**МІНІСТЭРСТВА
ПРЫРОДНЫХ РЭСУРСАЎ І АХОВЫ
НАВАКОЛЬНАГА АСЯРОДДЗЯ
РЭСПУБЛІКІ БЕЛАРУСЬ**

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**МИНИСТЕРСТВО
ПРИРОДНЫХ РЕСУРСОВ И ОХРАНЫ
ОКРУЖАЮЩЕЙ СРЕДЫ
РЕСПУБЛИКИ БЕЛАРУСЬ**

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29.06.2018 № 11-1-1/118-1Исх
На № — ад 20.04.2018

Комитет по осуществлению Конвенции об оценке воздействия на окружающую среду в трансграничном контексте

Министерство природных ресурсов и охраны окружающей среды Республики Беларусь (далее - Министерство), ссылаясь на письмо Комитета по осуществлению Конвенции об оценке воздействия на окружающую среду в трансграничном контексте от 20 апреля 2018 года, имеет честь предоставить ответы белорусской стороны на вопросы, содержащиеся в Приложении 2 к вышеуказанному письму. При подготовке ответов белорусской стороной в полной мере принята к сведению информация МАГАТЭ относительно применения соответствующих норм безопасности при размещении ядерных установок.

Министерство выражает надежду на то, что предоставленные ответы будут объективно рассмотрены Комитетом, а также не возражает против привлечения к их рассмотрению и изучению совместно с документацией об оценке воздействия Белорусской АЭС на окружающую среду внешних экспертов.

Также Министерство любезно просит членов Комитета в продолжение своей работы по подготовке к предстоящему в феврале 2019 года Совещанию Сторон учесть предоставленные Беларусью в ходе заседания 7-ой рабочей группы по ОВОС и СЭО (28 - 30 мая 2018 года, Женева) комментарии, отражающие имеющиеся на данный момент в проекте решения IS1/d разногласия и неточности.

Приложение: ответы белорусской стороны на 16 л. в 1 экз.

Первый заместитель Министра,
Национальный координатор
Республики Беларусь по Конвенции Эспо И.В.Малкина

Unofficial translation

06.2018 № 11-1-1/
№ - 20.04.2018

The Implementation Committee under the Convention on Environmental Impact Assessment in a Transboundary Context

The Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, referring to the letter of the Implementation Committee under the Convention on Environmental Impact Assessment in a Transboundary Context of April 20, 2018, has the honor to provide the responses of the Belarusian side to the questions contained in Annex 2 to the abovementioned letter. The Belarusian side fully took into account the IAEA information regarding the application of the relevant safety standards for the location of nuclear facilities during preparation of the responses.

The Ministry expresses its hope that the provided responses will be objectively considered by the Implementation Committee, and has also no objections against seeking the services of scientific experts and other technical advice by the Implementation Committee in accordance with its Structure and functions during consideration and study its responses as well as the documentation on the environmental impact assessment of the Belarusian NPP.

The Ministry also kindly asks the Implementation Committee members, in continuation of their work on preparation for the upcoming Meeting of the Parties (February 2019), to take into account the comments provided by Belarus during the 7th meeting of the Working Group on EIA and SEA (28-30 May 2018, Geneva) reflecting currently available in the draft decision IS1/d discrepancies and inaccuracies.

Enclosure: the responses of the Belarusian side, 16 pages.

First Deputy Minister,
National Coordinator of the Republic
Belarus on the Espoo Convention — Iya Malkina

Answers to *the list of questions in the course of consideration of documents concerning the Environment Impact Assessment (hereinafter referred to as "EIA") at the Belarusian NPP*

Question (a). What is the size, according to current international rules, recommendations, guidelines and other relevant guidance documents, of the area around the commercial nuclear power reactor for which the population density has to be assessed in order to take into account the radiological impact of a major accident and to prepare accordingly the emergency measures? Was it respected in the case of the Ostrovets nuclear power plant?

Being the IAEA Member State, Belarus strictly complies with international requirements established by the Agency.

While preparing the EIA of the Belarusian NPP, assessment of population density around the NPP site was implemented in accordance with the IAEA requirements in place at that time.

It should be noted that in 2012, after official approval and publication of the new IAEA standard GSR Part 3 (Interim, IAEA, 2011) and other IAEA requirements of GSR series, the IAEA started revision process of its requirements and guides. Numerous new requirements and guides have been published since that time, many documents are in the drafting stage now.

The IAEA documents used when drafting the EIA are listed in table below.

Table 1 – Previous and currently valid IAEA documents related to assessment of population density around the NPP

Requirements valid during EIA development	New requirements currently valid
Fundamental safety principles: Safety fundamentals. Safety Standards Series №SF-1 / International Atomic Energy Agency. — Vienna: IAEA, 2006.	Valid
International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, IAEA Safety Series No. 115, IAEA, Vienna (1996).	GSR Part 3, Interim, 2011 GSR Part 4, 2016 GSR Part 7, 2015
Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-R-2, 2004	Still valid

Arrangements for Preparedness for a Nuclear or Radiological Emergency. Safety Guide, Safety Standards Series №GS-G-2.1 / International Atomic Energy Agency. — Vienna: IAEA, 2007. Method for developing arrangements for response to a nuclear or radiological emergency. EPR-METHOD / International Atomic Energy Agency. — Vienna: IAEA, 2003	
N/A	Actions to protect the public in an emergency due to severe conditions at a light water reactor IAEA, 2013 IAEA-EPR-PPA, May 2013
Nuclear Safety Requirements «Site Evaluation for Nuclear Installations», NS-R-3, 2003	NS-R-3 (2016 г.)

The distance from NPP site to the nearest border of the Republic of Lithuania is 24 km and to the capital of Lithuania – Vilnius – about 50 km.

In accordance with IAEA NS-R-3 (2010, para 4.10-4.13, and which was valid during EIA preparation) requirements for population density assessment are:

«The distribution of the population within the region shall be determined.

In particular, information on existing and projected population distributions in the region, including resident populations and to the extent possible transient populations, shall be collected and kept up to date over the lifetime of the installation. The radius within which data are to be collected should be chosen on the basis of national practices, with account taken of special situations. Special attention shall be paid to the population living in the immediate vicinity of the installation, to densely populated areas and population centres in the region... An evaluation shall be performed of the potential radiological impacts of normal discharges and accidental releases of radioactive material, including reasonable consideration of releases due to severe accidents, with the use of site specific parameters as appropriate.»

In accordance with IAEA documents valid during drafting of EIA (requirements NS-R-3 (2003) and recommendations of EPR-Method (October 2003)) the recommended size of the emergency planning zones for urgent protective measures around the NPP (1000 MW and more), where

urgent measures for protection of the population were to be planned, is in the range from 5 to 25 km. Assessment of population distribution around the Belarusian NPP have been undertaken in directions and at different distances from the NPP within a zone exceeding the recommended one – at a distance of up to 30 km (territory of Lithuania is at the distance of 25-30 km from the NPP site).

In order to receive data on distribution of the Lithuanian population within 25-30 km from the NPP site, the Ministry of Natural Resources and Environment Protection of the Republic of Belarus made an official request to the Republic of Lithuania (letters dated 24.03.2009 and 06.05.2009) (clause 5.4 of NS-G-3.2). The Ministry of Environment of the Republic of Lithuania in its official letter (dated 22.05.2009 No. (1-15)-D8-4528) did not provide any official information on the demographic situation on the Lithuanian territory within 30-km zone, but proposed to the Belarusian Side to make this assessment by its own using the information provided on the web-site:

http://db1.stat.gov.lt/statbank/SelectTable/Omrade0.asp?PLanguage=1.

Due to the fact that Lithuania has not provided the requested data, population density was assessed based on the data available to Belarus with the use of extrapolation method (this is allowed according to para 4.12 of NS-R-3 (2003)). On the territory of Lithuania within the 25-30-km zone from the NPP site there are several rural settlements, which population are similar in size to those located in in Belarus. In accordance with para 5.5 - 5.7 NS-G-3.2 the available information data on population density in Lithuanian settlements located at a distance of 30 km from the NPP site were analyzed. Based on these data, the population density there was assessed and did not exceed 15 persons per 1 km^2 (book 11, part 8.2, page 158).

We additionally inform that Belarus is not a HERCA/WENRA member. It should be noted that recommendations of HERCA/WENRA «General presentation of the HERCA/WENRA Approach for a better cross-border coordination of protective actions during the early phase of a nuclear accident» were published in 2014 after EIA for Belarusian NPP was conducted and are not a mandatory document. This document defines that urgent protective measures should be implemented at the distance up to 20 km from the nuclear facility and, also, that it is recommended to have in the protection strategy a possibility of extension of this distance up to 100 km, if necessary and taking into account prognosis of the emergency situation development and real meteorological conditions. Therefore, this document HERCA/WENRA can be used as a recommendation for the development of emergency strategies and emergency preparedness and response planning by member countries of HERCA/WENRA.

In November 2015, IAEA requirements GSR Part 7 have been published. According with GSR Part 7 two emergency planning zones for urgent protective measures and two distances for radiation monitoring, food and drinking water restriction should be arranged around the NPP. Sizes of this emergency planning zones and distances are not defined in this document.

In 2013, after the EIA was prepared, the IAEA methodology on size of emergency planning zones and distances assessment (document EPR-NPP-PPA, IAEA, May 2013) was published. In this document the reference on the recommended size for extended planning distance (100 km) was made for the first time.

The extended planning distance (EPD) according with the GSR Part 7 is beyond the urgent protective action planning zone for which arrangements shall be made to conduct radiation emergency monitoring and assessment of the radiological situation off the site in order to identify contaminated areas.

Mentioned by the Lithuanian experts the 100-km zone around the NPP is not the emergency planning zone for taking the urgent protective actions but this is the radius of extended planning recommended by IAEA (where radiation emergency monitoring is planned). The requirements were established by IAEA in GSR Part 7 in October 2015 and recommendations on size of emergency planning zones and distances were published in EPR-NPP-PPA in 2013. These requirements and recommendations of IAEA are related to emergency preparedness and response and are not the criteria for site evaluation.

Former and presently existing requirements of IAEA do not contain any requirements about the radius of the required population density and distribution assessment on site evaluation stage.

When developing the EIA, Belarus was guided by the existing at that time IAEA documents which did not require in past and do not require at present any assessment of population distribution within 100 km.

In particular we inform that as a Member State of the IAEA Belarus follows IAEA requirements in the field of radiation safety and protection. Belarus has been the first country that introduced new IAEA requirements of GSR series to the national documents and it was noted by IAEA as "a good practice". In accordance with IAEA and national requirements the predictive assessment of NPP impact on the population and planning of emergency response to nuclear and radiological emergencies at the Belarusian NPP is being carried out now and will be carried out in future.

ANNEX

IAEA requirements

Criteria for population distribution assessment in area around the NPP are defined in the following documents of IAEA:

- safety requirements **NS-R-3 "Site Evaluation for Nuclear Installations", 2003** (clauses 4.10 - 4.13);

- safety guide **NS-G-3.2 "Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants", 2002** (a document related to NS-R-3, as far as site specifications and potential impact of the nuclear plant in the area are concerned).

Assessment have been done with these assumptions from IAEA requirements and recommendations:

- during assessment of the site suitability for the nuclear plant, inter alia, density and distribution of the population and other specifications **within the external zone** shall be considered from the point for emergency protective measures (para 2.1 NS-R-3);

- *«2.22. In the evaluation of a site to determine its potential radiological impact on the region for operational states and accident conditions that could lead to emergency measures, appropriate estimates shall be made of expected or potential releases of radioactive material, with account taken of the design of the installation and its safety features. These estimates shall be confirmed when the design and its safety features have been confirmed»* (para 2.22 NS-R-3).

Specific requirements for the assessment of population in the NPP area are stated in clauses 4.10 - 4.13 of NS-R-3 which describe the necessity of study of population distribution within the area around NPP-site.

Documents of IAEA do not specify any particular size of zones around the NPP where density and distribution of population shall be assessed.

The NS-R-3 established requirements and section 5 "Distribution of population" of Safety Guide NS-G-3.2 recommend guide for population distribution assessment.

So, in accordance with the aforesaid documents and established approaches to assessment of sites for nuclear power installations **density of population in the external zone** shall be assessed **for the purposes of emergency planning and protection of population in case of a nuclear or radiological emergency on NPP.**

During the drafting EIA by the year 2013 in EPR-Method(2003 г.) IAEA recommended emergency planning zones for the urgent and early protective measures. Currently, the necessity of emergency planning zones for the urgent and early protective measures is regulated in new documents of IAEA EPR NPP Public Protection Actions.

The table shows the sizes of emergency planning zones for the urgent and early protective measures (shelter, evacuation, resettlement, thyroid blocking) for reactors having capacity over 1000 MW in accordance with IAEA documents.

EPR-Method, 2003	EPR NPP Public Protection Actions, 2013
Precautionary action zone by 3- 5 km	
Urgent protective action planning zone	
5-25 km	15-30 km

These IAEA documents (in table) provide approaches for emergency planning zones assessment because the size of emergency planning zones for the urgent and early protective measures shall

be determined by radiological consequences of the beyond design accident on the selected the NPP.
IAEA requirements for assessment are:
- density and distribution of population;
- possible radiological consequences of discharges on normal operation and accident, including consideration of severe accidents and parameters of site in appropriate cases;
- emergency planning zones,
for confirmation of response emergency plan feasibility have been observed by site assessment for the Belarusian NPP and included to the statement on EIA (the pre-project stage).

Question (b). According to current international rules, recommendations, guidelines and other relevant guidance documents, should the contamination of rivers and groundwater by radionuclides through direct discharge of contaminated water into the environment following a major accident or through the air be assessed before building a commercial nuclear power reactor? Was such an assessment undertaken in the case of the Ostrovets nuclear power plant?

Currently, during deployment of new nuclear power plants IAEA suggests that the following documents should be guided with, which also concern the issues of assessment of environmental pollution:

- general safety requirements GSR Part 3 "Radiation Protection and Safety of Radiation Sources" (2015) - requirement 31 "Radioactive wastes and Discharges"[1];

- draft Safety Guides DS 428 "Prospect assessment of radiation impact of projects and activities on environment" (awaiting the publication).

During the environment impact assessment (hereinafter – EIA) of the Belarusian NPP no aforementioned IAEA documents were valid.

At the same time, the document GSR Part 3 replaced the General safety requirements No. GSR Part 3 (Interim), issued in 2011, which, in their turn, replaced the International Basic Safety Standards, issued in February 1996 in Series of IAEA publications for safety No. 115.

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[1] Clause 3.132. In proper cases of submission of an application for getting an official permit for discharges registered persons and licensees in cooperation with suppliers shall:
a) determine the specifications and activity of the material to be discharged, as well as possible places and methods of discharges;
b) determine all significant ways of radiation by means of the proper pre-operational examination. In these cases emitted radio nuclides may lead to increased radiation injury of the population;
c) assess doses for a representative person as a result the planned discharges;
d) consider radiological impact on environment along with the means of the protective and safety system, as required by the regulating body;
e) provide the regulating body with the information received in accordance with sub-clauses a) – d) above, as the data used for establishment of the allowed limits for discharges and terms of their observance in accordance with clause 3.123.

In accordance with the IAEA document - IAEA Safety Series No. 115, which was valid as of the date of development of the report on EIA of the Belarusian NPP, the following main requirements to emission of radioactive substances to the environment were defined in clause III.10: "If necessary, the registered persons and licensees shall do the following before the beginning of emission of any solid, liquid or gaseous radioactive substance from the sources under their responsibility:

(a) **determine specifications and activity of the material to be discharged and potential points and methods of discharge;**

(b) **by means of the proper pre-operational study determine all essential radiation methods, which may lead to population exposure to emitted radio nuclides;**

(c) evaluate doses for critical groups as a result of planned emissions; as well as

(d) submit this information to the Regulatory Agency as the input information for the establishment of the allowed emission limits and the terms for the fulfillment thereof."

Apart from the documents proposed by IAEA for consideration, we would like also to point out other provisions of the documents worked out by IAEA, which contain important aspects of assessment of contamination of surface and ground waters:

- clause 2.23 NS-R-3 "Site Evaluation for Nuclear Installations": **direct and indirect ways**, by which **emissions and discharges of radioactive material from the nuclear plant can potentially reach people and environment and impact on them**, shall be determined and estimated before the beginning of NPP construction;

- clause 3.2 NS-G-3.2 "Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants": **calculations of dispersion and concentration of radioactive nuclides shall be performed** before the beginning of NPP construction **to show whether radiological consequences of common and emergency emissions of radioactive materials are allowed into the hydrosphere;**

The EIA Report contains information with regard to:

– determination of quantitative and qualitative specifications of surface water;

– assessment of possible stream contamination with radio nuclides and transboundary transfer of radioactive contaminations;

– assessment of the contemporary state of ground water, forecast of changes in the status in case of NPP location;

– assessment of transboundary transfer of radionuclides by ground waters.

The following main variants of radioactive substances penetrating the hydrosphere were simulated as a result of a beyond design accident (hereinafter - BDA) (See book 11, part 8.3, pages 116-118):

1) Direct organized discharge into surface water bodies.

Discharge of radioactive waste into the environment is prohibited by regulatory legal acts of the Republic of Belarus[11]. This prohibition is provided in the design documentation of the Belarusian NPP (design solutions are not available, which make it possible to provide direct organized discharge of radioactive wastes to surface water bodies).

2) Direct unorganized (uncontrolled) discharge into surface water bodies.

The design of the Belarusian NPP stipulates that all discharges of residual and waste waters pass to the general site circulating technical water supply system, which has no direct contacts with the first and second contours, and consequently, it cannot be contaminated with radioactive substances. The aforesaid circulating system is mainly intended for the secondary coolant and turbine island equipment of the nuclear unit along with subsequent water supply to cooling towers for own cooling.

In the case of a BDA, the secondary coolant circulation stops in the Switching Valve Building due to disconnection of feeding pumps, circulating system pumps are disconnected what makes it impossible to discharge residual water from the circulating system to blowing water pipelines to the Viliya River. Besides, in case of an accident blowing water pipelines are closed by means of specially intended valves.

In the case of a BDA, the main volume of liquid radioactive waste is represented by the primary coolant and the emergency core cooling system, accumulated in special sump tanks, located in containment below 0.00 elevation and having no contact with the ambient environment, including the circulating system.

So, the only way for liquid radioactive waste to pass to open water pools in the case of the BDA is above ground (flow, during containment failure), but this is impossible due to location of sump tanks below 0.00 elevation, relatively small volumes of liquid radioactive wastes and a long distance to the nearest open water pool (about 8 km).

We hereby additionally inform you that in order to exclude **thermal** load on natural watercourses, the design of the Belarusian NPP foresees a special heat-exchanging pond located near the second stage pumping station.

Besides, a stilling basin, which is intended for reduction of waste water discharge speed to the Viliya River near the water outlet opening.

3) Radionuclide intake into the Viliya River from the exhaust cloud as a consequence of a direct deposition and wash-off from the surface adjacent to the river (indirect contamination).

The assessment of possible radionuclide contamination of surface-stream flows and transboundary transfer of radioactive substances (the Viliya River) pollution was performed for the most unfavorable situation – the maximal density of radionuclide deposition on the water surface by taking into account the maximum rainfall runoff from the water-collecting area contaminated with radioactive nuclides as a result of an accident.

The decrease in the specific activity in the water of the Viliya River is caused by the blurring of the radioactive spot by convective currents and diffusion in the transport aquatic environment. It was assumed in assessments that reference radio nuclides are represented in water in dissolved or adsorbed forms. When the spot of radioactive contamination moves, its bottom blurring occurs due to the interaction of radio nuclides in "water – suspended matter – bottom sediments" system. The bulk of the radioactive substance in a dissolved form passes the calculated area within 100-120 hours from the deposition beginning.

The calculations performed to assess the consequences of a probable radionuclide contamination of the Viliya River in case when a part of the activity ejected into the air as a result of the BDA over the nearest section of the Viliya River would settle on its surface and water-collecting area, showed that maximum expected concentrations of radioactive nuclides (^{131}I, ^{137}Cs, ^{90}Sr) in the transboundary cross section in case of a non-project accident do not exceed intervention levels (IL) specified in the Radiation Safety Standards (NRB-2000, NRB-2012), i.e. **there is no need in water protection measures, as well as measures on the population protection in these conditions.**

Result of calculation of flow time and maximum concentrations of radionuclides

Variants of water content	Flow time of radioactive nuclide front to the cross section of 1.1 km from the boundary, hour	Maximum concentration in a transboundary cross section of 1.1 km from the boundary, kBq/m^3		
		^{90}Sr	^{137}Cs	^{131}I
5 % availability	4.56	0.3	1.2	0.9
50 % availability	10.2	0.76	2.2	2.4
95 % availability	13.2	1.48	4.5	4.4
IL	-	5.0	10.0	6.3
Permitted concentration in drinking water	**-**	**10.0**	**10.0**	**10.0**

4) Penetration of radionuclides to ground water.

Studies of possible radioactive contamination of ground water were carried out in the zone of impact of the designed NPP (the zone of 30 km) for the Ostrovets site. Possible radioactive contamination of ground water was estimated by two reasons:

as a result of emergency aerosol emissions of the NPP that cause contamination of large areas, i.e. from the site contamination source;

as a result of emergency incidents (spills) at the NPP site during the operation of the plant and its decommissioning, i.e. from the local contamination source.

Due to the fact that the distance from the place of the location of the Belarusian NPP is equal to about 23 km to the adjacent territory of the Republic of Lithuania and the Viliya River is the main drain of groundwater of the zone of 30 km that determines the flow direction towards its valley, the movement of contaminants with the groundwater flow (both groundwater and pressure quaternary and pre-quaternary ones) towards the Republic of Lithuania is not expected.

Question (c). According to current international rules, recommendations, guidelines and other relevant guidance documents, should the management of radioactive waste and spent fuel from a commercial nuclear power reactor (near surface repository or deep geological disposal) be decided before building such a reactor? Was there any mention of the waste management policy in the EIA of the Ostrovets nuclear power plant?

According to the international recommendations, the following decisions related to radioactive waste and spent fuel management should be taken before NPP construction.

IAEA document NS-R-3 "Site Evaluation for Nuclear Installations" (2010), paragraph 2.9:

"In the analysis to determine the suitability of the site, consideration shall be given to additional matters relating to safety such as the storage and transport of input and output materials (uranium ore, UF6, UO2, etc.), fresh and spent fuel and radioactive wastes."

Before taking the decision on the construction of the Belarusian NPP, the issues on radioactive waste management and spent nuclear fuel management were considered within the framework of the National Research and Engineering Programs.

The following major issues were considered:

technologies for processing low-, and intermediate-level radioactive waste;

storage and disposal of low-, and intermediate-level radioactive waste;

long-term storage of high-level radioactive waste and possibilities of their disposal;

spent nuclear fuel management, storage of spent nuclear fuel at the NPP site, possibility of return of spent nuclear fuel to the supplier's country.

The issues of radioactive waste management and spent nuclear fuel management are discussed in sections 7.5 "Radioactive waste disposal" (part 8.1, pages 139-144) and 8 "Nuclear fuel handling" (part 8.1, pages 148-150) of the EIA report.

The Radioactive Wastes Management Strategy of the Belarusian NPP was approved in 2015 by the resolution of the Council of Ministers of the Republic of Belarus.

According to this strategy, low-level and intermediate-level radioactive waste will be temporarily stored in radioactive wastes repositories of the Belarusian NPP for 10 years, and high-level radioactive waste will be stored in high-level radioactive wastes repositories of the Belarusian NPP for the entire service life of the NPP.

A permanent disposal facility for low-level and intermediate-level radioactive waste of the Belarusian NPP will be built by 2028.

The Strategy provides for consideration of possible construction of high-level radioactive waste disposal facility in deep geological formation.

In accordance with the Intergovernmental Agreement between the Republic of Belarus and the Russian Federation on cooperation in construction of the nuclear power plant in the Republic of Belarus, dated 16.12.2011, spent nuclear fuel shall be returned to the Russian Federation for processing.

In accordance with the legislation of the Russian Federation, after high-level waste generated in the processing of spent nuclear fuel of Russian origin, can be stored for up to 20 years in the Russian Federation on a contractual basis.

The issue of storage (disposal) of high-level nuclear wastes after procession of spent nuclear fuel will be worked out within the framework of the National Program on scientific support of the Belarusian NPP.

Actual issues and the state of management of radioactive wastes and spent nuclear fuel, including the Belarusian NPP, were discussed at the sixth review Meeting of Contracting Parties to the Joint Convention on the Safety of Spent

Fuel Management and on the Safety of Radioactive Waste Management (May 21 – June 1, 2018 in Vienna). At the meeting of country team No.3 the 6th National Report of the Republic of Belarus on implementation of the Joint Convention was presented and discussed. The country group identified as an area of good performance the revision of norms and rules on the safety of radioactive waste management, accounting for IAEA IRRS mission recommendations: passive safety, periodic reviews, waste acceptance criteria.

The following challenges were identified: completion of the legislative and regulatory work on the management of all radioactive waste in the country, and to strengthen and establish a strategy for waste management including future spent fuel.

Currently, development of a strategy on management of spent nuclear fuel of the Belarusian NPP is under way.

Question (d). What are the selection and exclusion criteria (for example, geological and seismo-tectonic structure of the site, seismic hazard assessment (probabilistic assessment), etc.) that a country has to apply, according to current international rules, recommendations, guidelines and other relevant guidance documents, when assessing the suitability of a nuclear power plant site? Were such criteria applied in the selection of the Ostrovets site in comparison with the other sites that were also examined and were the data provided in the EIA documentation sufficient to have an idea of the selection process?

Criteria for the site selection and sorting out are provided in the requirements and recommendations of IAEA documents NS-R-3 and NS-G-3.1-3.6.

In IAEA terms, the site selection procedure for a nuclear plant in general consists of site inspection and selection stages.

Sites inspection is a procedure of detection of candidate sites for a nuclear plant after the study of a large area and rejection of unsuitable parts.

Site selection is a procedure of assessment of remaining sites by their screening assessment and comparison based on safety considerations and by taking into account other factors in order to select one or several candidate sites preferred.

Site assessment is an analysis of factors on the site, which can have impact on nuclear plant safety or activity on this site.

Site assessment includes the following stages:

- a site selection stage. One or several preferred candidate sites are selected after the inspection of a large area, rejection of unsuitable sites and screening assessment and comparison of the remaining sites.
- a site characterization stage. This stage is divided into:

- site inspection, during which suitability of the site for nuclear power plant location is being checked according to the exclusion criteria determined in advance;
- confirmation of site suitability, during which site features which are required for analysis and design, are determined.

- a pre-operational stage. Analyses and inspections started at the previous stages are continued after the beginning of NPP construction and before the beginning of its operation in order to complete and clarify site features used during the final design.

The requirements of the national document of the Republic of Belarus [1] were also used for selection and assessment of the site suitability for the Belarusian nuclear power plant construction. This document was developed based on the requirements and recommendations of IAEA document No. NS-R-3 and others.

Site selection criteria that **forbid** NPP construction are provided in the table below.

Ref. No.	Site selection criteria that forbid NPP construction	National document of the Republic of Belarus TKP 097-2007 (02300)	IAEA document NS-R-3
1.	Tectonically active faults	cl. 5.1.3	cl. 3.5-3.7
2.	Seismicity of more than 9 points according to MSK-64	cl. 5.1.3	cl. 3.1-3.4
3.	Over water-supply sources used or approved ground water storage used or planned to be used for drinking water supply	cl. 5.1.3	Not required
4.	In areas without water-supply sources sufficient with a provision of 97% to compensate losses in NPP cooling systems	cl. 5.1.3	cl. 3.52-3.54
5.	On territories where active karst is found or it is possible to activate diffusion and karst processes	cl. 5.1.3	cl.3.35-3.34
6.	In areas of active soil slip and other dangerous slope processes (landslides, mud streams)	cl. 5.1.3	cl. 3.33-3.34

7.	Floods that occur once per 10,000 years	cl. 5.1.3	cl. 3.18
8.	Territories potentially subjected to floods with a wave of waterfront flush from water reservoirs	cl. 5.1.3	cl. 3.29-3.32
9.	Territories where NPP location is prohibited by the environmental legislation	cl. 5.1.3	Not required
10.	Average population density is more than 100 persons per sq. km.	cl. 5.1.3	Not required

As the Table shows, **more severe restrictions** are used in the Republic of Belarus for the assessment of the site suitability for NPP location compared with IAEA document No. NS-R-3, namely three additional criteria are added:

drinking water-supply sources criterion;

environmental legislation criterion;

population density criterion: 100 persons per sq. km. and over.

Scope and volume of surveys and studies to obtain information required for the site assessment for NPP location are provided in the regulatory document of the Republic of Belarus [2]. The document is developed taking into account IAEA safety requirements NS-R-3 and IAEA safety standards series NS-G-3.

The composition and the scope of surveys and studies to obtain information in the amount required for the site assessment for NPP location are provided in the regulatory document of the Republic of Belarus [2]. The document was developed by taking into account IAEA safety requirements NS-R-3 and IAEA safety standards series NS-G-3.

These surveys and studies include:

- topographical surveys and studies;
- geological engineering and hydrologic surveys;
- researches for study of seismotectonic conditions and seismic hazard assessment;
- engineering and hydrometeorological surveys and studies;
- research of factors related to the impact of NPP on the environment and radiation safety of population.

The site for the Belarusian NPP was selected according to IAEA safety standards and national documents of the Republic of Belarus.

Based on studies carried out, as well as available archive materials on hydrogeological, meteorological and other factors considering prohibitive and limiting requirements for NPP location on the territory of the Republic of

Belarus, **three candidate sites were identified**: Krasnopolye, Kukshinovo and Ostrovets.

The entire complex of surveys and studies was performed on these sites according to IAEA documents and national documents of the Republic of Belarus.

Results of works performed are given in the form of tables in the EIA Report of the Belarusian NPP [3], they are sufficient for understanding of the site selection procedure.

Screening assessment of candidate sites shows that a range of factors unfavorable for NPP location was identified at Kukshinovo and Krasnopolye:

- it is potentially possible to activate suffusion and karst processes, which is a complicating factor;
- complicated engineering-geological and hydrogeological conditions of the Kukshinovo site (there is no regularity in deposition of soils of different composition and properties, pressure waters are available there with the piezometric level close to the ground surface up to 1.5 m);
- less favorable conditions of foundation (arrangement of foundations)

No unfavorable conditions for NPP location were revealed on the Ostrovets site.

IAEA document No. NS-R-3, clauses 2.1 and 2.2., provides that if these factors cannot be compensated by design solutions, site protection measures or administrative procedures during further study at the site characterization stage, the site shall be considered unsuitable.

Based on the above, the Ostrovets site was selected as the preferred one, because it has no unfavorable factors affecting NPP safety.

It should be noted that the overall probability assessment of seismic hazard has been performed at the Ostrovets site and based on this assessment various stress test have been performed. The tests results showed that the minimum seismic margin is 0.03g or 30% for all SSC (system structures and components)

In 2018 a peer review of the stress tests, carried out by Belarus party, was conducted by the European experts. The results of this review confirm that the process of determining the design seismic base with seismic gap equal to 10 000 years meets the IAEA and WENRA international practices and guidelines (2014).

In accordance with para 64 of the decision of the 6th Meeting of the Parties of the Espoo Convention in January 2017 Belarus conducted the IAEA SEED mission for assessment of the Belarusian NPP safety in relation to special external hazardous impacts.

The scope of the SEED mission hosted by Belarus covered (please refer to the table prepared by the IAEA):

• site evaluation review, including review of screening and review of site evaluation report,

• review of site monitoring, including pre-operational stage monitoring programme and operational stage monitoring programme,

• review of issues identified from the Fukushima Daiichi accident.

The mission studied materials of the Preliminary Safety Assessment Report of the Belarusian NPP.

According to the press release published by the IAEA, the SEED mission team noted in its conclusions, that the design parameters of the plant take into account external hazards, such as earthquakes, floods and extreme weather conditions, as well as events caused by a human factor. The mission also noted that programs for monitoring of hazards, which will be carried out during the entire lifetime of the NPP, are adequate and properly documented. It also noted that additionally measures were taken, which are to meet the challenges related to external events in light of the lessons learnt from the Fukushima accident.

The complete SEED report of IAEA can be found online ate the IAEA Web-site http://www-ns.iaea.org/downloads/actionplan/SEED%20Mission%20Report%20Belarus.pdf

List of references

1. ТКР 097-2007 (02300) Nuclear Power Plant Sitting. Main Safety Criteria and Requirements.ТКП 097-2007 (02300)

2. ТКР 098-2007 (02250/02300) Nuclear Power Plant Sitting. Main Requirements for Range and Scope of Surveys and Studies when Selecting NPP Location and Site.

3. EIA Report. Part 8.1. Estimation of the NPP influence on the surrounding environment. Explanatory Note. (Version 06.07.2010).

4. https://www.iaea.org/newscenter/pressreleases/iaea-mission-concludes-site-and-external-events-design-seed-review-in-belarus.

5. http://www-ns.iaea.org/downloads/actionplan/SEED%20Mission%20Report%20Belarus.pdf