Responses to questions of the Implementation Committee of the Espoo Convention

I. Steps following decision VI/2

1. Please explain the reasons, indicating the relevant provisions of the Convention, why you consider that the steps taken following Decision VI/2 warrant/do not warrant the conclusion that Belarus is in compliance with the provisions of the Convention?

The Republic of Belarus, in the development of decisions taken at the 27th session of the Implementation Committee of the Espoo Convention (12-14 March 2013), as well as in the framework of the implementation of decision VI/2 of the Meeting of the Parties (June 2014) has taken the following steps to show the intention of Belarus to follow the provisions of the Espoo Convention fully.

According to the conclusions of the 6th Meeting of the Parties, Belarus was called upon to make a final decision on the choice of the location in full compliance with Article 6 of the Convention and continue the Transboundary EIA procedure based on the final EIA report.

EIA Report.

Final EIA report (4 books) in English language was sent with the letter of the Ministry of Environment dated 11th of February 2011 to the Ministry of Environment of Lithuania. The letter contained clarifications of the fact that the final EIA report additionally contained explanations of project decisions, to which the affected parties had shown interest during consultations and public hearings and didn’t include any new information on Belarusian NPP parameters and its impact on the environment. The letter contained the terms of presenting comments (questions) to the report (until 18th of March 2011). EIA report contained detailed information to assess the impact of the proposed facility on all components of the environment and human health as well as safety evaluation of all actions to be taken under any circumstances and fully complies with the requirements of Appendix II. Thus, the preparation of EIA documentation is made by the Republic of Belarus in full accordance with paragraphs 1 and 2 of Article 4 of the Espoo Convention.

Consultations.

Final EIA report in English was handed over to the Lithuanian Party in February 2011. From 2011 to 2013 consultations were held by correspondence.

Final EIA report in Lithuanian was submitted with the letter of the Ministry of Environment dated 11th of June 2013 together with bilateral consultations materials for the period 2009-2013 for its distribution to the public and concerned government authorities and holding public hearings and experts’ consultations.

The Belarusian Party adheres to the position that the terms granted to the Lithuania for consultations on the EIA report are reasonable. The Belarusian Party has sent 6 letters during 2012 – 2013 years only (16th of November 2012, 27th of February 2013, 30th of April 2013, 11th of June 2013, 19th of July 2013 and 1st of October 2013) with a proposal to conduct consultations.

The lack of response from Lithuania on the Belarusian Party's requests, expressed in the letter dated 11th of June 2013 about conducting public consultations, forced the Belarusian Party to take measures to inform the Lithuanian public, to gather views and comments of Lithuanian citizens on the final EIA report and to conduct public hearings on their own.

The Belarusian Party organized public hearings for Lithuanian citizens on 17th of August 2013 in Ostrovets. During the event a high-quality translation into the Lithuanian language was provided. All participants were provided with free visa support, insurance and transfer from Lithuania to Ostrovets and back. Personal invitations to take part in this event were addressed to the officials of Lithuania, including Minister of Environment, Minister of Energy, Members of Parliament.

The Republic of Belarus believes that the Lithuanian public was given a reasonable opportunity to express their opinion on the EIA report back in 2010 during the public hearings in Vilnius.

Furthermore, Belarus provided the Lithuanian public an additional opportunity to submit their comments on EIA Report via the competent authority of Lithuania until 18th of October 2013

The above information indicates that Belarus complies with the requirements of paragraph 6 of article 2, paragraph 8 of article 3, paragraph 2 of article 4 and article 5 of the Convention.

Final decision

By the Decree of 2011 location in Ostrovets was determined for design purposes (project documentation) of the Belarusian nuclear power plant, of which the Lithuanian Party was informed by the letter from the Ministry of Environment dated 23rd of September 2011 #13-15/424-B.

The Decree of 2013 was passed after the completion of all the environmental impact assessment procedures, including transboundary, as well as on the basis of all necessary approvals and state examinations provided by the national legislation, including the conclusion of the state ecological examination of the Ministry of Environment. The Decree of 2013 has the character of the final decision on the construction of the Belarusian NPP on the location, for which the project documentation was designed in accordance to the Decree of 2011. The Lithuanian Party was informed about the Decree of 2013 by the letter of the Ministry of Environment dated 21st of November 2013 #13-13/2028-2

The final decision (The Decree of 2013), adopted by the Republic of Belarus, is complying with paragraphs 1 and 2 of Article 6 of the Espoo Convention.

Post-project analysis.

Pursuant to Article 7 of the Espoo Convention the Belarusian Party has developed a program of post-project analysis if the Belarusian NPP in 2014 and sent it to all parties concerned, including Lithuania (Letter of the Ministry of Environment dated 23rd of May 2014). After receiving comments from the interested parties the program was updated, validated and sent with the letter of the

Ministry of Environment dated 9th of February 2015 to all parties concerned, including Lithuania.

In the process of execution of the post-project analysis program the Belarusian Party is ready to make reasoned amendments and updates based on the proposals of the interested parties.

In addition, the Belarusian Party is in the process of creating of an automated system of control of radioactive contamination in the observation area of the Belarusian NPP.

Other steps that can contribute to the improvement of the bilateral cooperation for the dispute settlement, the Belarusian Party, according to the letters of the Ministry of Environment dated 18th of November 2014 and 2nd of December 2015, has proposed to create a joint body for the post-project analysis of the Belarusian NPP, as well as other aspects of the Belarusian NPP; develop and implement a joint project of the system of radiation monitoring of nuclear facilities located near the Belarusian-Lithuanian border; conduct a series of consultations on issues of interest to the Lithuanian Party; intensify the process of concluding a bilateral agreement on the implementation of the Espoo Convention.

Bilateral cooperation

Purcuant to Article 8 othe Espoo Convention Belarus submitted a revised text of the draft bilateral agreement on the implementation of the Espoo Convention in the letter of the Ministry of Environment dated 15th of May 2014. From May 2014 to December 2015 Belarus has repeatedly proposed Lithuania to resume consultations on the draft of the aforementioned agreement.

On the 17th of December 2015 consultations on the draft agreement were held in Vilnius.

The next round of consultations with the Lithuanian Party is scheduled for the second quarter of 2016 in Minsk.

At the same time, the Republic of Belarus regrets the protracted process of work on the draft bilateral agreement on the implementation of the Espoo Convention, believing that the purpose of such agreements is the efficient management of the transboundary EIA procedure.

2. Please lists the issues on which you continue to disagree with Lithuania .

First of all, the Republic of Belarus does not share the opinion of Lithuania on the necessity to make changes and updates into the final Belarusian NPP EIA report. The decision of the Implementation Committee of the Espoo Convention on the submission of Lithuania towards Belarus as listed in the annex to the document ECE/MP.EIA/IC/2013/2, does not contain any recommendations for the revision of the EIA report.

Belarus notes, that the detailed additional information on the transboundary impacts and on the justification of Belarussian NPP siting was sent to Lithuania at the end of 2012 and in June 2013.

Secondly, Lithuania insists on the continuation of the EIA procedure in the transboundary context. Belarus notes that the transboundary procedure has been completed on the basis of the fulfillment of all EIA stages envisaged by the provisions of the Espoo Convention. Belarus submitted final EIA report to Lithuania, held hearings with the Lithuanian public, provided opportunity to the public to make comments and suggestions on the submitted documentation, provided clarifications to the comments and ensured due consideration of the comments in the EIA report. On the basis of the above mentioned procedural steps Belarus has taken final decision - The Decree of the President of the Republic of Belarus № 499 of 2.11.2013 “On the construction of the Belarusian nuclear power plant”, - which was confirmed by the decision VI / 2 of the Meeting of the Parties (paragraph 52, footnote 32). Belarus informed Lithuania about this in accordance with the established procedure.

At the same time, Lithuania had repeatedly set in to Belarus the number of questions related to scientific and technical aspects of the EIA report. In its turn, Belarus has repeatedly provided letters with the comprehensive information on the questions of Lithuania. At the same time, we would like to emphasize that Belarus has repeatedly come up with the proposal to organize meetings at expert level with the Lithuania, this step would contribute to the sooner solution of disputable issues and disagreements. In particular, the last request to hold this kind of meeting was sent to Lithuania on December 2, 2015. We regret that the Lithuanian side did not accept the proposal of Belarus, and had chosen the continuation of written correspondence. According to the opinion of Belarus, Lithuanian`s actions are aimed to the prolongation of the negotiation process, rather than settlement of disputes on the point of substance.

3. Please present the current state of works at the site.

The construction of the Belarusian NPP has begun in November 2013 after obtaining a license on NPP construction from the regulatory authority and adoption of the Decree of the President of Belarus in accordance with the legislation of the Republic of Belarus.

As of the beginning of 2016 a full-scale construction and installation work at the facilities and structures of power units #1 and #2 is under way. Basic equipment is contracted and its production and delivery on availability to the NPP location has started.

All work is done in accordance with the schedules of equipment supply and construction, provided by the General contract.

To date, construction and installation work is about 36% finished from the total volume of construction, provided by the Belarusian NPP project. The installation of the reactor plant, heat engineering and electrical equipment of the power unit #1 will begin this year.

Staff training programs are conducted in accordance with the State program. The development of the nuclear energy is conducted in accordance to the IAEA “Milestones” document. In 2012 INIR Mission of the IAEA welcomed the infrastructure needed for the creation of nuclear power in Belarus.

For reference: information on the progress of construction of the Belarusian NPP is in the public domain on the Internet sites of the Ministry of Energy of Belarus, the State Enterprise “Belarusian NPP” and in social networks (Facebook, Youtube etc.)

II. ALTERNATIVES

4. What conditions (environmental and economic) should a location satisfy in order to qualify as a reasonable alternative for placing a new nuclear power plant?

The Belarusian Party has repeatedly informed Lithuania that according to the Espoo convention (article 1, para. 6) Belarus has used the regulatory document Technical Code of Established Practice (TCEP) 097 – 2007 «Placement of nuclear power plants. Main criteria and safety requirements» during location selection. The document is designed to meet the requirements and recommendations set out in the IAEA document “Safety requirements. Site evaluation for Nuclear Installations” № NS-R-3.

Environmental conditions that forbid the NPP placement:

1. On sites, located on the tectonically active fractures

2. On sites, where seismic activity is characterized by the intensity of SSE over 9 points on a scale MSK-64

3. Above the sources of water supply with approved groundwater supplies used or to be used for drinking water, if the impossibility of its contamination by radioactive materials is not justified.

4. In areas that do not have water resources, sufficient for making up 97% of losses in NPP cooling systems and that do not have reliable sources to make up for the loss of water in the cooling systems of the reactor facilities, important for NPP safety.

5. On locations with active karst or with possible activation of the diffusion-karst process.

6. In areas of active landslide and other dangerous slope processes (landslides, mudflows)

7. In areas subject to catastrophic floods and floods with recurrence once in 10 000 years, taking into account the ice jams, wind surges and tidal effects.

8. In areas potentially subject to flooding with surges breaking the waterfront of reservoirs, located upstream.

9. In areas where the NPP location is prohibited by environmental legislation.

10. In the territory with an average population density of 100 inhabitants per km^2 or more

These environmental conditions (factors) are specified by par. 3.1-3.7, 3.18, 3.29, 3.33, 3.34, 3.35, 4.10 of IAEA Publication № NS-R-3.

Requirements to the documentation of the EIA are set out in Appendix II to the Espoo Convention (1991) and include a description of the environmental aspects of the proposed activity.

There are no requirements for description of economic conditions for planned activities in EIA.

The economic feasibility of the project of NPP is a part of the business plan, which refers to the information that constitutes a trade secret. The Convention clearly indicates on the inadmissibility to demand information relating to trade secret (para. 2, Art. 2 of the Convention)

Nevertheless, in our opinion, economic conditions that can satisfy a location selection for the NPP are:

1. The cost of natural resources withdrawn from circulation.

2. The cost of the necessary engineering work to ensure safe operation conditions of the NPP to accommodate the adverse factors of NPP placement, if applicable. According to the TCEP 097 – 2007 there are 13 factors, for example: saline soils, floodplain terraces of the rivers, slopes of 15^0 or more, major nutrition aquifers, areas with groundwater at a depth of less than 3 m from the surface etc.

3. Distances to the nearest railway and highways, the main watercourse etc. that determine the cost required for the construction of transport communications for the NPP.

In the absence of prohibiting environmental conditions (factors) and with minimal amount of economic conditions (unfavorable factors) a location can be qualified as a reasonable alternative for NPP placement.

5. Please describe the national procedure for selecting a possible location for a new nuclear power plant

Site selection procedure in Belarus is conducted in accordance with the recommendations of the IAEA leadership № NS-G-3.1 “External Human Induced Events in Site Evaluation for Nuclear Power Plants”, para 1.8, reference 1 and includes the following steps:

Stage and location selection step. The rejection of unacceptable locations is held on the basis of the requirements of the normative document of Belarus TCEP 097-2007 (02300) «Placement of nuclear power plants. Main criteria and safety requirements». In stock and archive materials, available results of geotechnical studies, weather and hydrological observation materials stages and locations are selected with no factors that prohibit the NPP placement.

Characterization step. This step is further divided into:

Verification. At this point complex engineering and environmental studies are performed on selected locations in accordance to the normative document of Belarus TCEP 098-2007 “Placement of nuclear power plants. Basic composition and volume of the study and research during stage and site selection for the NPP”. The presence of unfavorable factors is established (according to TCEP 097-2007 there are 13 factors) and the section “Studies of factors associated with the influence of the NPP on the environment and radiation safety of the population” is developed.

Based on the comparison of the results of completed studies on the seismotectonic, geotechnical, hydrological, town planning and environmental conditions, as well as land use conditions, the power delivery, transport communications, expert commission is preparing a report on the choice of the priority area of the possible NPP placement.

State committee on site selection for construction of the NPP in Belarus is created, which is considering submissions and determines the primary and backup sites for placement of the NPP.

Preparation of EIA report.

For a selected priority area materials on the justification of investing and construction of the NPP in Belarus are developed. An integral part of these materials is the EIA report of Belarusian NPP. The report passes the state environmental examination.

The Decree of the President of Belarus, that allows the design of the Belarusian NPP.

Confirmation, when characteristics of the site required for the analysis of the detailed design are determined.

In-depth studies of the environmental characteristics are carried out on the primary location in order to substantiate the NPP safety according to the regulatory requirements of the Republic of Belarus (TCEP 294-2010) and the Russian Federation (NP-006-098) “Requirements to Contents of Safety Analysis Report of Nuclear Power Plant with VVER Reactors” and IAEA documents #NS-R-3, NS-G-3.1-3.6. The purpose of these studies is to evaluate the possible impact of environment and technological factors on NPP safety.

According to research materials “Report on the justification of the Belarusian NPP safety” is developed. The report on the basis of studies the impact of environment and technological factors on NPP safety are assessed. The documentation passes all necessary examinations, including the state ecological examination.

The Decree of the President of Belarus that allows the beginning of the construction of the Belarusian NPP. The location selection.

6. What conditions (environmental and economic) should a technology satisfy in order to qualify as a reasonable alternative for building a new nuclear power plant?

Conformity of NPP project to the current international safety requirements and IAEA recommendations.

International safety requirements of various countries that produce nuclear technologies (USA, European operating companies – EUR, Japan, Korea, China) to advanced nuclear reactors is set out in IAEA document IAEA-TECDOC-1391 «Status of advanced light water reactors designs 2004». (Современное состояние проектов усовершенствованных легководных ядерных реакторов). This document contains characteristics of advanced nuclear power plants, recommended for implementation for "beginner countries", including the Russian NPP projects AES-91/99 and AES-92, which are the prototypes for AES-2006 project.

Provision of nuclear and radiation safety due to internal properties of the reactor, the use of modern materials and equipment.

Internal properties of the reactor, i.e. its self-protection is manifested in the fact that during the reactor acceleration (increasing capacity) due to negative feedback with the temperature increase the reactor power will be reducing, resulting in the reactor shutdown.

Project stability to internal and external shocks as well as human errors

Dual containment of metal and concrete. The inner sealed envelope in case of a hypothetical accident will not allow the radiation to extend beyond the reactor building and the outer envelope protects the reactor from adverse external shocks. The plant will not be affected in the event of an earthquake up to 8 points, hurricane, flood, explosion and even aircraft crash on the reactor building.

Presence of active and passive safety systems.

The advantage of the project is a unique combination of active and passive safety systems, that provide a high level of security and meet the requirements not only of today, but also of future decades.

Passive safety systems, in particular, is the double containment, hydrogen suppression system, passive heat removal system to ensure long-term heat removal from the reactor and containment in case of any emergency situations, including full blackout.

In the extremely unlikely case of an accident with core melting the project provides a core catcher that will not allow the molten fuel to compromise the containment and spread beyond.

The application of these systems protect the NPP from natural and manmade impacts as well as human errors in case of emergencies.

The service life of the reactor plant – 60 years

Affects the economic indicators of the NPP

The capacity factor of no less than 90%

The larger the capacity factor, the more reliable is the NPP, the more electricity is produced.

The economic competitiveness of NPP in comparison with fossil fuel energy sources

The cost of electricity produced at the NPP should be lower than on fossil fuel plants

7. Please describe the national procedure for selecting the technology for a nuclear power plant.

According to the international practice, as a rule, beginner countries independently decide on the choice of nuclear reactor types (nuclear technology) for their nuclear power plants, and the choice of a specific NPP project and the company for its implementation is carried out either via international tender procedure or on the basis of global market analysis of NPP projects through direct negotiations with the specific company with the conclusion of an appropriate intergovernmental agreement.

At the stage of selection of the NPP project for Belarus (2008) scientists and specialists had analyzed:

- Analysis of the world experience in the development of nuclear power, the basic types and generations of active and constructed NPPs;
- The study of the technical capabilities of the leading nuclear reactor construction companies and their NPP projects available on the global market
- The cost of projects and the possibility of obtaining loans for their realization

At the time of selection of the NPP project 31 countries operated 439 power units of various types.

Results of the analysis showed that the basis of the global nuclear energy constitute NPP with pressurized water reactors (VVER-PWR)

More than 65% of active reactors and 74% of reactors under construction refer precisely to this type. VVER-PWR reactors have the largest operational experience. Their technology is well developed and repeatedly tested. Most of the newcomer countries announced their intention to develop nuclear energy on the basis of VVER-PWR reactors. Thus, in the present century this reactor design will dominate the global nuclear power industry.

The global nuclear technology market analysis has shown that the choice of companies offering advanced NPP designs with VVER-PWR reactors of Generation 3 (3+) is limited. In the world there are only a few well-known companies:

- Joint American-Japanese company “Westinghouse-Toshiba”;
- Franco-German company group “AREVA”
- Russian state corporation “Rosatom” (JSC “Atomstroyexport”)

The management of companies "Westinghouse-Toshiba" and "AREVA" informed about the impossibility of NPP construction in timeline defined by Belarus. In addition, neither company fund the implementation of nuclear power projects in foreign countries and both can only assist in the development of financing schemes.

Russian project “AES-2006” of 3+ Generation with service life of the reactor plant of 60 years meets modern international standards for safety, ensured by active and passive safety systems and severe accident management devices. It is using technology and equipment, proven through a long time of operation, has all advantages and addresses the shortcomings of previous Russian nuclear reactors.

Taking into account the refusal of the companies "Westinghouse-Toshiba" and "AREVA", a high level of safety and reliability of the Russian projects (several performance indicators for reliability and safety of the Russian projects surpass foreign analogues), reference, possibility of credit granting, staff training in Russian educational centers, common language and technology development, as well as a number of other factors, the decision was made in the 4th quarter of 2008 on the construction of the NPP under the Russian project "AES-2006".

The project is based on the third generation AES-92 and AES-91/99 designs, which were highly rated by experts. Bulgaria on a competitive basis chose the Russian project AES-92 for the construction of its Belene NPP. The choice was approved by the European Union, because the project received a certificate of compliance with the requirements of the European operating companies (EUR) in 2007, making it possible to implement the project in EU countries. The decision to build a NPP based on the same project was made by India as well. Regarding the project AES-91/99, it has already been implemented in China in 2007, when two power units at the Tianwan NPP were put into operation.

The AES-2006 project selected by Belarus takes into account all the best from prototype projects with the addition of a number of safety systems. With this project, Russia has won the international competition for the construction of NPPs in Turkey, Hungary, Finland, Bangladesh and other countries.

The presence of the world’s first reference, ie active, Tianwan NPP of new generation in China, which has past its lifetime warranty, Russian NPP projects’ victories in international competitions confirm the correct choice of the Republic of Belarus of AES-2006 project.

8. How would you fully address the no-action alternative in the case of the proposed building of a nuclear power plant?

Discussing its question the concept of ‘no-action alternative’ (abandonment of the construction) should be clearly defined. In justifying the project estimated cost (P) and the amount of electricity output over the life cycle (M) are evaluated. As a ‘no-action’ alternative the purchase price of the same amount of electricity (P1) is estimated. If purchase price (P1) is higher than the cost of the project (P), then the project is appropriate.

The subject of the Espoo Convention is to consider the impact of the NPP on the environment in a Transboundary Context. Appendix II of the Convention states that the EIA report, if necessary, should describe ‘reasonable’ alternatives.

According to the requirements of regulatory documents of the Republic of Belarus and Appenix II of the Espoo Convention the EIA report describes the ‘reasonable’ alternatives to the necessary extent:

- Alternative locations for NPP construction
- Alternative energy sources
- Possible embodiments in project

9. How would you describe a watercourse that can be safely used as the exclusive source of water for cooling a new nuclear power plant?

According to the requirements of regulatory documents of the Republic of Belarus and IAEA recommendations as the exclusive source of water for cooling an NPP a watercourse with the following characteristics can be used:

1. Features water resources, sufficient for making up 97% of losses in NPP cooling systems and a reliable source to replenish the loss of water in the cooling systems of the reactor facilities that are important for the NPP safety.
2. Prevents NPP location flooding during the maximum water level.
3. Preserves the minimum allowable flow of water of no less than 75% of minimum monthly average water consumption of 95% of the supply for the winter or summer low water (the smallest one).
4. No negative impact on water level in the river.
5. Positive water balance and provide all the utilitarian needs in the selection of river water, and the preservation of the sufficient volume of water for environmental purposes.
6. The water temperature should not rise in comparison with the natural temperature of the water body by more than 5 ^{o}C with the general temperature increase to no more than 20^{o}C in summer and 5 ^{o}C in winter for water bodies that are inhabited by salmon and whitefish fish species, and to no more than 28 ^{o}C in summer and 8 ^{o}C in winter in other cases.
7. Has minimal values of the concentration of substances in relation to the maximum allowable concentration of the substance in aqueous medium (Hygienic Standard of the Republic of Belarus GN-2.1.5.10-29-2003), maximum permissible concentration (MPC) and tentative permissible levels (TAC) of chemicals in water bodies of community, cultural and drinking use.
8. Has minimal values of concentration of radioactive substances in relation to the reference levels of radionuclides in drinking water (Annex 1 to the hygienic standards of “Radiation Safety Standards” (RSS-2012)).

Watercourse characteristics of Vilija river meet the above regulations and the recommendations of the IAEA as the exclusive source of water for cooling a NPP.

10. What would be the impact on the watercourse described above and its water basin as a consequence of the normal operation of a nuclear power plant7 using water from the said watercourse?

1. *Thermal effects.*

Maximum permissible level of thermal pollution is restricted by regulatory document of the Republic of Belarus “Appendix 1, 2 for decree of the Ministry of natural resources and environmental protection of the Republic of Belarus and Ministry of Public Health of the Republic of Belarus dated March, 8 2007 year № 43/42 «Concerning several questions of water quality estimation o fishery water bodies».

According to the requirements of decree of Ministry of Environment and Ministry of Public Health of the Republic of Belarus dated 08.05.2008 № 43/43 the water temperature in watercourse shouldn’t exceed the natural temperature of a water object more than for 5^{o}C with general temperature build-up no more than 20oC in the summer and 5^{o}C in the winter for water objects where dwell salmon and whitefish, and no more than 28^{o}C in the summer and 8oC in the winter in the other cases.

Additional construction for discharge cooling from NPP is stipulated in the Belorussian NPP project for the most unfavorable period (in the context of temperature effect). The construction of final cooler allows to reduce the discharged water temperature before the discharge into watercourse in July and August to 2^{o}C and in October to 5^{o}C.

Conclusion. As we can see from above, the discharged water from NPP won’t have temperature effect on the water course.

2. *Contaminants*

There are following types of sewage within the Belorussian NPP design basis:

- sanitary sewage of free access area;
- sanitary sewage of controlled access area;
- oil effluents;
- open drains.

Discharges not polluted with radioactive elements are being drained from general facilities and plant service building to the system of sanitary sewage of free access zone.

Discharges are being drained from bathing units, washbasins and sinks of the controlled access facilities to the sanitary sewage of controlled access zone

Discharges with the effluent oil content less than 100 mg/dm3 are being drained to the oil effluents.

Production wastewater not polluted with radioactive elements is being drained from cooling mechanisms and pump bearings to the open drains.

Treated wastewater after UV disinfection comes in circulating technical water supply system for reuse.

In order to reduce the concentration of chemical and other (suspended) substances in discharged wastewater to the MPC standards a complete biological wastewater treatment is envisaged with deep removal of hydrogen and phosphorus and additional cleaning.

Suspended substances and sand from sandtraps, septic tanks and oil traps is sent to a disposal site with waterproof base, which are part of the complex treatment facilities. Disposal site's capacity is accepted at a rate of accumulation of sludge during 5 years. Caught in the settling tanks and oil traps gravity oil comes into oil effluents.

Removal of dried sludge and caught in the process of oil purification, with water content up to 50%, is done in the prescribed manner to the landfill of production and consumption waste.

Conclusion. Accepted purification schemes allow to minimize the concentration of pollutants and reuse treated wastewater in recycled system of technical water supply and provided accumulation reservoirs eliminate the possibility of unauthorized discharge of untreated wastewater into the environment.

3. Radiation effect.

The Belarusian NPP organized division of industrial buildings on NPP in free access area (FAA) and controlled access area (CAA). In order to prevent contamination of the watercourse in the process of purification of domestic wastewater CAA provides the following technical solutions and organizational measures which exclude the possibility of getting radionuclids with domestic wastewater into the environment:

1. Separate collection of domestic waste. The sanitary sewage system of CAA drains from toilets and showers. Runoff from special laundry, sanitary inspection rooms come in special sewage capacities

2. Radiation monitoring of these waters before their discharge to the treatment plant of domestic wastewater treatment of CAA, including manual radiochemical and chemical control in radiochemical laboratory.

3. Withdrawal of wastewater of CAA for further special water treatment in excess of the permissible level of activity.

4. Cleaned water of CAA and FAA is fed in the reverse system of technical water supply after monitoring their activity for further use.

5. In order to guarantee the environment protection a monitoring of activities in control tanks located on their supply lines into the watercourse is conducted.

Conclusion. Discharge of control tanks into the watercourse is allowed when the total specific activity of water is less than 20 Bq/l, which, taking into account the expected nuclide composition, reliably ensures that the requirements of para.131 of Radiation Safety Standards-2012 under the joint presence of several radionuclides in water and corresponding reference levels.

11. What would be the impact on the watercourse described above and its water basin as a consequence of a major accident, accident beyond the design-base or disaster at the nuclear power plant using water from the watercourse referred to above?

Watercourse is contaminated with radionuclides due to direct deposition of radionuclides on the surface of the watercourse as a result of the surface washout of radionuclides.

One of the main factors that determine the level of contamination of the watercourse is the power of radionuclides fallout and contamination area.

Belarussian NPP project forsees that the intensity of the leakage of radioactive materials beyond the containment will be no more than 0.2% by volume per day with the maximum excess pressure estimated. Accidental releases in case of an accident beyond the design base on VVER-1200 power unit (5^{th} level on INES scale, residual risk below 10-7) do not lead to acute radiation effects on the population and do not restrict the use of large land and water areas for a long period.

The project assumes that the planning area is 5-7 km.

Let us compare the following data

- watercourse catchment area of 25000 km^2;
- radionuclide fallout area of 62 km^2;
- Surface flooding ratio for Cs^{137} – $5x10^{-4}$ $year^{-1}$, Sr^{90} – $3x10^{-2}$ $year^{-1}$.

Based on that data we can conclude that the content of Cs^{137} and Sr^{90} in water will be insignificant.

It was experimentally confirmed.

In 1994 an experiment was conducted to study the contamination of surface water of Iput River in Sozh-Dnepr basin, which flows through the Belarus-Bryansk "cesium spot: with a density of contamination from 1 to 60 Ci/km^2. Observations on the content of radionuclides were held in two locations, Vylevo and Dobrush, Gomel region.

Analysis of experimental date showed that Cs^{137} and Sr^{90} concentration in water control points was at the level of 8% and 0.4% of the reference level of radionuclides (10Bq/l) in drinking waters according to the norms of Radiation Safety Standards.

12. Please list incidents that you believe could lead to a major accident, accident beyond the design-base or disaster.

The incidents, that could lead to a major accident:

- increase/decrease of secondary heat removal circuit;
- increase/decrease of primary flow rate;
- reactivity anomalies and radial and core power distribution anomalies;
- violation of safety rules for storage and transportation of nuclear fuel;
- in-containment failure;

- false system operation.

For the events mentioned above the damage of the nuclear fuel element beyond the design limits are absent.

Initiating events that could lead to the accident beyond the design-base:

- While unit power operation:
  - compensated leakage of the primary circuit inside the detection zone – 4,00E-08 1/a year;
  - small break of loss of coolant from the primary circuit into the secondary – 2,76E-08 1/a year;
  - steampipe or line leak of feedwater in non isolated section – 1,78E-08 1/a year;
  - small break of loss of coolant of the primary circuit inside the cooling zone – 1,46E-08 1/a year;
  - loss-of- power – 1,26E-08 1/a year;
  - steam explosion in the RPV – 1,00E-08 1/a year;
  - large break loss of coolant of the primary circuit inside the cooling zone – 7,46E-09 1/a year.
- During low-power run and shutdown state:
  - failure of decay heat removal due to the failure of reactor energy removal channels of residual-heat removal system и low pressure safety injection system – 2,97E-07 1/a year;
  - loss-of-power with dense loaded reactor – 2,27E-08 1/a year;
  - unplanned letdown and drain loop fixture opening in shutdown state with the primary circuit drain – 1,61E-08 1/a year;
  - loss of external power in case of open-pool reactor – 1,37E-08 1/a year;
  - insulated small break of loss of coolant of the primary circuit through the pump rupture of minor diameter in “Assembly/Disassembly of reactor” and “warm-up in case hydraulic accumulator is out-of-service» status – 1,04E-08 1/a year;
  - reduced frequency of damage is under the requirements of engineering regulations of the Republic of Belarus ($1*10^{-5}$ 1/a year).

The project of Belarusian NPP also forces the presence of safety systems, the implementation of the necessary measures, and the application of engineering solutions that are, in case of an accident, lead the reactor into the controlled state, characterized by stabilization of the reactor’s parameters.

Incidents that can lead to disaster accidents with maximum radiation consequences.

As the most severe scenario of an accident that can lead to the maximum radiation consequences is heavy accident beyond the design-base with core melting was adopted in accordance to the project. The initial event for such an accident is a loss of coolant with high leakage with refusal of the emergency cooling system and with full de-energizing of the NPP in first 24 hours.

According to the results of the analysis of modes of accidents beyond the design-base on the Belarusian NPP a possibility of controlling such accidents was demonstrated, which, in turn, allows to effectively limit the consequences.

It should also be noted that the project takes into account the most significant impact situations:

- External explosions;
- Floods;
- Aircraft crashes;
- Hurricanes, tornadoes;
- Snow and ice loads;
- Seismic effects.

During the safety analysis of the Belarusian NPP the basic list of possible accidents taken into account and based on the requirements of the regulatory documentation was expanded with additional initiating events with regard to:

- Design features of the NPP being built;
- Safety systems configurations of the NPP project being built;
- Many years of experience in the design and operation of active NPPs with VVER reactors;
- Licensing power units projects with VVER reactors in the Russian Federation;
- IAEA recommendations.

13. How would you establish the maximum territorial extent of a significant impact from a major accident, accident beyond the design-base or disaster at a nuclear power plant?

When determining the areas of emergency the general criteria of response is used, established by the requirements of the IAEA DSR PARTN 3 and 7, GSG -2 and the regulatory document of the Republic of Belarus “Radiation Safety Standards”, according to which the equivalent radiation dose of thyroid gland during first 7 days (50 mSv) and the equivalent radiation dose for 7 days (100 mSv) are evaluated.

In EIA report to assess the accident consequences for the population a major accident and an accident beyond the design-base were considered.

Calculation of activities of radionuclide fallout and radiation doses to the population in case of major accident or accident beyond the design-base on different distances is done using the InterRAS The International Radiological Assessment System (InterRAS) Version 1.3, which is intended for use by persons performing the assessment of the radiological accidents and is based on the document “International basic safety standards for Protection against Ionizing Radiation and for the Safety of Radiation sources”

Technical regulatory act of the Republic of Belarus “Sanitary norms, rules and hygienic standards “Hygienic requirements for the design and operation of nuclear power plants”, annex 8 offers the following radius of emergency response areas:

- Preventive actions area (PAA);
- Urgent protective actions area (UPAA);
- Food restriction area (FRA)

14. What would be the measures that should be taken on the territory referred to above?

Protective measures within the PAA should be taken before or immediately after a release of radioactive materials or exposure in regard to the situation that arose on the NPP.

Protective measures within the UPAA should be taken on the basis of environmental monitoring or in appropriate situations in regard to the situation that arose on the NPP.

Protective measures within the UPAA should be taken on the basis of radiation control of environmental and food samples.

In a particular emergency situation only a small part of these areas may require protective measures.

In order to determine the measures to be taken in the emergency response areas, the preliminary report on Belarusian NPP safety analysis contains the results of calculations of emergency doses for the population. The calculations correspond to a realistic assessment of doses to the population with the worst possible dispersal conditions with 95% security in line with the NRC Regulatory Guide 1/145 – Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants.Rev.1.1982

As a result of a conservative estimate it is planned:

In preventive actions area – up to 3 km

- Informing and a note of warning to the population
- Thyroid blocking
- Population evacuation or its protection for a period of no more than one day at the impossibility of immediate evacuation

In urgent protective actions area – up to 25 km:

- Informing and a note of warning to the population
- Thyroid blocking

In food restriction area – up to 300 km – no planned measures to be taken

Conclusion. As a result of conservative estimates in the case of an accident beyond the design-base it is planned to hold emergency protective measures within a radius of up to 25km from the NPP.

15. Please explain whether storage of radioactive waste on the premises of the nuclear power plant increases the risk/likelihood and consequences/impact of a major accident, accident beyond the design-base or disaster at such nuclear power plant?

For storage of operational radioactive waste on each power unit of the Belarusian NPP project provides:

- a special separated room for storage of liquid radioactive waste (LRW storage);
- a specially equipped capital storage of solid radioactive waste of the ground type (SRW storage).

Risk assessment of the environmental impact in case of accidents on NPP is made with regard to intermediate storage of LRW in special rooms, provided by the project.

Processed (conditioned) radwaste in solid form is stored in SRW storage. Accidents at NPP will not lead to additional significant risks and consequences from radwaste storage in SRW storage provided by the project.

LRW Storage:

- Designed for intermediate storage of LRW (low and medium activity) before their processing at the curing facility;
- Storage is organized in a tank with volume of 80 m^3.

SRW storage is designed for:

- Receiving, processing (on the power unit #1) and storage in metal drums of solid radioactive waste;
- Receiving and storage of cured liquid radioactive waste in concrete containers;
- Receiving and storage of capsules with high-level solid radwaste.

SRW storage capacity:

- 2236 metal drums with SRW (447,2 m^3) – for 10 years of NPP operation;
- 448 concrete containers with cured LRW (672 m^3) – for 10 years of NPP operation;
- High-level solid radwaste – 30 m^3 for 60 years of NPP operation.