

DECREE
No. 378/2016 Coll.
of 7th November 2016
on siting of a nuclear installation

The State Office for Nuclear Safety sets, pursuant to § 236 of Act No. 263/2016 Coll., the Atomic Act, to implement § 24(7) and § 47(4):

§ 1

Scope

- This Decree incorporates the relevant Euratom legislation¹⁾ and regulates
- a) a list of the site characteristics of the site for a nuclear installation, assessed in terms of their capability to affect the nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security during the life cycle of a nuclear installation, and in terms of the impact of a nuclear installation on individuals, the public, society and the environment;
 - b) characteristics of the site characteristics of the site for a nuclear installation capable of affecting the nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security during the life cycle of a nuclear installation, the achievement of which causes the siting of a nuclear installation to be prohibited;
 - c) requirements for the scope and method of site evaluation for a nuclear installation ; and
 - d) requirements for the content of the documentation for the practice to be licensed that is the siting of a nuclear installation.

§ 2

Terms

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

- a) deep geological repository means radioactive waste repository located hundreds of metres beneath the Earth's surface and specifically intended for disposal of high level waste;
- b) underground repository means radioactive waste repository located tens of metres beneath the Earth's surface and specifically intended for disposal of low or intermediate level waste;
- c) site area of a nuclear installation means part of the site for a nuclear installation , where the nuclear installation grounds will be situated in stages of the life cycle following the siting of a nuclear installation; and
- d) near-surface repository means radioactive waste repository located near the Earth's surface and specifically intended for disposal of low or intermediate level waste.

¹⁾ Council Directive 2009/71/Euratom of 25 June 2009, establishing a Community framework for the nuclear safety of nuclear installations.

Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

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.

§ 3

Assessed characteristics of the site for a nuclear installation

(1) Site characteristics , assessed in site for a nuclear installation in terms of their capability to affect the nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security during the life cycle of a nuclear installation, are the occurrences of

- a) natural characteristics and phenomena, specifically
 1. seismicity;
 2. crack of the site for a nuclear installation as a result of a fault in the Earth's crust (hereinafter referred to as the "fault");
 3. floods;
 4. groundwater circulation;
 5. other geodynamic phenomena and geotechnical parameters of the foundation soils;
 6. climatic and meteorological phenomena;
 7. biological phenomena; and
 8. natural fires;
- b) phenomena originated in human activity, specifically
 1. aircraft crash and crash of any other flying object;
 2. explosions and fires originated in human activity, and their products;
 3. collision with the protection or safety zone;
 4. impact of the nuclear installation already located in the area;
 5. strong vibrations;
 6. electromagnetic interference;
 7. eddy current;
 8. adverse impacts of air, road, rail and waterway transport;
 9. effects of the pipelines and power transmission lines;
 10. pollution of the air, rock environment, surface and groundwater; and
 11. operation of an installation where readily flammable, explosive, toxic, suffocating, corrosive or radioactive material are located or are released therefrom; and
- c) any other phenomenon that may adversely affect the nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management and security of a nuclear installation.

(2) Characteristics of the site for a nuclear installation, assessed in terms of the impact of a nuclear installation on individuals, the public, society and the environment are the occurrences of phenomena capable of affecting the effect of a nuclear installation on the surrounding environment, specifically

- a) spread of radioactive substance via air, ground and surface water, and food chain; and
- b) population distribution and density, and its development.

§ 4

General requirements for the scope and method of the site evaluation for a nuclear installation

(1) Site evaluation for a nuclear installation shall assess the extent to which the characteristics pursuant to § 3 are capable of affecting the nuclear safety, radiation

protection, radiation situation monitoring, radiation extraordinary event management and security.

(2) The results of the assessment of the site for a nuclear installation shall be compared with the features of the characteristics of the area, the achievement of which causes the siting of a nuclear installation to be prohibited.

(3) The evaluation of the site for a nuclear installation shall include the assessment of

- a) the simultaneous effect and the interaction of characteristics pursuant to § 3, their intensity and duration;
- b) the future development of characteristics pursuant to § 3 during the life cycle of a nuclear installation; and
- c) the impact of installed capacity of a nuclear installation on the site for a nuclear installation in case of a nuclear installation with a nuclear reactor.

(4) The site evaluation for a nuclear installation shall take place for site area of a nuclear installation and up to such a distance thereof, which allows assessing the impact of characteristics pursuant to § 3 on nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management and security, however at least up to the distance determined for that attribute by this Decree.

(5) The site evaluation for a nuclear installation shall make use of

- a) the available records of individuals, if they are the originators of particular phenomena;
- b) the data of administrative bodies concerning the site for a nuclear installation;
- c) historical records relating to the site for a nuclear installation;
- d) the data obtained from surveys and evaluations; and
- e) the data detected and registered by instruments.

(6) The site evaluation for a nuclear installation shall include a description of the approach to the evaluation of attributes pursuant to § 3 and the procedures and methods of evaluation used.

§ 5

Seismicity

The assessment of the site for a nuclear installation in terms of seismicity shall

- a) be carried out up to a distance of 300 km;
- b) particularly include earthquakes whose epicentre is in the area up to 25 km; the assessment of the site for a nuclear installation in terms of that seismicity shall make use of the data obtained from the local network of seismic stations of high sensitivity;
- c) include, for the areas under point a), a compilation of the database containing geological, tectonic, geophysical and seismological data for that area, including information on pre-historical, historical and instrumentally recorded earthquakes;
- d) make use of a seismotectonic model of the region under point a);
- e) make use of a seismotectonic model of local geological conditions on the site area of a nuclear installation; and
- f) include a probabilistic estimation of seismic hazard in the form of determining the frequency of the occurrence of ground motion depending on their size on the site area of nuclear installation, in particular using of peak acceleration and response spectrum the seismic motion.

§ 6

Crack of the site for a nuclear installation as a result of a fault

(1) The assessment of the site for a nuclear installation in terms of its crack as a result of fault shall

- a) evaluate of faults
 1. with a evidence of past movement over the last 2.6 million years;
 2. with a documented occurrence of historical earthquakes or a group of the focuses of the earthquakes directly linked to the fault; or
 3. in a structural relationship with a known capable fault meeting the conditions of point 1 or 2 where there is a significant probability that the displacement on the fault could cause a movement of the other or near the surface of the site for a nuclear installation;
- b) make use of geological, geophysical or seismological data;
- c) be carried out up to a distance of 25 km; and
- d) include an assessment of
 1. the occurrence of slow deformations of the surface of the area, including faults that have not any geological effect but can be reactivated;
 2. the occurrence of linear topographic morphological features of the relief;
 3. the occurrence of sharp lithological boundaries;
 4. the occurrence of the signs indicating mechanical deformation of rocks on tectonic lines, in particular crush zones, clay minerals and saturation of water;
 5. the occurrence of instrument recorded earthquakes or documented historical earthquakes; and
 6. the signs of the occurrence of faults on the site area of a nuclear installation, in particular their increased permeability for the groundwater flow through the rock environment.

(2) The characteristics of the crack of the site for a nuclear installation as a result of a fault, the achievement of which causes the siting of a nuclear installation to be prohibited, are

- a) the occurrence of the motion or seismic capable fault or any other motion of the Earth's crust, which could cause any nuclear safety-reducing deformation of a nuclear installation, up to a distance of 5 km; or
- b) the formation of an associated fault on the site area of a nuclear installation.

§ 7

Floods

(1) The assessment of the site for a nuclear installation in terms of floods shall

- a) assess the possibility of flooding of the site area of a nuclear installation;
- b) be carried out throughout the catchment area that can affect the site for a nuclear installation;
- c) make use of meteorological, hydrographic and hydrological data;
- d) include
 1. the possibility of flooding of the site area of a nuclear installation as a result of precipitation, snow melting or storm surge;
 2. the possibility of occurrence and effect of the special flood caused by failure or accident on hydraulic structures diversifying, impounding or accumulating water;

3. the impact of water accumulation and water level surge as a result of sudden formation of natural or engineering barriers affecting the natural flow and level of waters; and
 4. the impact of erosion or deposit of sediments and the occurrence of floodplain sediments in the river basin; and
- e) evaluate the flood risk on the site area of a nuclear installation with the use of flood risk models, with the possibility of the occurrence of five hundred-year flow.

(2) The characteristic of the floods, the achievement of which causes the siting of a nuclear installation to be prohibited, is the regular flooding of the site area of a nuclear installation as a result of extreme meteorological situations with the probability of the occurrence once in 100 years or more.

§ 8

Groundwater circulation

(1) The assessment of the site for a nuclear installation in terms of groundwater circulation shall

- a) evaluate
1. the occurrence of hydrogeological structures of groundwater, including mineral waters and still unused resources of groundwater and mineral waters; and
 2. the impact of groundwater on a nuclear installation, including chemical properties of water in terms of aggressiveness; and
- b) include the creation of a hydrogeological model for groundwater flow, including a description of hydrogeological layers.

(2) The characteristic of the circulation of groundwater, the achievement of which causes the siting of a nuclear installation to be prohibited, is the existence of significant bodies of groundwater, which could result in permanent pollution by radioactive substance.

§ 9

Other geodynamic phenomena and geotechnical parameters of the foundation soils

(1) The assessment of the site for a nuclear installation in terms of other geodynamic phenomena and geotechnical parameters of the foundation soils shall

- a) evaluate
1. volcanism and the effects of post-volcanic activity;
 2. landslides, including snow avalanches;
 3. collapses and deformations of the surface of the site for a nuclear installation, including undermining;
 4. the unfavourable properties of the foundation soils;
 5. wind erosion; and
 6. sources of dust particles and fragments of rocks; and
- b) be carried out in case of phenomena under letter a)
1. point 1 up to a distance of 25 km;
 2. points 2 and 3 up to a distance of 5 km; and
 3. point 4 on the land of a nuclear installation.

(2) The assessment of the site for a nuclear installation in terms of other geodynamic phenomena and geotechnical parameters of the foundation soils shall take into account

- a) in case of phenomena pursuant to paragraph 1 letter a) point 1, the presence of volcanic rocks of the Palaeogene to Holocene age and the effects of post-volcanic activity, in particular outflows of gases or mineral water, associated with the past volcanic activity;
- b) in case of phenomena pursuant to paragraph 1 letter a) point 2, instability of slopes;
- c) in case of phenomena pursuant to paragraph 1 letter a) point 3, the occurrence of
 1. caverns and karst formations;
 2. deep mines, underground gas storage tanks and any other structures constructed under the ground and the remains of historical mining activities; and
 3. pumping boreholes and dissolving (leaching) technologies for exploitation of mineral resources and groundwater, including collapse or deformation of the surface; and
- d) in case of phenomena pursuant to paragraph 1 letter a) point 4
 1. geotechnical properties of occurring soil and rocks; and
 2. stability of the foundation soils and rocks under static and dynamic stress.

(3) The characteristic of other geodynamic phenomena and geotechnical parameters of the foundation soils, the achievement of which causes the siting of a nuclear installation to be prohibited, is the occurrence of

- a) volcanic rocks of the Pliocene to Holocene age or the effects of post-volcanic activity, in particular outflows of gases or mineral water, associated with the past volcanic activity, up to a distance of 5 km;
- b) phenomena pursuant to paragraph 2 letter c)
 1. on the site area of a nuclear installation; or
 2. outside the site area of a nuclear installation, if there is a risk of collapse or deformation of the surface of the site for a nuclear installation with an impact on nuclear safety;
- c) landslides reducing the nuclear safety; or
- d) persistent inappropriate properties of the foundation soil, namely
 1. unsuitability of the foundation soil for foundation of objects/constructions/buildings relevant to nuclear safety, if the average shear-wave velocity in foundation soil is lower than 360 m/s;
 2. occurrence of the foundation soil with its bearing capacity lower than 0.2 MPa;
 3. occurrence of collapsing or heavily swelling foundation soil;
 4. occurrence of the foundation soil ranked among medium organic or highly organic; or
 5. occurrence of soil liquefaction.

§ 10

Climatic and meteorological phenomena

The assessment of the site for a nuclear installation in terms of climatic and meteorological phenomena shall evaluate long-term climatic properties and meteorological phenomena, in particular

- a) total atmospheric precipitation;
- b) average annual and monthly air temperatures;
- c) wind direction and force;
- d) atmosphere stratification and stability;
- e) atmosphere temperature and its sudden changes;
- f) torrential rain;
- g) lightning;
- h) hurricanes and tornadoes; and

- i) rare meteorological events.

§ 11

Biological phenomena

The assessment of the site for a nuclear installation in terms of biological phenomena shall evaluate the presence of living organisms, living in the aquatic, rock or air environment, and their effects on technological systems of a nuclear installation, in particular air conditioning and cooling.

§ 12

Natural fires

The assessment of the site for a nuclear installation in terms of natural fires shall evaluate the presence of forest and any other continuous stands and utilised agricultural areas, which may be sources of natural fires, up to a distance of 5 km.

§ 13

Aircraft crash and crash of any other object

The assessment of the site for a nuclear installation in terms of aircraft crash and crash of any other object shall be carried out by determining the probability of aircraft crash and crash of any other object, the consequences of which will overcome the resistance of nuclear safety-relevant systems, structures and components anticipated by the design of a nuclear installation.

§ 14

Explosions and fires originated in human activity, and their products

(1) The assessment of the site for a nuclear installation in terms of the explosions and fires originated in human activity, and their products shall

- a) evaluate
 1. the scenarios for explosion, fire, including the occurrence and properties of the substances capable of causing explosion or fire, the characteristics of the pressure wave created, flying fragments loosened as a result of explosion and the spread of the products of combustion, and the magnitude of the vibrations generated by explosion;
 2. the threat arising from the use or destruction of explosives and ammunition; and
 3. the threat arising from mine quakes; and
- b) be carried out up to a distance of 5 km.

(2) The characteristic of the explosions and fires originated in human activity, and their products, the achievement of which causes the siting of a nuclear installation to be prohibited, is the distance of their occurrence from a nuclear installation preventing the implementation of preventive or protective measures to avoid threats to its nuclear safety, radiation protection, radiation extraordinary event management or security.

§ 15

Collision with the protection or safety zone

(1) The assessment of the site for a nuclear installation in terms of the collision with the protection or safety zone shall evaluate whether or not the site area of a nuclear installation extends into the protection or safety zone demarcated by other legislation, in particular into

- a) the road protection zone;
- b) the rail protection zone;
- c) the airports protection zone;
- d) the protection zone of gas pipelines, oil pipelines or any other product pipelines, and underground or above-ground gas storage tank;
- e) the protection zone of electricity network equipment;
- f) the protection zone of a heat energy generation or distribution facility;
- g) the protected deposit area or the mining area;
- h) the protection zone of a specially protected area;
- i) the protection zone of a cultural heritage site; the protection zone of a national cultural heritage site; the protection zone of a reserve of monuments or the protection zone of a zone of monuments;
- j) the protection zone of a water resource;
- k) the protection zone of natural medicinal sources, natural mineral water sources or an area of spa resort;
- l) the emergency planning zone of any other nuclear installation or set out by any other legislation; and
- m) the protection pillars of shafts, unmined deposits and the zones of surface and mine structures.

(2) The characteristic of the collision with the protection or safety zone, the achievement of which causes the siting of a nuclear installation to be prohibited, is the extension of the site area of a nuclear installation into the protection zone pursuant to paragraph 1 letters a) and b).

§ 16

Dispersion of radioactive substance through air, groundwater and surface water, and food chain

The assessment of the site for a nuclear installation in terms of the dispersion of radioactive material via atmosphere, groundwater and surface water, and food chain shall

- a) evaluate
 1. climatic and meteorological phenomena pursuant to § 10; landforms in terms of air flow and inversion states, and the occurrence of unfavourable conditions for the dispersion of radioactive material;
 2. the circulation of surface water and groundwater in the site for a nuclear installation, including water management that is necessary for ensuring the operation of a nuclear installation; and
 3. the current use of the site for a nuclear installation for agricultural activities, fishing, recreation, production and processing of foodstuffs and their raw materials, collection of groundwater and surface water, up to a distance of 5 km; and
- b) include, for all discharges and releases of radioactive substances in operating conditions of a nuclear installation during the life cycle of a nuclear installation

1. development of the scenario for the spread of radioactive substances in the atmosphere with the use of a suitable calculation model taking all conditions of the spread to the atmosphere into account;
2. development of the description for the spread of radioactive substances via surface water and groundwater with the use of a suitable calculation model taking all conditions of the spread to the hydrosphere into account; and
3. the estimation of the effective dose for a representative person.

§ 17

Population distribution and density, and its development

The assessment of the site for a nuclear installation in terms of population distribution and density, and development shall

- a) evaluate, with regard to population distribution and density, and development, the possibility of introducing urgent protective measures;
- b) be carried out up to a distance of 30 km; and
- c) make use of
 1. the results of the last population and housing census carried out;
 2. details of the population density in individual settlements;
 3. details of the change in population from the last population and housing census, in particular of the number of individuals and their economic activity; and
 4. details of the existence and use of buildings with public access.

§ 18

Special requirements for the scope and method of assessment of the site for a deep geological repository

(1) The assessment of the site for a deep geological repository shall evaluate the isolation and retention properties of the rock environment in combination with the artificially created barriers ensure that the stored radioactive waste does not cause, in the expected development of the deep geological repository, a representative person to be more highly exposed than given by a dose optimisation limit. The information concerning the site for a deep geological repository shall be obtained while leaving as far as possible the original properties of the geological environment unchanged.

(2) The assessment of the site for a deep geological repository shall also evaluate

- a) the depth and dimension of the suitable rock massif for siting of a deep geological repository and the distance of geological boundaries and tectonic failures, which can serve as transport ways of radioactive substance;
- b) the structure-geological properties of the rock environment, in which a deep geological repository is located, including brittle and ductile tectonics;
- c) the origin and the expected development of the rock environment;
- d) the suitability of the mechanical properties of rocks to ensure long-term stability of the natural barrier of a deep geological repository;
- e) petrographic and mineralogical composition of the rock environment;
- f) the occurrence of the heterogeneous rock environment with petrographically and mechanically different types of rocks, which are affected by hydrothermal and any other secondary metamorphoses;
- g) the occurrence of endogenous and exogenous phenomena, which can bring about significant changes in the natural barrier of a deep geological repository, in particular

- tectonic processes, seismic activity, volcanism, diapirism, deformations of the surface of the area, and rate of erosion and sedimentation;
- h) the circulation of groundwater in the site for a deep geological repository in terms of possible time of transport, retardation, solubility and change in the concentration of radioactive substance as a result of mixing with groundwater;
 - i) paleo-hydrogeological processes, climatic history and the expected long-term climate development on a regional and global scale;
 - j) vulnerability of the rock environment and groundwater circulation in terms of long-term climatic changes and their associated phenomena, in particular coverage of a deep geological repository by ice, permafrost or water;
 - k) physico-chemical, geochemical and microbiological properties of the geological environment, in particular
 1. retention properties of the rock environment and artificially created barriers;
 2. chemical composition of groundwater;
 3. reducing conditions;
 4. oxygen content; and
 5. the presence of microorganisms, colloids and organic substances;
 - l) geomechanical properties, in particular
 1. strength and deformation properties of rocks; and
 2. stress state of the rock environment;
 - m) gas permeability of rocks;
 - n) thermal properties of the rock environment, including thermal gradient;
 - o) the occurrence of current and future human activity, which is capable of disrupting the insulating properties of the storage system, in particular the utilisation of host rock by mining mineral resources or by utilising geothermal energy or by using the system for underground gas storage tanks;
 - p) the occurrence of changes in host and surrounding geological environment as a result of drilling and mining activities in the surveying stage of the siting of a deep geological repository, which would result in new preferable transport ways of radioactive material; and
 - q) the describability and predictability of the geological structure, groundwater circulation, and physical, mechanical and geochemical properties of the rock environment of site for a deep geological repository.

(3) The evaluation of the attributes of the site for a deep geological repository under paragraph 2 shall consider the depth under the Earth's surface, at which the siting of a deep geological repository is foreseen.

(4) The characteristics of the attributes of the site for a nuclear installation, the achievement of which causes the siting of a deep geological repository to be prohibited, are

- a) the rock environment, which allows for migration of radioactive, chemical and toxic substances, which can be released from the stored radioactive waste so that, in the expected development of that deep geological repository, a representative person is more highly exposed than given by a dose optimisation limit;
- b) the impossibility of creating
 1. a comprehensive spatial model for geological structure due to complex geological structure and tectonic conditions;
 2. a hydrogeological model, as a result of difficulties to describe and predict the hydrogeological conditions of the site for a nuclear installation; or
 3. geomechanical and geochemical models for the site for a nuclear installation; or

- c) the presence of geothermal energy sources.

§ 19

Special requirements for the scope and method of assessment of the site for a near-surface repository or an underground geological repository

(1) The assessment of the site for a near-surface repository or an underground repository shall evaluate whether or not the isolation and retention properties of the rock environment in combination with the artificially created obstacles ensure that the stored radioactive waste does not cause, in the expected development of that repository, a representative person to be more highly exposed than given by a dose optimisation limit. The information concerning the site for a near-surface repository or an underground repository shall be obtained while leaving as far as possible the original properties of the geological environment unchanged.

(2) Furthermore, the assessment of the site for a radioactive waste repository pursuant to paragraph 1 shall evaluate

- a) the depth and dimension of the suitable rock massif and the thickness of weathered zone;
- b) the distance of geological boundaries and tectonic faults, which can serve as for the transport of radioactive substance; and
- c) geomechanical properties, in particular strength and deformation properties of rocks, and natural stress state of the rock environment.

(3) The characteristic of the attributes of the site for a nuclear installation, the achievement of which causes the siting of a radioactive waste repository pursuant to paragraph 1 to be prohibited, is the rock environment, which allows for movement of radioactive, chemical and toxic substances so that, in the expected development of that repository, a representative person is more highly exposed than given by a dose optimisation limit.

§ 20

Requirements for the content of documentation for siting of a nuclear installation

Initial Safety Analysis Report, which shall include

- a) general part including
 1. identification of the parties preparing the initial safety analysis reports, details of their specialisation, qualification and authorisation, if any;
 2. general information about the properties of the site for a nuclear installation in the geographical and demographical field to the extent that may serve as a basis for assessing the individual properties of the site for a nuclear installation pursuant to § 3; and
 3. a list of the methods, documents and information sources used;
- b) the actual evaluation of the characteristics of the site for a nuclear installation and their characteristics, including a list of the documents and information sources used in the evaluation and the methods of evaluation, including
 1. near industrial, transport and military facilities, and forest stands, where phenomena may occur, which are originated in human activity, and the method of their assessment;
 2. impact of any other nuclear installation in the site for a nuclear installation;
 3. climatic and meteorological phenomena;

4. groundwater circulation and floods;
 5. geodynamic phenomena and geotechnical parameters of the foundation soils;
 6. impact of the dispersion of radioactive material;
 7. a summary of the individual characteristics of the site for a nuclear installation and their characteristics in terms of the prohibition of the siting of a nuclear installation;
 8. requirements for the design of a nuclear installation arising from the evaluation of the site for a nuclear installation; and
 9. in case of a radioactive waste repository, the projected properties of radioactive waste and the requirements for institutional control;
- c) description of the design of a nuclear installation in terms of compliance with the requirements for nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security; and
- d) drawing documentation, which shall indicate, in the appropriate resolution, the phenomena to be evaluated and their characteristics, and nuclear installation project.

§ 21

Entry into force

This Decree shall enter into force on 1 January 2017.

Chairperson:

Ing. Drábová Ph.D., m. p.