Written transboundary consultations with the Republic of Poland under the environmental impact assessment procedure of the NNS EDU

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1. GENERAL DIRECTORATE OF ENVIRONMENTAL PROTECTION, Department of Environmental Impact Assessment, Section of Environmental Impacts

Ref. No. of the Ministry of the Environment: 62

Ref. No.: DOOŚ-tos.0442.6.2016.az10

Date: 18/01/2018

Below are given the questions and comments on submitted EIA documentation including a polite request for written statements and explanations. If the topics of consultations are not exhausted in writing, the Polish party shall submit its polite request to hold consultations also in the form of meetings.

1.1. Methodology of radiological impact in the territory of neighbouring states

The radiological impact of the operation of a new nuclear source was determined by means of the computer code ESTE Annual, which is used to assess the radiation impact during normal operation of nuclear facilities. The methodology and algorithms of the code allow to find and identify the representative persons (critical groups of the population) exposed to the release of radioactive materials, situated in a circle with a radius of 100 km. In order to analyse the transboundary impact, the annual individual effective doses from the releases to air, watercourses and in general were assessed but only for countries that are situated within a distance of 100 km (for Austria and Slovakia); for other countries, the collective effective doses are indicated (Poland is situated at a distance of 118 km from the planned investment project). In addition, due to the failure to set the limits or recommended levels for the risk of personal injury, discussed in Chapter D.1.1.1. Impact on health and health risks, it seems that the value of lifelong personal injury should be calculated also for the Polish party as well as for the Austrian and Slovak parties.

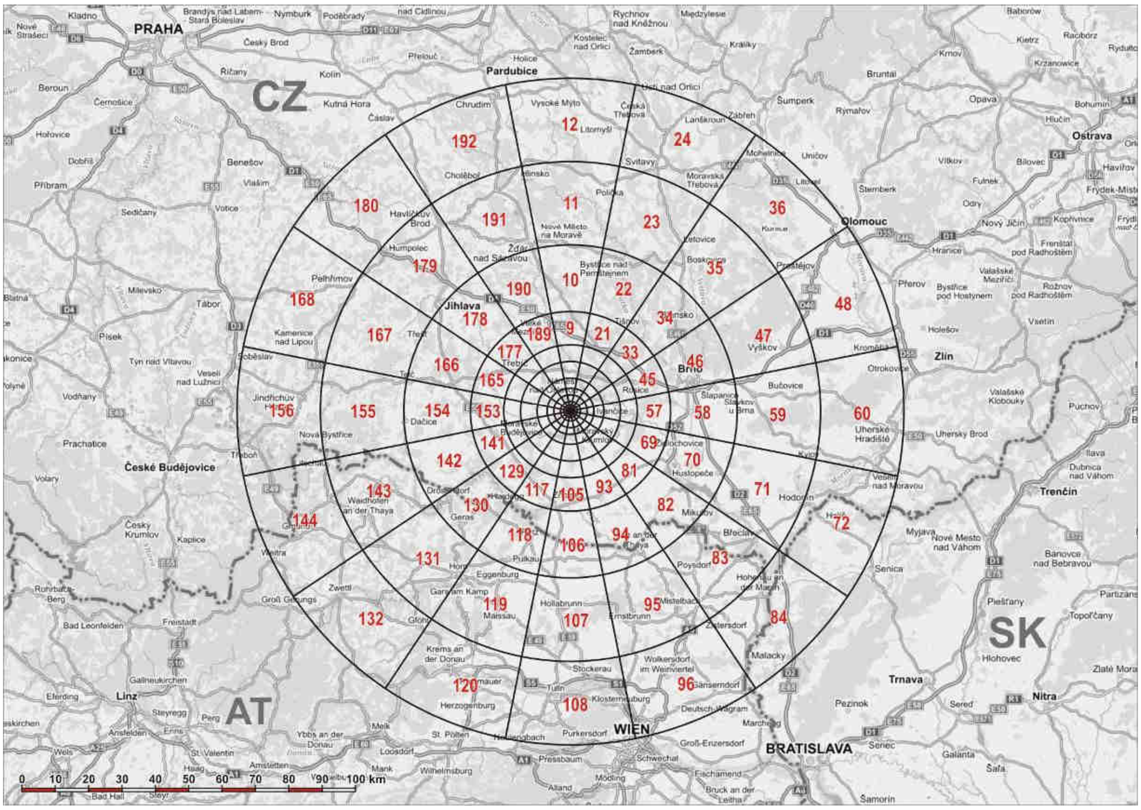
Comment

The calculation of annual individual effective doses from operational effluents of the NNS taking into account the co-acting effect of the EDU1-4 power plant in operation was executed in all sectors to a distance of 100 km as shown in Fig. D.7: Schematics of the arrangement of calculation network - whole calculation area. Although this area does not extend to the territory of Poland, sector 24 is situated relatively close (about 20 km from the border with Poland). In the context of answer to the request submitted, this sector 24 and adjacent sectors 12 and 36 were taken as reference sectors for assessing the risk of health damage from the operation of NNS for the inhabitants of Poland. The individual effective dose was calculated for Czech consumer basket, but the consumer basket of the Czech Republic and Poland are very similar according to the statistics data. In the case of Poland as well as reference sectors 24, 12, and 36, exposure of a representative person is realized only through discharges to the atmosphere from the NNS because liquid discharges to watercourses flow off in the Jihlava River and then through the Morava River into the Danube River and cannot affect Poland in any way.

Table 1 Annual and lifetime value of individual effective dose and risk of injury to health in selected sectors of the NNS 2x1200 MWe and decommissioning of the EDU1-4.

	Sector 12	Sector 24	Sector 36
Annual IED (Sv)	3.56E-08	8.41E-09	6.29E-09
Lifetime dose (70 years) (Sv)	2.49E-06	5.89E-07	4.40E-07
Risk of injury to health (for coefficient of 0.057/Sv under ICRP103)	1.42E-07	3.36E-08	2.51E-08

The maximum annual individual effective dose per capita of Poland living at the border with the Czech Republic can be estimated at less than 3.5E-8 Sv and the consequent risk of injury to health for the inhabitants of Poland will amount to a maximum of 1.42E-07 and, in reality, will be in the order of 1E-08 or lower. The risk of injury to health in the order of 1E-07 and 1E-08 can be interpreted as the probability that one out of 10 or 100 million inhabitants exposed to the appropriate source will suffer health detriment as a result of exposure. The insignificance of exposure of an ordinary inhabitant of Poland due to the operation of NNS can be assumed primarily from the comparison of the estimated maximum annual individual effective dose of 3.5E-8 Sv caused by NPP discharges in the nearest border regions of Poland and the dose received by an ordinary inhabitant of Poland from natural and artificial sources present in the nearest surroundings (by inhalation of decay products of radon, cosmic and cosmogenic radiation, medical exposure, etc., Annual report, Państwowa Agencja Atomistyki, 2016, http://www.paa.gov.pl/uploads/temp/strony/strona_401/text_images/PAA_Annual_Report_2016_readable_1.pdf), which has a value of 3.5E-3 Sv. The dose caused by the NNS is lower by 5 orders of magnitude, i.e. no health damage should be virtually recorded in the territory of Poland (not even one individual) as a result of the entire period of operation and operational discharges of the NNS. It should be also noted that the doses caused by the NNS were calculated on the basis of very conservative estimates of discharges of radioactive substances from the NNS, which will not be achieved with a high probability (see Annex 5.1 of the EIA documentation, Chapter 4.5, Table 15 and Table 16, which includes comparison of the design and actual discharges of the operated EDU1-4).



Obr. 1 Schematics of the arrangement of calculation network - whole calculation area

1.2. Cumulation of impacts in case of emergency

The EIA documentation points out that there are four separate nuclear facilities in the area of EDU1-4 - nuclear power plant, two spent nuclear fuel storage facilities and radioactive waste repository, and all the impacts of the planned project are or will be assessed in their cumulative activity with other nuclear facilities. The possibility of cumulative impacts of the planned project with the existing nuclear facilities was also evaluated in the context of extraordinary events, i.e. the possibility of simultaneous occurrence of the accident in more than one unit?

Comment

The EIA documentation deals with the issue of cumulation of accident conditions across on several units (Chapter D.II.1.10. Radiation Hazards Associated with Human Activity in Site and Its Surroundings).

In terms of the potential for concurrent accident conditions on several nuclear facilities in the site, such situation could actually occur, thanks to the independence of the technological solution of individual nuclear facilities, only in case of extreme external event such as extreme climatic conditions, extreme earthquake or extreme flood. Due to the fact that the units of the NNS will be design-protected from the effects of potential severe accident at any nuclear facility located in the site (including EDU1-4 units and spent fuel storage facility) and the favourable site characteristics, simultaneous accident conditions at several units due to common cause failure from external factors can be considered to be virtually excluded.

In terms of the potential influence on nuclear safety of the NNS in case of accident conditions on any of the units of the EDU1-4 in operation or in the case of two units of the NNS, during accident on the adjacent unit of the NNS, it should be taken into account that the safety systems of each NNS unit will be completely technology-independent of other nuclear facilities in the site and, at the same time, will be capable of independent accident condition management, without the support from other units and equipment. Technical and personnel safety measures for each unit of the NNS will be self-sufficient. The concept of autonomy of each unit of the NNS includes the long-term habitability of the control room and other back-up places of the NNS so as to allow for personnel activity in all states including severe accident conditions.

The consequences of potential severe accident of the NNS as well as the design basis accidents will be limited and will not jeopardize, in the period of possible parallel operation of one unit of NNS and EDU1-4, the possibility of safe shutdown of the existing EDU1-4 units (distance of the service points of the EDU1-4 from the nearest NNS unit is 800 m).

1.3. Radioactive waste and spent nuclear fuel management

The EIA documentation states that spent nuclear fuel will be initially stored in spent nuclear fuel storage pools in the area belonging to the given project (in the reactor hall or in the auxiliary building). Once removed from the pool, it will be stored in the spent nuclear fuel storage facility, which will be the new nuclear facility and will be built in the area of the given project, existing EDU 1-4 or in another selected location. Target-spent nuclear fuel (which does not find use as a secondary raw material for other energy recovery) will be deposited in a deep geological repository. In accordance with the update of the National Concept of Management of Radioactive Waste and Spent Nuclear Fuel, determination of at least two potential locations for the construction of deep geological repositories is planned in 2020. The commencement of construction of such a repository is estimated in 2050 and its operation in 2065.

a) What are the quantities and how many years of operation are expected for spent nuclear fuel pools of the given project?

b) Are any other potential locations of such spent nuclear fuel storage facility known at this stage?

c) The work schedule is already established to built the spent fuel storage pool and what is the capacity it should have?

d) Whether - and if yes, what - alternative solutions are considered for deep geological waste disposal?

Comment

Ad a) After having been removed from the reactor, spent nuclear fuel (SNF) shall be moved to the spent fuel storage pool. For individual reference projects, it is located either next to the reactor in the reactor hall inside the containment, or in an auxiliary fuel storage building next to the containment which is connected with the reactor hall by means of a transport corridor. The capacity of the storage pool for all reference designs meets the requirements for the storage of spent nuclear fuel produced during at least 10 years of reactor operation and throughout this period also provides additional free space for storage of all fuel from the reactor core in case of need for its complete removal and possibly other free storage capacity. Data on the production of SNF are presented in Chapter B.III.4. Other emissions and residues.

Ad b) In accordance with the National Concept of Management of Radioactive Waste (RAW) and Spent Nuclear Fuel (SNF) in the Czech Republic (updated version of the National Concept was approved by the Government of the Czech Republic in November 2017), SNF and RAW will be safely stored on the premises of producers (operators of nuclear facilities) until the construction and commencement of operation of the deep geological repository. At this stage, it is assumed that the SNF storage facility will be built in the area for NNS location or in the adjacent area.

Ad c) The schedule of activities for the construction of spent fuel storage facility is not currently established. The preparation and construction of spent fuel storage facility is, compared with the nuclear power plant, much easier and less time consuming. Having regard to the possibility to store spent nuclear fuel for at least 10 years after the start of operation of the NNS in spent fuel pools of the NNS, the preparation of a new storage facility will be essential to start no later than at the time of putting the NNS into trial operation. This procedure has been verified in the preparation of SNF storage facility at the Temelin site.

The capacity of the new storage facility will allow to store all spent nuclear fuel produced for 60 years of the planned minimum lifetime of the NNS in the appropriate power alternative. For data on the production of spent nuclear fuel of the NNS see Table B.24: Production of spent nuclear fuel of existing and future nuclear power plants in the Czech Republic. The table shows that, for alternative power 2x1200 MWe, we can assume production of 2748 t of SNF expressed in tons of heavy metal.

Ad d) The basic strategy of the Czech Republic for management of spent nuclear fuel is, according to the applicable National Concept of Radioactive Waste and Spent Nuclear Fuel Management as well as the updated National Concept of Radioactive Waste and Spent Nuclear Fuel Management (2017), the direct disposal of spent nuclear fuel in a deep geological repository, which will be ready for operation by 2065. Until such time, spent nuclear fuel will be safely stored with the producers (operators of nuclear installations) in a suitable storage facility compliant with the requirements of Czech legislation.

The preparation of a deep geological repository is fully within the competence of the Radioactive Waste Repository Authority which shall, as the notifier, ensure environmental impact assessment of the repository.

1.4. Transport of nuclear fuel and radioactive materials

The EIA documentation points out that production of nuclear fuel in the Czech Republic is not assumed. Supplies will come from abroad, using one or several normal means of transport - rail, road, sea or air transport. Are the sources of fuel supply known or is the possibility of transport of radioactive materials across the territory of the Republic of Poland considered?

Comment

Transport of nuclear fuel is carried out according to the approved rules and international agreements with the countries concerned. The sources of nuclear fuel supply for NNS have not yet been determined. It is expected that the contractor for reactor units shall contract for the supplies of nuclear fuel even if the supplier of fuel may change during the operation of NNS. In the transport of nuclear fuel, all rules on the transport of nuclear materials and provisions of relevant international agreements will be respected.

Fresh fuel and spent nuclear fuel transport is evaluated in the documentation from the perspective of potential environmental risks (Chapter D.II.1.9. Risks Associated with Radioactive Material Transport). Nuclear fuel is not foreseen to be produced on the territory of the Czech Republic and therefore, ready-made fresh fuel will be transported to the NNS. They will be supplies from abroad, by using one or more usual modes of transport - rail, road, ship or air transport. Similarly, the fuel is already transported to sites of nuclear power plants in the Czech Republic, so it is not a novelty. For transport of fresh nuclear fuel, it is possible, taking into account the current operation of EDU1-4 units, to expect maximum of 5 transports of fresh nuclear fuel to the site on average per year in normal operation of the NNS, while in accordance with the State Energy Policy of the Czech Republic (2015), nuclear fuel stockpiling for several years ahead and the associated adequate increase in the number of transports prior to the commencement of NNS operation are expected.

1.5. Other documents

The EIA documentation contains general information regarding the emergency plans to be drawn up and which relate to the procedure in case of a threat or radiation event. In the event of radiation extraordinary event, the authorities shall ensure the adoption of measures arising from the off-site emergency plan. The emergency planning zone of the project will be determined at the stage of issuing additional permits, in accordance with Czech legislation. In addition, the so-called "Safety Analysis Report" will be drawn up before the commencement of operation, containing a safety assessment of the already built facility ready for future operation. In connection with the above, I am writing to ask for information whether the documents mentioned above, i.e. off-site emergency plan and safety analysis report, will be also submitted to the Polish party.

I politely ask you to disclose information about the final selection of a reactor technology after signing a relevant contract with the contractor, in particular containing information on the type and quantity of radioactive substances in the reactor core.

Comment

The off-site emergency plan is a document containing a set of measures to deal with emergency in the area of the emergency planning zone of the nuclear facility. These measures are designed to provide protection of the population, the environment, livestock, property and cultural values. It is a non-public document, available only for the needs of the Integrated Rescue System and authorities dealing with the emergency. The off-site emergency plan is part of the documentation of the Integrated Rescue System. Further information about the off-site emergency plan is given in Chapter D.II.1.11.1. Radiation extraordinary event response preparedness.

The off-site emergency plan for the nuclear power plant is drawn up by the Regional Fire Rescue Service, in whose jurisdiction the power plant is situated. The off-site emergency plan is developed on the basis of documents handed over by the applicant for licence or the licence holder for the operation of a nuclear power plant and partial documents prepared by competent regional authorities, units and municipalities.

The future off-site emergency plan for the NNS (as well as the current off-site emergency plan of the EDU1-4) represents the property of the Fire Rescue Service of the Vysočina Region and cannot, therefore, be provided by the notifier to the Polish party. The public part of the off-site emergency plan for the operated Dukovany NPP is available on the website of the Vysočina Region (https://www.kr-vysocina.cz/vypis-z-vnejsiho-havarijniho-planu-pro-zonu-havarijniho-planovani-je-dukovany/d-854177#3.%20SYST%C3%89M%20KLASIFIKACE%20MIMO%C5%98%C3%81D%C3%9DCH%20UD%C3%81LOST%C3%8D).

The safety analysis reports for individual stages of preparation of a nuclear facility are the licensing documents that are owned by the operator of the nuclear facility and may contain trade secrets. In connection with the application for licence for siting of the NNS, the so-called "Initial Safety Analysis Report" will be drawn up which, like for the case of preparation of the NNS at the Temelín site, will be available on the website of ČEZ.

At the next stages of design preparation (licence for construction and for operation of nuclear facility), the relevant safety analysis reports can contain trade secrets both of the operator and, in particular, of the supplier of nuclear facility. For this reason, disclosure of safety analysis reports to a third party is usually not possible and cannot be guaranteed even for the NNS. On the other hand, it is assumed that the selected parts of the safety reports will be published on the website of ČEZ and will be thus available to the Polish party.

2. STATE VOJVODESHIP HYGIENIST IN OPOLE

Ref. No. of the Ministry of the Environment: 63

Ref. No.: 'NZ.9022.3.34.2017.ZD

Date: 15/12/2017

In the case of participation in transboundary consultations, questions related to the below should be taken into account for the investment project:

a) failure to assess the risk posed to Poland by a nuclear accident in the above power plant,

b) emissions released to air,

c) transport of radioactive fuel, radioactive waste and spent nuclear fuel management (risk of accident during transport of radioactive waste, even during their transport to the processing plants across the territory of neighbouring states of the Czech Republic and during transport of fuel elements),

d) external influences, e.g. terrorist attacks.

Comment

a)

Information about possible emergency situations and risks can be found in Part D.II and, in particular, in Chapter D.II. Radiation risks. This chapter contains impact assessment of the representative envelope cases of accident conditions including severe accident. For all the events assessed, the impacts on the territory and population of Poland are explicitly assessed. Informing neighbouring states, in particular in terms of informing in case of occurrence of an extraordinary radiation situation, is given in Chapter D.II.1.11.4. Informing neighbouring states.

b)

The calculation of annual individual effective doses from operational effluents of the NNS taking into account the co-acting effect of the EDU1-4 power plant in operation was executed in all sectors to a distance of 100 km as shown in Fig. D.7: Schematics of the arrangement of calculation network - whole calculation area. Although this area does not extend to the territory of Poland, sector 24 is situated relatively close (about 20 km from the border with Poland). In the context of answer to the request submitted, this sector 24 and adjacent sectors 12 and 36 were taken as reference sectors for assessing the risk of health damage from the operation of NNS for the inhabitants of Poland. The individual effective dose was calculated for Czech consumer basket, but the consumer basket of the Czech Republic and Poland are very similar according to the statistics data. In the case of Poland as well as reference sectors 24, 12, and 36, exposure of a representative person is realized only through discharges to the atmosphere from the NNS because liquid discharges to watercourses flow off in the Jihlava River and then through the Morava River into the Danube River and cannot affect Poland in any way. The annual and lifetime values of individual effective dose and risk of injury to health in selected sectors of the NNS 2x1200 MWe and decommissioning of the EDU1-4 are indicated in Table 1.

The maximum annual individual effective dose per capita of Poland living at the border with the Czech Republic can be estimated at less than 3.5E-8 Sv and the consequent risk of injury to health for the inhabitants of Poland will amount to a maximum of 1.42E-07 and, in reality, will be in the order of 1E-08 or lower. The risk of injury to health in the order of 1E-07 and 1E-08 can be interpreted as the probability that one out of 10 or 100 million inhabitants exposed to the appropriate source will suffer health detriment as a result of exposure. The insignificance of exposure of an ordinary inhabitant of Poland due to the operation of NNS can be assumed primarily from the comparison of the estimated maximum annual individual effective dose of 3.5E-8 Sv caused by NNS discharges to the population in the nearest border regions of Poland and the dose received by an ordinary inhabitant of Poland from natural and artificial sources present in the nearest surroundings (by inhalation of decay products of radon, cosmic and cosmogenic radiation, medical exposure, etc., Annual report, Państwowa Agencja Atomistyki, 2016, http://www.paa.gov.pl/uploads/temp/strony/strona_401/text_images/PAA_Annual_Report_2016_readable_1.pdf), which has a value of 3.5E-3 Sv. The dose caused by the NNS is lower by 5 orders of magnitude, i.e. no health damage should be virtually recorded in the territory of Poland (not even one individual) as a result of the entire period of operation and operational discharges of the NNS. It should be also noted that the doses caused by the NNS were calculated on the basis of very conservative estimates of discharges of radioactive substances from the NNS, which will most likely not be reached.

c)

Transport of nuclear fuel is carried out according to the approved rules and international agreements with the countries concerned. The sources of nuclear fuel supply for NNS have not yet been determined. It is expected that the contractor for reactor units shall contract for the supplies of nuclear fuel even if the supplier of fuel may change during the operation of NNS. In the transport of nuclear fuel, all rules on the transport of nuclear materials and provisions of relevant international agreements will be respected.

Fresh fuel and spent nuclear fuel transport is evaluated in the documentation from the perspective of potential environmental risks (Chapter D.II.1.9. Risks Associated with Radioactive Material Transport). Nuclear fuel is not foreseen to be produced on the territory of the Czech Republic and therefore, ready-made fresh fuel will be transported to the NNS. They will be supplies from abroad, by using one or more usual modes of transport - rail, road, ship or air transport. Similarly, the fuel is already transported to sites of nuclear power plants in the Czech Republic, so it is not a novelty. For transport of fresh nuclear fuel, it is possible, taking into account the current operation of EDU1-4 units, to expect maximum of 5 transports of fresh nuclear fuel to the site on average per year in normal operation of the NNS, while in accordance with the State Energy Policy of the Czech Republic (2015), nuclear fuel stockpiling for several years ahead and the associated adequate increase in the number of transports prior to the commencement of NNS operation are expected.

Transport of spent nuclear fuel from the NNS to the spent fuel storage will be realised depending on location of the storage either within the premises or outside the premises. Spent nuclear fuel can be transported to the spent fuel storage facility by rail or by road. Both cases will involve maximum of units of transports per year.

Compared to the transport of any other dangerous goods (in terms of energy, transport of any other types of fuels), transport of radioactive materials in relation to the environment and the population is much less risky and its amount and frequency of transport are low. The potential for radioactive release into the environment during transport is minimised. Procedures are drawn up for each transport of radioactive materials, i.e. how to restrict any radiation consequences of an accident so that health of population could not be jeopardised. For transport of radioactive materials, strict limitations are set in Decree of the State Office for Nuclear Safety No. 379/2016 Coll., for dose rate on the surface of the cask used for transporting radioactive materials and at a specified distance from that cask. The cask type-approved by the State Office for Nuclear Safety shall be solely used for transport.

d)

Basic information on the requirements and the way of securing the NNS against risk of terrorist attack and sabotage is provided in the Documentation (Chapter D.II.1.8. Risk of Terrorist Attack). The essential requirements and the ways of securing the NNS against terrorist attack including intentional aircraft crash and also against cyber attacks are specified in the relevant chapter of the documentation. The risk of act of terrorism against the NNS will be assessed in detail in the following phases of the design preparation and development in compliance with the requirements laid down by the Atomic Act, and eliminated by standard means and procedures of the security of nuclear facilities, used in the existing practice in accordance with current requirements of international and national legislation.

The method of securing nuclear facility and nuclear material will match the hazard resulting from design basic threat (DBT), as laid down by SÚJB decision on the basis of the binding statement of the Ministry of Interior, Ministry of Defence, and the Ministry of Industry and Trade, together with the rights and responsibilities in ensuring the security of nuclear material. Design basis threat means a set of features and capabilities of an individual, who is located inside or outside the nuclear facility or near nuclear material and who is capable of using this object intentionally and unlawfully. Design Basis Threat is subject to Act No. 412/2005 Coll., on Classified Information Protection and on Security Capacity, as amended, and its implementing decrees. The design basis threat is updated regularly once a year or more frequently in case of change in the security situation in the Czech Republic.

Detailed analyses of the consequences of accidents of NNS buildings in case of aircraft crash and other external events caused by human activities could be potentially abused in preparation of sabotage or terrorist attack. Therefore, such evidence of resistance, assumptions and results will be classified in accordance with Act No. 412/2005 Coll., as classified information.

Other external influences resulting from human activities are assessed in the documentation in Chapter D.II.1.10. Radiation Hazards Associated with Human Activity in Site and Its Surroundings. Naturally external influences that must be reflected in the design of the NNS are described in Chapter B.I.6.3.1.6. Suitability of the site for NNS location.

3. Ecological and Cultural Association "Common Earth"

Ref. No. of the Ministry of the Environment: 64

Ref. No.: -

Date: 08/01/2018

3.1. No sufficient justification for the need of another nuclear power plant and no sufficient assessment of alternatives

Although the document defining the scope of the EIA report states the intent of construction of new capacities "up to 3500 Mw(e)", the EIA documentation reduces this capacity to 2400 MW(e). It should be noted that only the unit rating of Russian reactor model currently available on the market is exactly 1200 MW(e). It is not a coincidence, given the fact that the Czech nuclear complex traditionally prefers the Russian producer, i.e. Rosatom. At the same time, the EIA report showed that the Jihlava River is certainly not able to provide a sufficient quantity of water needed to increase the overall performance of the reactor and that tritium contamination will significantly increase. The calculations for the scenario for more than 80 years have a high degree of uncertainty: water shortage may be felt much sooner and in a steeper way. For that reason, the EIA documentation is a clear evidence that alternative solutions should be further examined.

In accordance with the EIA Directive (2014/52/EU), examination of the alternative solutions must be implemented and decisions must be based on a comparison of the environmental impacts of widely understood variants of the investment project. Such alternatives should be various options for electricity production as well as different reactor types, their alternative locations, or power outputs. In the case of EIA for the Dukovany NPP, alternative solutions have not been assessed in the manner which entitles to base the decision on new units on such an assessment. It argues that the decision on new units has already been adopted in the Energy Strategy for the Czech Republic (2015) and in the National Action Plan for the Development of Nuclear Energy Sector in the Czech Republic (2015). However, the alternatives have not been properly assessed even in the "Energy Strategy ..." and the "National Action Plan ..." was not the subject of a strategic EIA.

Comment

The NNS supplier will be selected in the course of the project preparation. Selection of the supplier is not part of the environmental impact assessment. In any case, none of the suppliers shall be prioritized and consider it on the basis of a comparison of the possible performance of the site with the performance of the unit of one of the potential suppliers is not correct. Environmental as well as safety requirements for all the types of reactors are identical and their maximum potential impacts have been considered in the assessment. This means that the parameters used for the assessment of the effects safely cover the equipment parameters of all the eligible suppliers. Therefore, the NNS supplier may be any of the suppliers of the reference reactor types, or even another manufacturer, whose design meets all the legal requirements (in particular those that are required for nuclear power facilities) and at the same time complies with the envelope parameters used for the environmental impact assessment.

As for the security of cooling water from the Jihlava River, it is possible to indicate the following facts. The EIA documentation reliably demonstrates that for the NNS with the net electrical output of up to 2,400 MWe, the required security for the supply for the power plant of 99.5% (the requirement of the Notice Author) will be met, the required security for minimum residual flow rates is 98.5% (according to the recommendations of the standard ČSN 75 2405 Water management analysis of reservoirs), even when considering climate change +2°C. This security will be met even during a temporary concurrence of the operation of NNS Unit 1 and EDU1-4 or EDU2-4. For details see Chapter D.I.4.1.3.1. Effects on the minimum residual flow rate in the Jihlava River and the security of water supply for the power plant. It should be noted that the presented data relate to the ecological functions of the river, given by compliance with the established minimum flow rates. The supply of water for potential accident conditions is in order of magnitude lower and can be reliably secured.

For the maximum concentrations of H-3 in surface waters, the documentation demonstrates both the failure to achieve an immediate maximum activity concentration of 3,500 Bq/l and the requirement not to exceed an annual average activity concentration of 1,000 Bq/l according to environmental quality standard. In terms of effects on underground waters, which may be subsidized with surface water, the failure to achieve the value of activity concentration of 100 Bq/l in drinking water is also evaluated.

The EIA documentation is focused on a specific design of a new nuclear source in the Dukovany site, which forms a sub-part of the energy mix. It is not and cannot be a conceptual document, assessing the industry strategies.

The form of the energy mix was the subject of the energy concept (State Energy Policy of the Czech Republic (SEK), 2004, Update of the State Energy Policy of the Czech Republic, 2015), which included the strategic environmental assessment (the so-called SEA). Therefore, the form of the energy mix, or the share of individual sources in the energy mix, has undergone a variant evaluation, which was concluded by approval of the relevant concepts by the Government of the Czech Republic. In the case of SEK 2004, it was a variant and multi-criteria assessment of 6 different scenarios of the coverage of energy needs of the Czech Republic up to 2030 from various types of power plants. The optimised scenario best met all of the criteria. In the case of the Update of the SEK 2015, the SEA assessment contained a multi-criteria assessment of the current state of the energy mix (corresponding to the structure according to the SEK 2004) and its time progression up to 2040 with the proposed new corridors of an optimised energy mix according to the draft Update of the State Energy Policy of the Czech Republic in draft version of 2014. This assessment was concluded by issuing the opinion of the Ministry of the Environment and the approval of the Updated State Energy Policy by the Government of the Czech Republic after the incorporation of requirements from the opinion of the Ministry of the Environment on the SEA in 2015.

Therefore, the documentation deals with the sub-part of the adopted energy mix, its nuclear part - i.e. new nuclear source in the Dukovany site. Other components of the energy mix (including renewable energy sources) are not affected and are prepared by their notifiers or investors as sub-components of the energy mix.

Therefore, if the documentation indicates data concerning the scenarios of energy development and their evaluation and comparison, they are the informative data based on the previously implemented strategies and related evaluations (including their comparison with regard to environmental impacts). The documentation does not evaluate, question and even prefer them in any way. The purpose of these data is to prove the fact that the project of new nuclear source is in accordance with the adopted energy strategies of the Czech Republic and that the strategies have undergone an appropriate process of environmental impact assessment. The requirement to evaluate any other (non-nuclear) energy sources and their impact on nature cannot be fairly required from the Notice Author. And, by analogy, for example, the notifiers of renewable energy sources cannot be imposed an obligation to evaluate gaseous, nuclear or other alternatives.

Therefore, the Intent in the current degree of preparation is designed with one implementation variant consisting of construction of the new nuclear source at the Dukovany site. The choice of this variant is based on consideration of the potential options of variant solution that are given in the documentation in Chapter B.I.5.2.1. Survey of Variants under Consideration.

The Documentation contains the impact assessment for both the implementation variant (i.e. Intent implementation) and the zero variant (i.e. Intent non-implementation). At the same time, the zero variant means a maintenance of the existing state of the environment and its development trends.

3.2. Reactor models

It should be noted that the EIA documentation provides information about possible reactor types for Dukovany units (information whose content is like from industry-specific advertising leaflets), which are reportedly available on the market and meet the highest safety requirements, but they are not and have not yet been operated anywhere in the world: have never been completed or even ordered (in the case of Atmea), they have been abandoned already during construction (AP1000 in the Summer NPP in the USA), objections have been raised regarding safety even at the stage of design documentation (KEPCO EU - APR), they have not yet been licensed in the EU (VVER-1200, the first expected licence for Hanhikivi NPP in 2019) or are built with multi-year delays and large exceeding of originally expected costs (EPR in the Olkiluoto NPP and in the Flamanville NPP).

However, the VVER reactors are available not only under various names (1200 MW(e)) but also with different levels of security, and should therefore be regarded as not fully specified. It is not possible to assess the levels of security in public: during the forthcoming licensing procedure between the operator and the nuclear supervisory body; of course, they will remain confidential and the possibility to disclose them to the public and subject them to independent assessment will be completely excluded. For different types of reactors, the safety features should be confirmed such as whether they are equipped with a sufficient number of redundant systems (parallel) or whether the reactors can withstand seismic phenomena that may occur in the site. Ii is not sufficient to refer to the supervisory requirements regarding the safety limits that should be met by new reactors if there is no evidence that these requirements can be met at all. The design lifetime of 60 years makes it necessary to consider the concept of ageing management of installations in order to avoid security problems related to security such as those that occurred in both the Dukovany NPP and Temelín NPP (false results of the quality control of welding of critical elements of the installation). Such concepts are not in the present EIA documentation.

Comment

Of course, the new nuclear source can be supplied by several suppliers. However, their detailed technical solutions are not subject to the EIA. Legal requirements (both in the field of the environment and in the field of nuclear safety or other) are the same for all potential suppliers. All cases concern the reactors of PWR type (pressurized water reactor) Generation III+. The NNS will be required to have the selected reactor type in compliance with the relevant WENRA and IAEA recommendations for new reactors beyond applicable legislation of the Czech Republic.

Specific technical and technological description of all the considered reference reactor types is included in Chapter B.I.6. Description of technical and technological solution, or its Sub-chapter B.I.6.3.1.8. Information concerning reference designs. Descriptions of the reference projects are based on the data of reference units provided by their contractors. The safety characteristics of the type of VVER reactor in question are sufficiently obvious from the descriptions. The description of all the types considered is provided at the reasonable level of detail, which corresponds to the purpose of the EIA procedure, including basic technical information on individual reference projects, state of their construction and licensing, implemented measures for extraordinary event management, including description of safety systems and way of protection against release of radioactive substances into the environment, as well as summary technical information on PWR Generation III+ reactor units and their designs.

With regard to the operating experience with the PWR Generation III+ reactors, several units of this type are already in operation or should be put into operation in 2018 (Russia, China, India, the United Arab Emirates), other units should follow in the following years. The environmental impact assessment and the assessment of safety documentation were carried out for various stages of the licensing of new nuclear units in several EU countries (Bulgaria, Czech Republic, Finland, Hungary, Slovakia, United Kingdom). The IAEA has assessed compliance with the safety standards for 11 types of new nuclear sources with PWR reactors. Positive operating experience with PWR reactors is long-term experience and lasts for 60 years. The Generation III+ uses proven technologies and differs from the previous generations mainly in greater resistance to external hazards and the significant strengthening of safety systems. All these facts provide sufficient proofs that the current safety requirements are and will be fulfilled.

Basic information on the Management Programme for the whole life cycle of a nuclear installation and the Ageing Management Programme are presented in the Documentation (Chapter B.I.6. Description of Technical and Technological Solution). However, the ageing management is not subject to the EIA procedure and will be taken into account at further stages of project preparation. All suppliers will be obliged to demonstrate, in compliance with the relevant legal requirements and standards, the way of taking into account the requirement for the minimum 60-year design life of their projects. The service life of 60 years is made possible by incorporating operating experience on similar reactors and the results of material research.

3.3. Assessment of the calculated severe accidents

The EIA documentation contains the calculation of the impact of severe accidents with partial melting of the reactor core. The assumption was that containment will remain basically unchanged, which is a baseless assumption, adopted without any reason. For this calculation, there is an assumption of the isotopic composition of release at the level of 30 TBq for Cs-137 and 1000 TBq for I-131. For comparison, the level below 500 Tbq for Cs-137 was adopted for the planned reactor in the Hanhikivi NPP (Finland). Under these assumptions, according to the EIA documentation, there will be no individual doses within a radius of 100 km and farther from the Dukovany NPP, which would require the application of the means of radiation protection.

However, the impact on agricultural areas can be considerable, even at a distance greater than 100 km from the location of the NPP (its distance from the Polish border is 118 km). On page 508 of the EIA documentation, the maximum permitted levels of radioactive contamination of food and feed following a nuclear accident are indicated (in accordance with Council Regulation (Euratom) 2016/52). The Polish legal regulations do not include a list of actions and preventive measures similar to those in force in Austria[1] and in Germany[2], where steps are described in detail in the agricultural sector in order to avoid the maximum level of contamination of food and feed.

The measures are defined such as immediate harvest and protection of the harvest, or also a provisional retention of pigs in the farm premises. These measures must be launched in the case of the values given in the table below and are, compared to the calculated levels of pollution as a result of a severe accident, in compliance with the EIA documentation (page 539):

	I-131 in Bq*h/m³	I-131 in Bq/m²	Cs-137 in Bq*h/m³	Cs-137 in Bq/m²
Value in Austria and Germany for start of agricultural countermeasures	170	700	350	650
Values assessed in the EIA document for 100 km (95% quantil) (p. 539)	2750	56000	172	1600

These values are exceeded for almost all kinds of pollution within 100 km and besides, they could be easily exceeded at distances greater than 100 km. More information should be provided about the calculations for distance above 100 km to allow the Polish party to properly assess the implications for agriculture in our country. In addition, the values set out in Regulation (Euratom) 2016/52 are much higher, which was discussed in the statement of Mraz & Becker (2017)[3], in particular due to the fact that an assumption was adopted for the calculation of doses in the statement on the levels of contamination of food that only 10% of all food is contaminated and 1% of liquid food. This will not apply in the case of largest accident in one of the EU countries, combined with meteorological conditions.

Comment

The limit value of leakage of Cs-137 into the surroundings of 30 TBq for severe accident has been determined with regard to the requirements of Czech legislation and IAEA and WENRA recommendations to reduce the radiological consequences of a severe accident. This maximum permissible value of the source term Cs-137 has to ensure the reduction of long-term and economic impacts of a severe accident. The isotope Cs-137 is selected because of its dominant importance for long-term contamination of the surroundings, as well as its contribution to the health consequences. It is therefore the design envelope restriction, which the selected supplier will have to demonstrate within the licensing process.

However, the resulting source term was compared with the source terms submitted under the "REQUEST FOR INFORMATION FOR STRATEGIC DECISION-MAKING ON THE NEXT PROCESS OF NEW NUCLEAR POWER PLANT CONSTRUCTION PROJECTS" and found equivalent in all significant parameters determining the environmental impacts, which ensures that the consequences of

1 Osterreich: Maßnahmenkatalog für Radiologische Notstandssituationen. Arbeitsunterlage für das Behördliche Notfallmanagement auf Bundesebene gemäß Interventionsverordnung. Version Juli 2014. Abteilung I/7 Strahlenschutz. https://www.bmlfuw.gv.at/dam/jcr:1882b9a4-e561-4b00-8e17-5aaa7442bfda/Ma%C3%9Fnahmenkatalog%202014.pdf

2 Übersicht über Maßnahmen zur Verringerung der Strahlenexposition nach Ereignissen mit nicht unerheblichen radiologischen Auswirkungen Überarbeitung des Maßnahmenkatalogs Band 1 und 2. Empfehlung der Strahlenschutzkommission. Heft 60, SSK 2007

3 Mraz, G., Becker, O. (2017): Health effects of ionizing radiation and their consideration in radiation protection. Supported by Vienna Ombuds-Office for Environmental Protection

specific DBA and DEC in future licensing documentation for the selected reactor type will always be lower than the consequences presented in the EIA documentation.
The method of indicating the value of the source term up to 500 TBq of Cs-137 for the planned nuclear power plant in Hanhikivi in Finland for the evaluation of a severe accident is misleading. Finnish legislation sets out the maximum leakage of Cs-137 during a severe accident to 100 TBq of Cs-137, which shall only guarantee the limited health consequences of a severe accident. Therefore, this value is used in the Finnish EIAs for the NNS, regardless of the reactor type or a real potential for such a leakage. This fact is mentioned in many places of the EIA study for the power plant in Hanhikivi (Fennovoima- Environmental Impact Assessment Report for a Nuclear Power Plant, February 2014). The EIA study also explains the context in which the value of 500 TBq of Cs-137 was used. For example, in the EIA document, part "Responses to the statements and questions of some foreign countries concerning Environmental Impact Assessment Program", page 13 states that „In order to evaluate the impacts of a nuclear power plant accident, the EIA procedure has included modelling of the spread of a radioactive release caused by a severe reactor accident, the consequent fallout, and radiation dose received by the general public. The studied release was the Caesium-137 release of 100 TBq laid down in the Government Decree (717/2013), which corresponds to a severe reactor accident (INES 6). The impacts of a release five times higher than the 100 TBq release (more than 50,000 TBq of iodine-131 equivalents) were also assessed corresponding to an INES 7 accident. However that release is theoretically impossible in terms of noble gases, because the release would mean that five times more noble gases than the reactor contains would be released. Such a fivefold release would not cause any immediate health impacts."

The assumption of maintaining the integrity of the containment is the design requirement for the NNS and it is therefore not true that it would be the assumption accepted without any reason. In order to meet the criterion K3 of the SÚJB (see D.II.1.5.1. Criteria according to the statement of the SÚJB) "Such design measures must be taken for postulated accidents of the NNS with the core melting or damage of irradiated nuclear fuel in the storage pools ensuring that it will not be necessary to evacuate population in the immediate surroundings of the NNS and introduce long-term restrictions on food consumption...", the containment integrity must be maintained during severe accident.

This requirement is also included in the WENRA document "WENRA Reactor Harmonisation Working Group (RHWG) - Report on Safety of new NPP designs, 3/2013", where Article O.3.4 Measures to Limit the Radiological Consequences of Core Melting states that in the case of severe accident it is necessary to maintain the integrity of the containment. Maintaining the integrity of the containment during severe accident will be part of the design and licensing bases for the NNS, the demonstration of which will be required within the licensing process for the NNS pursuant to the Atomic Act. It is also the requirement, which stems from the EUR requirements on new nuclear reactors and is known to all suppliers of the reference units and all of them declare that they meet the requirement in the context of their designs, and will have to adequately demonstrate and prove it within the tender procedure and the licensing process for the selected unit. According to the information of the individual suppliers, radioactive releases in case of severe accidents are several times smaller for all the considered types of nuclear reactors.

The EIA documentation evaluates the effects of a severe accident on the agricultural production pursuant to Council Regulation Euratom 2016/52. The quantities of agricultural products is specified and expressed in total area and in tonnes, which in case of severe accident in the middle of the growing season, may be contaminated above the permitted level for marketing (selling) these products in the EU countries. This regulation is valid in the Czech Republic and other EU countries. According to the results of the analyses carried out for the EIA documentation, **during severe accident of the NNS, the agricultural production on the territory of Poland will not be contaminated above the levels set out in Council Regulation Euratom 2016/52.**

Other measures according to relevant national regulations, which may include, but are not limited to, immediate harvesting of agricultural products or the sheltering of farm animals in stables (which are all the measures to prevent future economic losses, even if their introduction leads to incurring of costs), which are put in place by relevant national legislation in Germany and Austria, are not defined in the Czech Republic or in a number of other countries including Poland and therefore were not even evaluated in the EIA documentation.

Contrary to the values of the contamination of agricultural products covered by Council Regulation Euratom 2016/52, it is not the limit, but recommended guidance levels, at which precautions according to the Austrian and German procedures should be considered. The aim of these precautions is to avoid economic loss that would have occurred if due to inactivity the **levels of contamination set out in**

Council Regulation Euratom 2016/52 were achieved and these products were prohibited on the EU markets. The consideration of the implementation of precautions should take into account the question whether the costs of the introduction of precautions will not be higher than the potential economic loss that could arise if no precautions were in place. In the case of Poland, according to the results of the evaluation of severe accident of the NNS, the contamination levels of agricultural products under Council Regulation Euratom 2016/52 should not be exceeded and it would not be therefore necessary to introduce any precaution.

The values of deposit of the monitored critical radionuclides as a basis for considering precautions under Austrian and German legislation are presented in the EIA documentation (see Table D94 for severe accident and Tables 86 and 91 for design basis accidents). These are the values of the average maximum and the 95% quantile of maximum deposits throughout the annulus at the given distance. In general, if the considered area is located only in part of the respective annulus, the achieved average and maximum values of the deposit are lower for that area than for the whole annulus (it is also the case of Poland).

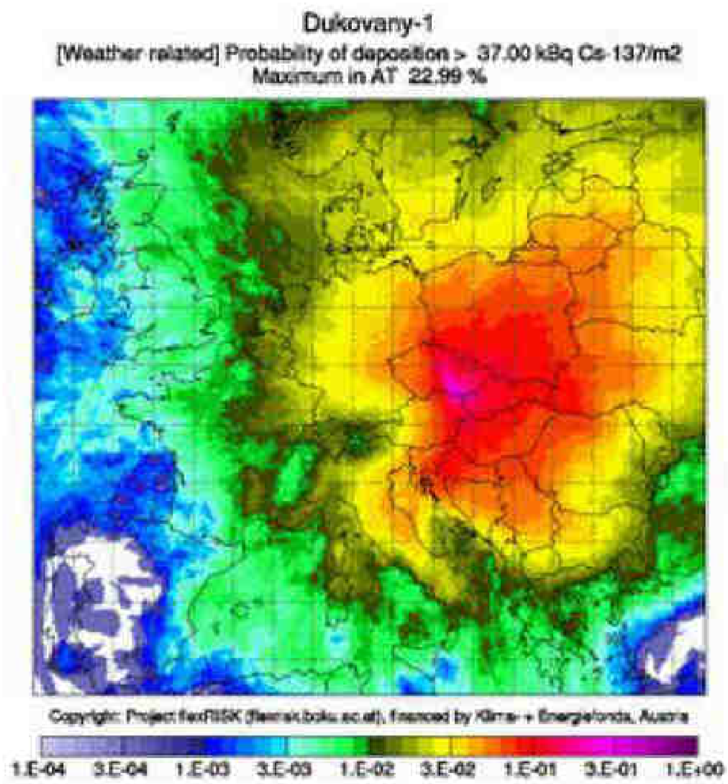
If the Austrian and German guidance levels to consider preliminary measures are applied to the territory of Poland, then the calculations show that during severe accident the value of 700 Bq/m^2 of surface activity of I-131 will not be reached with a probability more than 78% anywhere in Poland and the value of surface activity of 650 Bq/m^2 for Cs-137 will not be reached in Poland at all.

3.4. Most severe accident?

The above discussed calculations of a severe accident do not show the worst case scenario, which would be the release of a substantial portion of the isotopic composition. Such release is modelled in the flexRISK project: the magnitude of release is 76.05 Pbq of Caesium Cs-137 (which is the 2,500 times of the composition of isotopic release calculated in the EIA documentation). Even if such a high level of release is assigned a very low probability of occurrence, it cannot be completely excluded from this assessment.

The FlexRISK[4] project shows which regions in Europe would be probably affected based on the realistic model of weather conditions. Although the following example was calculated for Dukovany Unit 1, it gives a good idea of what to expect in the event of a worst case scenario.

[4] flexRISK wurde aus den Mitteln des Klima- und Energiefonds gefördert und im Rahmen des Programmes "NEUE ENERGIEN 2020" durchgeführt. http://flexrisk.boku.ac.at/



The figure shows, depending on particular weather conditions, the probability of contamination of individual areas above 37 kBq of Caesium Cs-137 in the event of a severe accident in the Dukovany site. The scale ranges from 100 % of probability (purple edge, 1.E+00) to 0.01% (1.E-04). Disaster with a very high level of release means a negative radiological impact on the area of virtually all Europe.

Comment

Basic safety requirements for new reactors are laid down so that in conditions of a severe accident the function of the containment is maintained and the early and large releases of radioactive substances are virtually eliminated in the case of a severe accident. In relation to the EIA Documentation, large leak can be regarded as a leak, which significantly exceeds the value of the leak of the **main reference isotopes** according to Table D.79: Source member for severe accident, which is referred to in the EIA documentation in Chapter D.II.1.6. Determination of the source term for the evaluation of the radiological impacts of abnormal occurrence. For Cs-137, this is the value significantly exceeding 30 TBq.

The leak of 76.05 Pbq of the isotope Cs-137, which is stated in the above mentioned study under the flexRISK project, implicitly assumes a total failure of the containment. This assumption used in the flexRISK study **does not substantially correspond to the requirement to maintain the functionality of the containment** during a severe accident, which is in compliance with the requirements of legislation of the Czech Republic and WENRA applied to the NNS and other relevant legislative requirements of the Czech Republic and WENRA recommendations below, and for these reasons, this assumption cannot be accepted in the context of the discussion to the EIA documentation for the NNS.

Decree of the State Office for Nuclear Safety No. 329/2017 Coll., on Requirements for the Design of Nuclear Facility, Section 7(5) states:

The design of a nuclear facility with a nuclear reactor must provide reasonably feasible technical and organizational measures for management of design extension conditions in order to achieve such resistance of nuclear facility that

a) severe accident, which could lead to the early radiation accident or a major radiation accident, is the virtually excluded fact, and

b) severe accident, which is not among the virtually excluded facts and which could lead to radiation accident, will be managed so that the protective measures according to Section 104(1) a) will be required (i.e. sheltering, use of iodine prophylaxis, evacuation) and b) points 2 and 3 of the Atomic Act (i.e.

restrictions on the use of radionuclide contaminated food and water and restrictions on the use of radionuclide contaminated feedstuffs.

At the same time, the requirement specified by the State Office for Nuclear Safety in Criterion 3 and the related WENRA recommendations for limiting the consequences of a severe accident apply to the NNS.

Criterion K3 (State Office for Nuclear Safety): Such design measures must be taken for postulated accidents of the NNS with the core melting or damage of irradiated nuclear fuel in the storage pools (i.e. for severe accidents) ensuring that it will not be necessary to evacuate population in the immediate surroundings of the NNS and introduce long-term restrictions on food consumption. The NNS accidents with the core melting, which could lead to early and/or large releases, should be practically excluded. An early leak means a leak not allowing safety measures to be taken for the postulated NNS accidents with the core melting, i.e., sheltering and iodine prophylaxis; a large leak means a leak that would require measures taken ruled out by this criterion.

For severe accidents (design extension conditions with core melting), space- and time-limited radiological impacts will be required according to the WENRA recommendations, which will ensure compliance with the following requirements:

- avoiding the need for the evacuation at a distance of more than approximately 3 km,
- avoiding the need for the sheltering and iodine prophylaxis at a distance of more than approximately 5 km,
- agricultural production at a distance of more than approximately 5 km will be suitable for consumption one year after a radiation accident,
- no permanent relocation anywhere outside the premises of the power plant (for practical application, it is interpreted as no permanent relocation at a distance over 800 m from the reactor).

Meeting the requirements of Czech legislation, IAEA and WENRA recommendations, and demonstrating this fulfilment within the licensing process of the NNS will ensure that large leaks described in the comment will be excluded by design solution for the NNS or, in the terminology according to the Atomic Act, the IAEA and WENRA recommendations virtually excluded. This exclusion will be ensured through the design solution of the NNS, which will be equipped for the case of severe accident either with the system safely holding the melt inside the reactor pressure vessel, or inside the containment and at the same time through the technical design of the containment and other systems ensuring the desired tightness of the containment and limitation of radioactive releases into the environment in conditions of a severe accident.

3.5. Spent fuel and radioactive waste

In the Czech Republic, a national deep geological repository is planned for the purpose of storage of spent fuel and other radioactive waste. The start of operation of such a repository is planned in 2065. At present, seven proposed locations are officially designated but residents of all of them do not want to accept such facility and associated waste in their municipalities.

In summary, the plan for the construction of new units in the Dukovany NPP is unacceptable at the time when the problems are de facto unresolved in relation to financing of the investment project, water supply to the NPP as well as technology and location of radioactive waste repository for radioactive waste from the NPP.

Comment

The basic strategy of the Czech Republic for management of spent nuclear fuel is, according to the applicable National Concept of Radioactive Waste and Spent Nuclear Fuel Management as well as the updated National Concept of Radioactive Waste and Spent Nuclear Fuel Management (approved 11/2017), the direct disposal of spent nuclear fuel in a deep geological repository, which will be ready for operation by 2065. Until such time, spent nuclear fuel will be safely stored with the producers (operators of nuclear installations) in a suitable storage facility compliant with the requirements of Czech legislation.

The process of preparation of a deep geological repository is fully within the competence of the Radioactive Waste Repository Authority. At the same time, the issue of repository cannot be associated with the project of new nuclear source, it will be used for the storage of spent nuclear fuel or radioactive waste also from other sources, including institutionary sources. The example of other EU states, especially Finland and Sweden, can demonstrate that the preparation of a deep geological repository is technologically feasible. The RAWRA cooperates on the preparation of a deep geological repository with the Finnish company Posiva that is responsible for the preparation of a repository in Finland, where the site has already been selected and the actual construction of a deep geological repository has commenced.

The questions concerning the method of funding the project are not the subject of the EIA procedure.

The questions concerning the technology (1 to 2 units of PWR Generation III+ type with a net electrical output up to 2,400 MWe), structure of licensing reference designs and supplier selection are described in the EIA documentation to the extent sufficient for the EIA procedure, determination of the envelope of environmental impacts and their assessment (see answers to relevant comments)

The security of water supply for the NNS is addressed in detail in the EIA documentation (see the above response to the relevant comment 3.1 above).

4. Ministry of Energy, Department of Nuclear Energy

Ref. No. of the Ministry of the Environment:

Ref. No.: -

Date: 07/03/2018

4.1. Aspects of nuclear safety

The Ministry of Energy requests information on whether, and if yes, how the selection procedure for technology for nuclear power plant will take into account the aspects of nuclear safety - e.g. by conducting a pre-licensing safety assessment by the State Office for Nuclear Safety of the Czech Republic (SÚJB), and if not, whether an interaction between the potential suppliers of technologies for nuclear power plant (e.g. according to a “short list”) and the SÚJB is expected before the formal application for building permit.

Comment:

The NNS project will be implemented in accordance with legislation of the Czech Republic and the current internationally accepted IAEA and WENRA safety recommendations. The hierarchy of requirements to be generally fulfilled by the NNS is referred to in the EIA documentation, Figure B.20.

At this time, the investor is not aware of the SÚJB planning the so-called “pre-licensing procedure”. However, we do not exclude the fact that the SÚJB may decide to take this step in the future.

Before applying for the construction permit, the particular supplier of the new nuclear source will already be known and close communication will take place between the applicant, the supplier and the SÚJB, especially to discuss the technical issues for this application.

4.2. Backup power supply of internal consumption

Page 150, Chap. B.I.6.3.2.5. Electrical systems, Fig. B.40 Ideological wiring diagram of the NNS (new source of nuclear source) to the electricity network

Please indicate how the requirement of independence of backup power supply for internal consumption was met - the connections shown in diagram in Fig. B.40 are routed to one electricity station – in terms of the requirements set out in IAEA document No. SSG-34 Design of Electrical Power Systems for Nuclear Power Plants (Sec. 2, Figures 1-3).

Comment:

The diagram (Fig. B.40: Ideological wiring diagram of the NNS to the electricity network) is only for information and shows, in particular, the method of connection of the NNS to the Slavětice transformer station. This ideological diagram does not address the internal configuration of the transformer station and, therefore, inconsistency with the IAEA document SSG-34 cannot be drawn on the basis thereof.

The Slavětice transformer station includes both the 400kV section intended for power output and the 110kV section intended for securing the reserve power supply to cover the internal consumption of the NNS. At the same time, it has a sufficient amount of connections to the transmission or distribution system, at both voltage levels, so as to ensure the necessary reliability of securing the reserve power supply to cover internal consumption.

The IAEA document SSG-34 is included in a licensing basis of the NNS design and its requirements will therefore be required to be adequately fulfilled.

4.3. Location of the Technical Support Centre and the Emergency Control Centre

Page: 151 Chapter: B.I.6.3.2.7. Control and operation station

Please specify where the technical support centre and the emergency control centre will be located?

Will they be situated in the same building?

The NNS will also be provided with the centre for emergency management to manage and coordinate activities in emergency conditions.

Comment:

In accordance with the information referred to in the EIA documentation, in Chapter D.II.1.11.3.3., the NNS project will include the emergency control centre and the technical support centre to ensure radiation extraordinary event management. These centres will be located in accordance with the requirements set out in Decree No. 329/2017 on basic design criteria for a nuclear installation, in particular to:

- locate them in the area of a nuclear facility in suitable areas that will be seismically and functionally resistant,
- provide protection against the effects of ionizing radiation including ionizing radiation from a severe accident,
- have the capacity to shelter personnel of a nuclear facility involved in the management and implementation of the response to a radiation extraordinary event, for at least 72 hours,
- be continuously operational and habitable even in the case of a total blackout in a nuclear facility in design extension conditions.

Each of the centres performs different function and their location in the same building is not excluded.

The specific location will be agreed with the SÚJB in the permit for construction of a nuclear facility.

4.4. Childhood leukaemia

Page: 217, Chapter: C.II.1.3.3.2.1. Assessed indicators

Childhood leukaemia is not specified, although the whole subsection on pages 225-226 is dedicated to this topic.

Comment:

Leukaemia, code C91 to C95, and the so-called non-Hodgkin's lymphomas, code C82 to C85, belong to malignant neoplasms of lymphoid, haematopoietic and related tissue (C81 to C96) and are under the indicators examined in Chapter C.II.1.3.3.2.1. The introductory section of Chapter C.II.1.3.3.2.3. Incidence of malignant neoplasms explains why special attention is given to childhood leukaemia, which is subsequently addressed in a separate section in Chapter C.II.1.3.3.2.3.

4.5. Total mortality

Page 219 – 220, Chap. C.II.1.3.3.2.2. Mortality

One of the discussed parameters is the overall mortality as a result of all causes for all reference groups. It should be noted, however, that this parameter does not provide any actual epidemiological information (as the total mortality of all persons eventually amounts to 100 %). Real information is given by mortality in relation to another parameter, such as child mortality and mortality of people under 50 years of age, because such parameters inform readers about health status of inhabitants or health situation in the area.

Comment:

Mortality is very often used in technical literature as one of the basic health indicators, which is sufficiently explained in the text of the EIA documentation. Mortality expresses the number of deaths in the given population over a certain period of time, most often a year, usually converted to a common denominator (100,000; million of inhabitants). Mortality could achieve the value of 100% only in the event that the whole assessed sample of population dies within a year.

All indicators of mortality were calculated separately for men and women. The mortality rate in the different geographical areas (exposed and control) was compared with the national level.

Since the mortality is one of the health indicators, whose frequency varies with age, the reflection of the living conditions in different population groups cannot be compared using simple indices (e.g. by gross mortality, i.e. the number of deaths per 100,000 living residents), because for population with a higher proportion of elderly, such an index is higher, without reflecting the overall level of health status and health aspects of the living conditions of the population group.

For comparison, the so-called “age standardization” is always used, i.e. mathematical conversion that corrects the results so as to eliminate the effect of different age structures. Therefore, the mortality indicators were age-standardized in all cases and the results are presented as the Standardized Mortality Ratio (SMR) in the EIA documentation.

4.6. Annual effective dose

Page 244, Chap. C.II.3.3.1. General information regarding the sources of public exposure

It was stated that the average annual effective dose from natural sources in the Czech Republic represents 90% of the total average annual effective dose for the average inhabitant. But this seems very unlikely given that the average annual effective doses of medical X-ray examination in Europe are at the level of 20-40%, not 10%. It is possible that this portion in the Czech Republic amounts to 10%, which, however, should be commented on.

Comment:

Information in Chapter C.II.3.3.1 (i.e. information on the average annual effective dose from medical exposure) was processed on the basis of publicly available data from the National Radiation Protection Institute (SURO), https://www.suro.cz/cz). The founder of the SURO is the SUJB (State Office for Nuclear Safety). The party preparing the documentation and the notifier of the intent shall not comment on the timeliness of such official sources.

Other public sources show that at present, when the proportion of medical exposure increases over time, in particular with the development and a number of applications of the CT technologies and nuclear medicine, the average annual individual effective dose from medical purposes in the Czech Republic currently reaches the level of approximately 0.8 - 1 mSv/year, which would correspond to a higher percentage of medical exposure at the level of approximately 20%. On the other hand, it should be noted that the average of natural exposure in EU countries is approximately 2.2 mSv and therefore about 1/3 lower than the average of natural exposure in the Czech Republic (about 3.2 mSv, while some official sources indicates 3.4 mSv), which is mainly due to geological strata. The higher value of natural exposure decreases the percentage of medical exposure.

4.7. Radiation situation monitoring

Page 252, Chap. C.II.3.3.2.3. Situation regarding emissions

The monitoring comprising the following was described:

a) measurement of the gamma activity of radioactive aerosols and the activity of iodine in the air;

b) measurement of the activity and concentrations of radioactive samples from the environment;

c) measurement of the dose rate. In the latter case, the dose rate is estimated on the basis of the measurements performed by means of thermoluminescent dosimeters (TLD), most often read on a quarterly basis, which raises a big issue of the absence of real measurement of the dose rate in real time.

This situation should be appropriately described as reading, for example in Chapter D.II. 1.11.3.2.1, will lead us to learning that such real-time measurements are being performed (“teledosimetric system”).

Comment:

In accordance with the information provided in the documentation, Chapter C.II.3.3.2.3. Immission situation, the TLD (thermoluminescent dosimeters) system measures the dose equivalent rate of gamma radiation and thus allows to identify the possible excessive presence of gamma sources in its vicinity.

The TLD system is one of many methods of radiation situation monitoring in the surroundings of the EDU1-4 and its basic goal is to control the impact of operation of the EDU1-4 on the environment and confirm the non-exceeding of general exposure limits. However, its purpose is not to timely identify potential releases of radioactive substances (there are other systems for that purpose, e.g. TDS) or accurately determine exposure of the population and, therefore, the TLDs are evaluated only on a quarterly basis.

In accordance with the information in the EIA documentation referred to in Chapter D.II.1.11.3.2. Radiation situation monitoring, the EDU1-4 power plant is also equipped with other systems such as service radiation monitoring system and TDS (teledosimetric system) that are used primarily for the early identification of the presence of radioactive materials in the locations where they should not occur in terms of design, thus informing in time the operator of the power plant, who shall remedy or mitigate the situation before a possible release outside the power plant area.

Similar systems such as TDS and TLD, as mentioned above, are expected to apply even in the case of NNS in accordance with legislation of the Czech Republic and with the current internationally recognized safety recommendations of the IAEA and WENRA.

4.8. Collective and individual effective doses and committed effective doses

Page 394, Chap. D.I.3.3.4.7. Transboundary impact, Table D.30: Poland - annual collective effective doses and committed effective doses

Please notify:

a) What will be the annual collective effective doses and committed effective doses? The table shows only one value and, by definitions, there are two types of doses.

b) What will be the annual effective dose and the committed effective dose for an adult and a child representative for Poland [Sv/year]?

c) What will be the annual committed effective dose equivalent for thyroid gland of an adult and a child representative for Poland [Sv/year]?

Comment:

a)

Table D.30 in the EIA documentation indicates the sum of total collective effective dose and committed effective dose, all caused by summary effluents of the NNS with the co-acting effect of the EDU1-4 according to various calculation scenarios for one year. These are not the annual collective doses but the collective doses caused by annual discharges to the atmosphere and hydrosphere (note: it is inaccuracy in the text of the name of Table D.30 in the EIA documentation).

Polish public exposure as a result of the normal operation of the NNS in all 3 calculation scenarios has been determined as exposure to global nuclides discharged to the atmosphere and hydrosphere as a result of normal operating conditions of the NNS with the co-acting effect of the EDU1-4.

Global nuclides mean long-lived nuclides C-14, H-3 and K-85, i.e. nuclides which when discharged to the atmosphere or hydrosphere reach the global natural water cycle (H-3), or are mixed in the atmosphere of the Northern Hemispheres (Kr-85), or become part of the atmosphere and biosphere (C-14), and cause the exposure of the population throughout the world (or the Northern Hemisphere) and, to the effect, of the population in Poland.

From the properties of the individual nuclides causing global exposure, it is possible to derive that the exposure caused by nuclides C-14 (pure beta source with a half-life of 5730 years) and H-3 (also pure beta source with a half-life of 12 years) is implemented as a committed effective dose caused by internal exposure. The exposure to nuclide Kr-85 is implemented as an external gamma and beta radiation emitted by Kr-85.

The summary of responses to the question on the collective dose and the annual committed collective dose is contained in the table below.

Table 2. Poland - Collective doses caused by annual discharges to the atmosphere and hydrosphere

	NNS 2x1200 MW_e, EDU1-4 decommissioning	NNS 1x1750 MW_e, EDU2-4 operation, EDU1 decommissioning	NNS 1x1750 MW_e , EDU1-4 decommissioning
Total collective effective dose and committed effective dose beyond 100 km zone, [manSv]	**5.74E-02**	**5.12E-02**	**3.81E-02**
of which C-14 [manSv]	5.74E-02	5.12E-02	3.81E-02
of which H-3 [manSv]	1.88E-05	1.64E-05	1.49E-05
of which Kr-85 [manSv]	3.56E-06	7.05E-05	7.05E-05
of which: Committed collective effective dose caused by C-14 and H-3 [manSv]	**5.74E-02**	**5.12E-02**	**3.81E-02**
of which: Collective effective dose caused by Kr-85 [manSv]	3.56E-06	7.05E-05	7.05E-05

b)

The calculation of annual individual effective doses from operational effluents of the NNS taking into account the co-acting effect of the EDU1-4 power plant in operation was executed in all sectors to a distance of 100 km as shown in Fig. D.7: Schematics of the arrangement of calculation network - whole calculation area. Although this area does not extend to the territory of Poland, sector 24 is situated relatively close (about 20 km from the border with Poland). In the context of answering the submitted request, this sector 24 and the adjacent sectors 12 and 36 were taken as reference sectors for evaluating the effective dose and committed effective dose for an adult and a child representative for inhabitants of Poland in the nearest border areas (see Tables 2, 3, 4 below). The individual effective dose was calculated for Czech consumer basket, but the consumer basket of the Czech Republic and Poland are very similar according to the statistics data (see Table 5). In the case of Poland as well as reference sectors 24, 12, and 36, exposure of a representative person is realized only through discharges to the atmosphere from the NNS because liquid discharges to watercourses flow off in the Jihlava River and then through the Morava River into the Danube River and cannot affect Poland in any way.

Table 2 Sector 24: Annual individual effective dose and committed effective dose for an adult and a child representative for Poland in sectors NNS 2x1200 MWe and decommissioning of the EDU1-4.

	Ag [year]					
	0 – 1	**1 – 2**	**2 – 7**	**7 – 12**	**12 – 17**	**above 17**
ATMOSPHERE:						
Committed (50 or 70 y.) effective doses by inhalation for the age category (concerned) (sum over all nuclides) [Sv]	2.14E-09	3.62E-09	4.58E-09	4.24E-09	4.34E-09	4.24E-09
Committed (50 or 70 y.) effective doses by ingestion for the age category (concerned) (sum over all nuclides) [Sv]	1.82E-09	2.09E-09	2.24E-09	2.31E-09	1.95E-09	2.07E-09
Effective dose from external exposure from deposit (sum over all nuclides) [Sv]:	9.64E-10	9.64E-10	9.64E-10	9.64E-10	9.64E-10	9.64E-10
Effective dose from external exposure from cloud (sum over all nuclides) [Sv]:	1.13E-09	1.13E-09	1.13E-09	1.13E-09	1.13E-09	1.13E-09
ATMOSPHERE: Total effective dose and committed dose through all the pathways considered [Sv]:	6.05E-09	7.80E-09	8.91E-09	8.64E-09	8.39E-09	8.41E-09

	Ag [year]					
	0 – 1	1 – 2	2 – 7	7 – 12	12 – 17	above 17
HYDROSPHERE: Total effective dose and committed dose through all the pathways considered for the age category (concerned) [Sv]:	-	-	-	-	-	-
ATM + HYDRO: Total effective dose and committed dose through all the pathways considered for the age category (concerned) [Sv]:	6.05E-09	7.80E-09	8.91E-09	8.64E-09	8.39E-09	8.41E-09

Table 3 Sector 12: Annual individual effective dose and committed effective dose for an adult and a child representative for Poland in sectors NNS 2x1200 MWe and decommissioning of the EDU1-4.

	Ag [year]					
	0 – 1	1 – 2	2 – 7	7 – 12	12 – 17	above 17
ATMOSPHERE:						
Committed (50 or 70 y.) effective doses by inhalation for the age category (concerned) (sum over all nuclides) [Sv]	8.33E-09	1.41E-08	1.79E-08	1.65E-08	1.69E-08	1.65E-08
Committed (50 or 70 y.) effective doses by ingestion for the age category (concerned) (sum over all nuclides) [Sv]	6.62E-09	7.58E-09	8.10E-09	8.40E-09	7.18E-09	7.61E-09
Effective dose from external exposure from deposit (sum over all nuclides) [Sv]:	4.66E-09	4.66E-09	4.66E-09	4.66E-09	4.66E-09	4.66E-09
Effective dose from external exposure from cloud (sum over all nuclides) [Sv]:	6.81E-09	6.81E-09	6.81E-09	6.81E-09	6.81E-09	6.81E-09
ATMOSPHERE: Total effective dose and committed dose through all the pathways considered [Sv]:	2.64E-08	3.32E-08	3.75E-08	3.64E-08	3.56E-08	3.56E-08
HYDROSPHERE: Total effective dose and committed dose through all the pathways considered for the age category (concerned) [Sv]:	-	-	-	-	-	-
ATM + HYDRO: Total effective dose and committed dose through all the pathways considered for the age category (concerned) [Sv]:	2.64E-08	3.32E-08	3.75E-08	3.64E-08	3.56E-08	3.56E-08

Table 4 Sector 36: Annual individual effective dose and committed effective dose for an adult and a child representative for Poland in sectors NNS 2x1200 MWe and decommissioning of the EDU1-4.

	Ag [year]					
	0 – 1	1 – 2	2 – 7	7 – 12	12 – 17	above 17
ATMOSPHERE:						
Committed (50 or 70 y.) effective doses by inhalation for the age category (concerned) (sum over all nuclides) [Sv]	1.58E-09	2.68E-09	3.39E-09	3.14E-09	3.21E-09	3.14E-09
Committed (50 or 70 y.) effective doses by ingestion for the age category (concerned) (sum over all nuclides) [Sv]	1.48E-09	1.69E-09	1.81E-09	1.86E-09	1.57E-09	1.67E-09
Effective dose from external exposure from deposit (sum over all nuclides) [Sv]:	7.69E-10	7.69E-10	7.69E-10	7.69E-10	7.69E-10	7.69E-10
Effective dose from external exposure from cloud (sum over all nuclides) [Sv]:	7.14E-10	7.14E-10	7.14E-10	7.14E-10	7.14E-10	7.14E-10

	Ag [year]					
	0 – 1	1 – 2	2 – 7	7 – 12	12 – 17	above 17
ATMOSPHERE: Total effective dose and committed dose through all the pathways considered [Sv]:	4.54E-09	5.85E-09	6.68E-09	6.48E-09	6.27E-09	6.29E-09
HYDROSPHERE: Total effective dose and committed dose through all the pathways considered for the age category (concerned) [Sv]:	-	-	-	-	-	-
ATM + HYDRO: Total effective dose and committed dose through all the pathways considered for the age category (concerned) [Sv]:	4.54E-09	5.85E-09	6.68E-09	6.48E-09	6.27E-09	6.29E-09

Table 5 Consumer baskets of the Czech Republic and Poland according to statistical data

Annual consumption (2014)		**Czech Republic**	**Poland**
milk and dairy products	[l/year]	236.50	205
beef	[kg/year]	7.90	1.6
pork	[kg/year]	40.70	39.1
leaf vegetable	[kg/year]	11.90	11.55
other (non-leaf) vegetable	[kg/year]	86.40	104.00
potatoes	[kg/year]	70.10	101.00
grain	[kg/year]	140.80	106.00

Note: The source of data on food consumption of the population of Poland was the document issued by the Statistical Office "Domestic deliveries and consumption of selected consumer goods per capita in 2014". The source of data on food consumption of the population of the Czech Republic was the Czech Statistical Office (http://www.czso.cz) Food consumption per capita: Consumption of food, drink and cigarettes per capita in the Czech Republic between 2000 and 2010.

The maximum annual individual effective dose per capita of Poland living at the border with the Czech Republic can be estimated at less than 3.5E-8 Sv. The insignificance of exposure of an ordinary inhabitant of Poland due to the operation of NNS can be assumed primarily from the comparison of the estimated maximum annual individual effective dose of 3.5E-8 Sv caused by NPP discharges in the nearest border regions of Poland and the dose received by an ordinary inhabitant of Poland from natural and artificial sources present in the nearest surroundings (by inhalation of decay products of radon, cosmic and cosmogenic radiation, medical exposure, etc., Annual report, Państwowa Agencja Atomistyki, 2016, http://www.paa.gov.pl/uploads/temp/strony/strona_401/text_images/PAA_Annual_Report_2016_readable_1.pdf), which has a value of 3.5E-3 Sv. The dose caused by NNS is lower by 5 orders of magnitude.

c)

Annual committed effective dose to the thyroid gland for inhabitants of Poland

Detailed assessment of radiation impacts of the operation of the NNS on representative persons through all routes of exposure has been carried out within 100 km from the NNS. For the purposes of determining the exposure of representative person in the territory of Poland, it is possible to apply the results of exposure of hypothetical representative person in the nearest area of the Czech Republic (distance from the Polish border is about 20 km).

In order to prepare the answer to the question, a new calculation has been developed because the calculation of committed effective dose equivalent for thyroid gland from normal operation of the NNS was not part of the underlying studies for EIA documentation. The calculation was executed for sector 12 because the highest individual doses from 3 border sectors (12, 24, 36) have been identified in this sector in the context of answer to the previous question.

The category under 1 year of age is selected as representative for the age category "children". Justification: In this age category, the calculated doses to the thyroid gland are the highest, in all other age categories (i.e. 1-2, 2-7, 7-12, 12-17), the calculated doses to the thyroid gland are lower.

The dominant contribution to the dose to the thyroid gland is caused by nuclide I-131. The dominant part of the dose to the thyroid gland is caused by ingestion of iodines, the minor part (10-30%) by inhalation of iodines.

The committed dose equivalent to the thyroid gland of children in Poland, due to annual discharges, does not exceed the value of 7 nSv.

The committed dose equivalent to the thyroid gland of an adult in Poland, due to annual discharges, does not exceed the value of 2 nSv.

Table 7 Maximum committed equivalent dose to the thyroid gland caused by annual effluents representative for Poland

	NNS 2x1200 MW_e, EDU1-4 decommissioning	NNS 1x1750 MW_e, EDU2-4 operation, EDU1 decommissioning	NNS 1x1750 MW_e, EDU1-4 decommissioning
Representative person, 1 year of age, [Sv]	6.56E-09	2.03E-10	1.74E-10
Representative person, adults (over 17 years), [Sv]	1.44E-09	4.02E-11	3.58E-11

4.9. Location of centres

Please indicate the location of the Backup Emergency Control Centre (power plant owner) and the Backup Technical Support Centre? At what distance from the planned power plant these centres will be located? Will they be situated in the same building?

Please indicate the location of the Off-site Emergency Support Centre (for the purposes of management and intervention actions outside the power plant)?

Page 521, Chap. D.II.I.11.3.3. Other facilities and devices for NNS

In accordance with the requirements set out in SÚJB Decree No. 329/2017 Coll., on basic design criteria for a nuclear installation, the NNS will include:

- Shelters,
- Emergency Control Centre,
- Technical Support Centre,
- Backup Technical Support Centre,
- Backup Emergency Control Centre,
- Off-site Emergency Support Centre.

Comment:

In accordance with the information in the EIA documentation SÚJB specified in Chapter D.II.1.11., the backup emergency control centre, the backup technical support centre and the off-site technical support centre of the NNS will be designed as required by Czech legislation (in particular Decree 329/2017 Coll., on basic design criteria for a nuclear installation) so as to meet (inter alia) the following requirements:

- not to be affected by design extension conditions,
- to be able to withstand external influences which could lead to a loss of functionality of the centres they back up.

The specific location of the backup emergency control centre, the backup technical support centre and the off-site emergency support centre will be agreed with the SÚJB under the licence for construction of a nuclear facility. The centres will be at a sufficient distance from the planned power plant so that their functions and habitability were not affected by radiation extraordinary event in the premises of the power plant. Their location in the common building outside the premises of the nuclear facility is possible and also appropriate due to the functions in radiation extraordinary event management.