c) safety culture assessment,
d) management system efficiency assessment and
e) assessment of the quality management system for systems, structures and components relevant to nuclear safety.

18. Engineering psychology and ergonomics, comprising

a) a description of the programme to monitor and manage the human factor impact on processes relevant to nuclear safety, optimisation of the human-machine relationship,
b) analysis of whether the scope of participation of nuclear installation operators in the implementation of safety functions has been appropriately chosen,

c) information about the recruiting system and application of a personnel qualification system,
d) analysis of whether the proportion of human activities has been appropriately taken into consideration in the development of internal regulations,
e) demonstration of correct application of the principles and criteria of the human factor discipline in the design of the man-machine interface, in particular in the design of the main control room, the backup workplace and the technical support centre of the nuclear installation,
f) information about verification and validation of the results of the human factor impact assessment programme and
g) information about the method and results of human performance monitoring.

19. Probabilistic safety assessment, containing
a) a description and justification of the purpose and scope of the presented probabilistic safety assessment of the nuclear installation with regard to the risk of exposure of the population,
b) information on how the results of the probabilistic safety assessment were used,
c) quality assessment and uncertainties of the probabilistic safety assessment conducted,
d) a description and evaluation of the results of the probabilistic safety assessment and
e) identification of design and operational measures significantly contributing to nuclear safety assurance.

20. Radiation extraordinary event management, comprising
a) where an emergency planning zone has been established, a description of construction and related technical equipment needed to ensure full readiness for radiation accident response at the nuclear installation, in particular
   1. shelters
   2. the emergency control centre,
   3. the backup emergency control centre,
   4. the technical support centre,
   5. the backup technical support centre and
   6. the external emergency support centre, and
b) where no emergency planning zone has been established, a description of technical means specified in accordance with the Decree concerning the details of ensuring radiation extraordinary event management to ensure
   1. the announcement of a radiation extraordinary event and notification that it has occurred,
   2. management of and response to radiation extraordinary event,
   3. a communication link between the persons managing the radiation extraordinary event response and assembly points, and
   4. a communication link as part of the system for the organisation of assembly or sheltering of persons and their departure or evacuation from assembly points or shelters.

21. Decommissioning of the nuclear installation, comprising
a) a description of the approach to the implementation of the statutory requirements for decommissioning the nuclear installation,
b) identification and justification of the chosen approach to decommissioning the nuclear installation,
c) a description of the concept for decommissioning the nuclear installation,
d) the currently anticipated timetable of decommissioning of the nuclear installation.

22. Management of events and scenarios of design extension conditions that do not progress into severe accidents, comprising
    a) a description of the objectives of the assessment of the nuclear installation capacity to cope with design extension conditions,
    b) references to the parts of the operational safety analysis report that contain information necessary to assess the nuclear installation resistance under design extension conditions,
    c) a description of the types of events and scenarios considered and categorisation of these scenarios, and
    d) descriptions of the methods of selection, resolution and results of the analyses of these scenarios, which shall contain
        1. justification of the selection of initiating events and scenarios,
        2. justification of the selection of acceptance criteria for the results of the analyses,
        3. basic assumptions of the analyses, initial conditions and information about the computing means used and
        4. summary and evaluation of the results of the analysis.

23. Measures to prevent the occurrence and limit the consequences of severe accidents and analyses of postulated severe accidents, comprising
    a) a description of the safety objectives of analyses of severe accidents,
    b) an analysis of the methods to prevent the occurrence and progression of severe accidents with references to the analyses referred to in points 19 and 22,
    c) identification of the available means to limit the consequences of severe accidents,
    d) a description and justification of the selection of the analysed variants of severe accidents, a summary of the results of analyses thereof and a discussion of the procedures that can be applied to limit their consequences,
    e) a description of severe accident management,
    f) an analysis of the results of the deterministic analysis of resistance of the nuclear reactor pressure vessel and containment system in the event of a severe accident and
    g) an analysis of the efficiency of design measures and reasonably practicable modifications to the nuclear installation design to make the occurrence of a severe accident a practically eliminated event or to limit the consequences thereof.

24. Diversion and alternative means for the management of design extension conditions, comprising
    a) a list, technical specifications and evidence of efficiency of these means or specification where in the operational safety analysis report these data are provided,
    b) an allocation of these means into mobile and stationary,
    c) requirements for the environmental classification of the systems, structures and components of these means, and
    d) evidence of availability, reliability and usability of these means as required for interventions by nuclear installation operators.