Chapter	Greenpeace comments	Final reply
2 Reactor type	Which life-time is envisaged for the Belarusian NPP? Is a life-time extension envisaged?	The life-time service of the Belarussian NPP is 60 years, which could be extended (by 10-20 years, based on adequate evaluation). The Operator takes the final decision on extension after the in-depth research and development analysis of extension, analysis of operating experience of the NPP in different regimes, correspondence of the evaluations to the actualized requirements for provision of nuclear and radiological safety, including international commitments of the state by applying the international practice and recommendations of the IAEA.
	Are there any differences between the design of the units of the Belarusian NPP and the design of Leningrad II?	There are no fundamental differences between the design of the Leningrad-2 NPP and the Belarussian NPP. Considering that the nuclear installation and the safety concept of these NPPs are alike – these differences do not impact the provision of adequate level of nuclear and radiological safety at these NPPs.
	Are there any differences between the design of the units of the Belarussian NPP and the design of Hanhikivi?	There are substantial differences between the design of units of the Belarussian NPP and the design of Hanhikivi NPP: they exist due to the different economical, ecological and other initial conditions, in relation to which the decisions about the planned activities on constructing the Belarussian NPP and Hanhikivi NPP were taken, as well as specificities of the national regulation in the sphere of design, construction and provision of nuclear and radiological safety for the nuclear energy facilities like NPP. The designs of these NPPs are implemented with application of different regulatory bases – Russian and Finnish ones. For example, it can be noted that ultimate heat sinks are different in these designs; as well as many other differences exist, which are related to contract requirements both in Belarussian NPP and Hanhikivi NPP. Nevertheless, it should be considered that, despite differences, the safety concepts at these NPPs are practically the same.
	What is the status of EUR certification of the reactor type of the Belarusian NPP?	EUR certification is not needed for the Belarussian NPP.
3 Radioactive waste and spent fuel	Does a national strategy / program for the management of spent fuel exist in Belarus?	At present, the development of the Strategy for Management of Spent Nuclear Fuel, to be produced at Belarussian NPP within subsequent periods of operation, is undergoing in the Republic of Belarus. The Draft of the Strategy is planned to be submitted to the Government for approval in 2018.

	Where will the high-level waste (HLW) be stored and how will residual heat be removed from the high-level waste?	Issues, which are related to the safe radioactive waste management of the Belarussian NPP, first of all, high-level waste, are solved both within the framework of design solutions in the medium-term perspective and within the framework of research in the long-term perspective. In the medium-term perspective, design solutions envisage the following order of radioactive waste (RW) management of the Belarussian NPP: high-level operational waste of the NPP shall be stored on site of the NPP during the whole lifetime of service of the NPP; residual heat removal from RW is envisaged as well. These measures are included to the design solutions on provision of safety on the high-level RW management. In the long-term perspective, according to the Strategy of Radioactive Waste Management for Belarusian NPP, it is planned to work out the necessity of constructing a disposal site for high-level radioactive waste in a deep geological formation. To achieve that, a set of research and development activities on the means of the high-level RW management would be performed. The final decision on procedure of high-level RW management would be adopted according to the results of performance of the full range of research and development works. High-level solid RW, which will be generated during the process of replacement of the in-core detectors and cutting of the surveillance specimens, will be collected to the special metal capsule, loaded to the shielding containers and transported to the containment of the solid RW storage facility. The abovementioned radioactive waste would be stored in the solid RW storage facility on NPP site during the whole lifetime of the NPP. At the same time, design solutions of the Belarussian NPP provide a set of measures for safety of the spent nuclear fuel management: a) after unloading from the reactor, the spent nuclear fuel (SNF) would be transported to the SNF at-reactor storage system. This system is a spent fuel storage pool equipped with the necessary equipment and systems. b) SNF at-reactor storage is designed for the cooling of the spent nuclear fuel, unloaded from the reactor, in order to decrease the activity and the residual heat of the spent fuel assemblies to the accepted values allowing transportation of the fuel assemblies.

	Is reprocessing abroad the only envisaged option for the management of spent fuel? If yes, are there any intentions to abandon this option?	In accordance with the intergovernmental agreement between the Republic of Belarus and the Russian Federation, the spent nuclear fuel from the Belarussian NPP is envisaged to be returned for reprocessing to the Russian Federation on terms, which are determined by the separate agreement. In this context the parties discuss the procedure and conditions for sending spent fuel back to Russia and handling products of processing. The alternative options for management of the irradiated fuel assemblies are to be elaborated within the framework of the Strategy of Management of Spent Nuclear Fuel of the Belarussian NPP. The Draft of the Strategy is planned to be submitted to the Government for approval in 2018.
	Which types and quantities of RW following severe accidents are expected?	It is foreseen that in case of severe accident at the NPP unit, all RW produced during accident (liquid, solid and gaseous) would be safely localized within containment of the NPP. It is expected that in this case, the estimated volume of the liquid radioactive waste (LRW) would be around 3000 m^3. After the transfer of the power unit to a safe state, there is unlimited amount of time for cleaning and reprocessing of the generated waste by the envisaged RW management systems, which helps to provide reliable level of nuclear and radiological safety. Technological processes of RW management are organized in a way that discharges and emissions of radioactive substances into the environment are excluded.
	Are radiological consequences of accidents affecting the RW management facilities to be established at the Belarusian NPP site evaluated?	The design of the Belarussian NPP envisages all required systems of RW management; according to the design, above mentioned systems are located in controlled access area. The safety requirements laid down in the design of NPP were taken into account when assessing the radiological consequences of accidents at the Belarusian NPP. The analysis of radiological consequences upon violations of normal operation and accidents in the NPP systems is presented in the safety report of the Belarussian NPP.
	Are there any plans to transport the high-level waste from reprocessing of the spent fuel in Russia back to Belarus?	In accordance with the intergovernmental agreement between the Republic of Belarus and the Russian Federation, the spent nuclear fuel from the Belarussian NPP is envisaged to be returned for reprocessing to the Russian Federation on terms, which are determined by the separate agreement. In this context the parties discuss the procedure and conditions for sending spent fuel back to Russia and handling products of processing.
	Are the costs for the management (including storage and disposal) of radioactive waste and spent fuel included in the calculated energy production costs?	The Belarusian NPP radioactive waste management system will be financed from the proceeds from the sale of electricity. The measures to improve this system will be financed out by the fund for maintaining and improving the safety of the Belarusian NPP, created by the operating organization.

	At what stage are the plans for the preparation and construction of a final disposal of HLW, long-lived LILW a Deep Geological Repository in Belarus?	According to the Strategy for management of Belarusian NPP radioactive wastes it is planned to work on issue related to construction of the facility for disposal of high-level RW in deep geological formation. For this purpose, a set of research and development works on development of ways of management of high-active RW will be performed, including: technological solutions on organization of the system of high-active RW disposal in deep geological formation will be analyzed; possible locations of the facility for disposal of the specified category of RW will be determined; design decision on construction of this disposal facility will be chosen; financial expenses on its construction will be estimated. In the future, the issue of the final isolation of of high-active RW wastes in a deep geological formation is planned to be considered taking into account the accumulated level of knowledge and world experience in this area of activity
4 Load-following operation	What is the expected extent of the load-following operation for the Belarusian NPP?	In the safety reports on Belarussian NPP units, the Operator states that these units perform load-following operation within 100-75% Nном during all life-time service, according to the daily curve with power change rate not exceeding 5% Nном/min, with the number of cycles not exceeding 200 per year (not more than 2 cycles per day). As of 28 April 2018, the safety documentation on load-following operation of the units of Belarussian NPP are examined for licensing of the operation for the unit 1 of the Belarussian NPP.
	Are there any experiences with load-operation for the AES-2006 design?	As of 20 June 2018, there is an experience of load-following operation of units of the AES-2006 design - unit 1 of the Novovoronezh NPP-2.
	Which other AES-2006 plants will operate in load-following mode?	As of 20 June 2018, three units of the AES-2006 design will be operate (unit 2 of the Novovoronezh NPP-2 and units 1,2 of the Leningrad NPP-2 in Russian Federation). There is no open-access information on shifting the units into load-following operation.
	Which is the possible impact of the load-following operation on the Belarusian NPP?	The safety documentation on load-following operation of units of the Belarussian NPP are being examined under licensing the operation of unit 1 of the Belarussian NPP. After completion of the expertise, the information may be granted.
	How could any envisaged load-following operation threaten the safety of the Belarusian NPP?	The safety documentation on load-following operation of units of the Belarussian NPP are being examined under licensing the operation of unit 1 of the Belarussian NPP. After completion of the expertise, the information may be granted.
	What is the impact of load-following operations on the economic efficiency of the Belarusian NPP?	The impact of load-following operations of units of the Belarussian NPP is under discussion. Special focus is paid to the impact of the external factors, including the dynamics of the regional energy market, the dynamics of the regional energy consumption, etc.

<table>
<tr><td rowspan="6">5 Protection against aircraft crash and terror attacks</td><td>Is there any assessment of the possible radiological consequences of a large commercial airliner crash on the Belarusian NPP? Does this assessment also include possible effects of impact induced vibration and effects of combustion and/or explosion of aircraft fuel?</td><td rowspan="5">Withing the framework of investigating the aerial impact on the operating safety of the Belarussian NPP is performed a series of assessments, including analysis of safety with deployment of the probabilistic approach. Within the framework of performance of current works are determined the measures on non-exceedance of the recognized probability of crashing of all types of aircrafts on the site of the Belarussian NPP.

Based on the probabilistic approach of aeronautical conditions, including flying qualities of aircrafts, the exclusion zone dimensions were calculated for the aircrafts to fly over the site of the Belarussian NPP.

As for the moment, all measures required to provide safety for the Belarussian NPP, on behalf of protection from crashing of all types of aircrafts, are conducted. The aerial space over the site of the Belarussian NPP is closed for the flights (exclusion zone is established for the flights), resulting in the probability of all-types aircrafts crashing on the site of the Belarussian NPP of less than 10-6 1/h.

The impact of aircrafts crash, including of big passenger-carrying aircrafts, on the safety of the Belarussian NPP was examined and assessed withing the framework of SEED IAEA mission of the Belarussian NPP, which is indicated in the corresponding report. The IAEA inspection team concluded: “safety provided for the Belarussian NPP from the aircraft crash with the application of design and administrative measures directed for controlling and restriction of the aircraft traffic (i.e. noflight zone) in the site area”.

At the same time it is to be noted that the current set of questions addressed is beyond the framework of stress-testing.</td></tr>
<tr><td>What are the possible radiological consequences of a deliberate crash with a large commercial aircraft?</td></tr>
<tr><td>Against which types of commercial aircraft is the Belarusian NPP protected by the design?</td></tr>
<tr><td>Are back-fitting measures concerning aircraft crashes possible?</td></tr>
<tr><td>Are the current WENRA recommendations18 for the protection of nuclear power stations against the crash of a large commercial airliner applied at the Belarus NPP?</td></tr>
<tr><td>What are the international requirements on which the physical protection of the Belarusian NPP is based?</td><td>Physical protection of the Belarussian NPP is organized in accordance to the requirements of the following international treaties of the Republic of Belarus: Convention on Physical Protection of Nuclear Material (ratified by the Decree of the Presidium of the Supreme Soviet of the Republic of Belarus No. 2381-KhP from June 14, 1993); Nuclear Terrorism Convention (ratified by the Law of the Republic of Belarus from October 20, 2006, No. 171-3); Resolution of the UN Security Council 1540 from April 28, 2004; Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev.4 и INFCIRC/225/Rev.5).</td></tr>
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6 Natural hazards	What are the follow-up measures in response to the 3 suggestions by the IAEA SEED mission?	Following the results of SEED mission, the expert group unanimously concluded that the Partner (the Republic of Belarus) has fulfilled systematic and thorough assessment of hazardous external impacts, in accordance with the duly compiled documentation, upon criteria. The inspection group approved the assessment as the positive international practice, which is mentioned in the mission report. A conclusion on design parameters coverage of corresponding site characterization, thus ensuring reliable level of safety, was made. Alongside this, the Inspection group suggested the following: 1. chapter where electromagnetic interference and storms are described, should be improved in section 2 of the SAR 2. assessment of response spectrum of the site should be duly documented in the SAR, accounting the characteristics of the soil and international practices (IAEA SSG-9); 3. consider the future changes of measures on provision of safety in the view of cases described in IAEA report “The Fukushima Daiichi Nuclear Power Plant Accident”, after completion of stress-test and finalization of PSA of the first and the second level. Considering these suggestions, the following measures were implemented: 1. The chapter, where electromagnetic interference and storms are described, would be improved, if needed, in section 2 of SAR (PSAR), which, in its turn, is currently reviewed by experts for licensing the operation of Belarussian NPP. 2. Taking into account the recommendations, the corresponding analytical assessments and substantiations are being made, as well as corresponding materials for the SAR (PSAR) are being developed. Current work is being finalized. 3. In the development and actualization of the regulatory base of the Republic of Belarus, in the sphere of application of nuclear energy, current recommendations by the IAEA are considered. Moreover, current recommendations in the sphere of safety are strictly followed and integrated to the national legislation.
	In which timeframe will these measures be implemented?	

7 Extreme weather conditions	Are climate change trends increasing the frequency and intensity of extreme events taken into consideration for the evaluation for extreme weather conditions?	In the design of Belarussian NPP are duly considered the extreme weather conditions and their dynamics, in particular: increase of rate and intensivity of hydrometeorological events caused by the climate change, which is evidenced by the results of the mission of the IAEA on the assessment of design of the NPP site, with accounting external events (SEED mission) and peer review on the results of Belarussian stress-tests in 2018. Additionally, to provide radiological safety and to assess the impact of the Belarussian NPP on the micro-climate, in accordance with the Program of Complex Ecological Monitoring of Belarussian NPP, since 2016, a monitoring of meteorological, aerial and micro-climate, as well as hydrological parameters is conducted.
	Has the mentioned detailed analysis concerning possible combinations of external effects to be used as input for determining the scope of PSA-1 already been completed? If yes, are there any new results?	Yes, the mentioned detailed analysis concerning possible combinations of external effects has to be used as input for determining the scope of PSA-1 already been completed. The results are shown in the SEED mission report (https://www-ns.iaea.org/downloads/actionplan/SEED%20Mission%20Report%20Belarus.pdf).
8 Earthquakes	When was the seismic hazard assessment performed? Are all investigations completed yet?	The initial assessment of the seismic hazard of the site of the Belarussian NPP was performed in full volume during the stage of selection of the NPP placement, in accordance to the requirements NP-031-01 “Standards for Design of Seismic Resistant Nuclear Power Plant”, RB-019-01 “Assessment of Seismic Hazards of Sites for Nuclear and Radiological Hazardous Facilities Placement on the Basis of Geological Data”. In the design of Belarussian NPP the external impacts are duly considered, including seismic ones, which is evidenced by the results of the mission of IAEA on the assessment of design of the NPP site, with accounting external events (SEED mission) and peer review on the results of the Belarussian stress-tests in 2018. Additionally, to provide radiological safety and to assess the impact of the Belarussian NPP on the micro-climate, in accordance with the Program of Complex Ecological Monitoring of Belarussian NPP, since 2016, is envisaged the monitoring of geophysical parameters. Currently, all assessments are finalized.

	Which IAEA recommendations were used for the seismic hazard assessment?	During the assessments, the following IAEA recommendations are considered: SSG-9 “Seismic Hazards in Site Evaluation for Nuclear Installations”, NS-G-3.3 “Evaluation of seismic hazards for nuclear power plants”, NS-G-3.6 “Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants”, NS-R-3 “Site Evaluation for Nuclear Installations”.
	Are the current WENRA recommendations on the assessment of natural hazards for the seismic hazard assessment used?	Following the recommendations, the first draft of the probabilistic analysis of the NPP unit under seismic impact was performed. First stage is completed, seismic hazard curves are built. After commissioning of unit, the following would be performed: field observations, screening of elements from the seismic PSA, specification of the most probable situations when the unit was seismically impacted and, if necessary, corrective measures would be developed. Currently, the unit is under construction.
	Which of the measures to improve the seismic resistance (Stress Tests Report 2017, p. 148), will be implemented? And if, in which time frame?	Currently, the roadmap on implementation of measures is being developed, which were recommended by the peer review. After the agreement and approval of the roadmap, terms of implementation of measures could be concluded.
	Because the calculation about the consequences of break of the Vileyka water basin dam is about 45 years old, are any new calculations done or planned?	The reassessment of the NPP site flooding possibility was not performed because it was not necessary: absolute elevation of the NPP site is 179.3 m, maximum absolute water level in the Vileyka water basin with 0.01% probability (10-4) is 159.8 м. During the stress tests of the Belarusian NPP the results of calculations from the “Report. The NPP in the Republic of Belarus. Hydraulic and mathematical simulation of the water intake structures of the NPP service water supply system”. Central Research Institute for Complex Use of Water Resources. Minsk, 2013 were taken into account. Known changes in the region, able to modify spreading of the released water since construction of Vileyka basin dam, have no significant impact on the design level in the river of Viliya at the water abstraction point of the NPP unit pump station. A break wave from the dam site, within distance of 30 km, will mainly flatten out. Therefore, in the transboundary area of the river of Viliya, the impact of this wave will be insignificant - without considerable changes in the natural hydrological conditions of the river of Viliya. Besides, the volume of water in Vileisk water basin has reduced due to sludge setting.

9 Flooding	Is there a new assessment of the flooding threat envisaged?	In the process of stress tests of the Belarussian NPP, the potential hazard of flooding due to atmospheric precipitations, break of dam (of water basin), flash floods, melting of snow, penetration of ground waters was assessed. The maximal level of flooding was defined, 10-4 / year, which corresponds to the recommendations for the stress tests of the EU. The main results of the stress tests: According to topography, the area of the Belarussian NPP near Ostrovets is classified as "dry area" (concept of the dry area). The area is slightly graded, the absolute elevation lies between +174,5 and 182,7 m BES. All rivers and water basins closest to the site of the NPP are located at more than 50 m lower than the site of NPP. The assessments have shown that in case of dam break, the distance between the site and the level of water would be around 50 m. The level of penetration of ground waters was not quantified thus, assuming water may rize to the bottom foundation, basements of buildings were made water-resistant as well as special drainage measures were developed. External impacts are duly considered in the design of the Belarussian NPP, including weather (climate) impacts, which is evidenced by the results of the IAEA mission on assessment of design of the NPP considering the external events (SEES mission) and peer review upon the results of Belarussian stress tests in 2018. Moreover, to ensure radiation safety in conditions of a changing climate (increased intensivity of the extreme hydrometeorological phenomena) and assessment of the impact of the Belarussian NPP on the environment, since 2016, a monitoring of meteorological and hydrometeorological parameters is performed. Herewith, it should be considered that in the assessment of hydrological situation around the Belarussian NPP, the hydrological monitoring data of the river Neman basin, in the territory of the Republic of Belarus, the Republic of Latvia and the Russian Federation, are used.
10 Loss of power supply and heat removal	Which are the most probable BDBA scenarios (Stress Tests Report 2017, p.97)? What is the meaning of "most probable" BDBA scenarios? To which quantitative value does this phrase correspond? Are there other possible BDBA scenarios?	This question is carefully studied in the Probabilistic Safety Assessment of levels 1 and 2.

	What is the probability for the failure of all BRU-A (mean value and 95% quantile)? How will it be ensured that water reserves of the 4 emergency heat removal tanks are available under severe accident conditions? What is the calculated failure probability of one or two of these tanks?	The level in the emergency heat removal tanks is monitored in all of the NPP operating modes. The emergency heat removal tanks are feeded from the tanks of LCU system, in case the level in them drops below the minimum value. The pumps and the motor operated valves involved in feeding the emergency heat removal tanks are powered from 7,8 emergency channels; i.e. they continue operating in the event of a power loss at the NPP.
	Where are the mobile DG being stored?	Mobile DG is located on site of the Belarussian NPP. The concept of managing the power loss event at the NPP, with powered reactor, is based on heat removal via SG PHRS. This system is autonomous, with direct current accumulator battery of 24 hours operational capacity; it could be charged from the mobile EDG of 500 kW, which is the part of "channel No. 7"
	For the Finnish NPP Hanhikivi, comprehensive design changes are made in the design of the VVER1200/V491 to try to avoid total loss of power (Station Black-Out) situations. They were also required to meet the Finnish regulations as well as the current WENRA recommendations. Are there similar regulations in Belarus? Are there any design changes envisaged?	Basing on the results of the expertise of documentation, which was submitted for the licensing of operation, as well as basing on the expert review, it is possible to conclude on modification and changes.
	Is it possible to implement the measures for the removal of residual heat from the spent fuel pool (See Stress Tests Report 2017, p.95) under severe accident conditions?	The implementation of measures is possible. Under severe accident conditions without a loss of power at the NPP (and without a loss of KAA, PE) cooling down of the spent fuel pool is made by routine system FAK or its alternative system JMN (if system FAK fails). In the event of a blackout, residual heat from the spent fuel pool is removed due to water evaporation from the spent fuel pool. The steam resulting from boiling of the spent fuel pool is removed by means of the operating passive residual heat removal system from the containment. The pool is feeded from tanks LCU by pump JNB50 powered from 7,8 channel of power supply of the means of control of the beyond design basis accidents.
11 Severe accident management	What is the capacity of the LCU tanks? In which frequency do they a temporary makeup from any water source? Are these water sources (e.g. the fire hydrants) protected against severe external hazards?	The volume of LCU tanks is 4x700 m^3. Two tanks are everytime full. Tanks of turbine houses are feeded by the GCF system, if necessary. These water sources (including fire hydrants) are shielded from the severe external impacts.

	Was the development of instructions for accident mitigation and the guidelines on management of beyond design basis and severe accidents completed? Are there any new important results?	The Guidelines on management of beyond design basis and severe accidents are updated, as of 01 September 2017, and sent by the Operator to Gosatomnadzor in October 2017. Currently, these documents are undergoing expert review for licensing operation of the unit No. 1 of the Belarussian NPP. The final version of the Guidelines would include recommendations from the PRT experts.
	Were the detailed organizational and technical measures already considered and presented in BDBA Management Guidelines and Severe Accident Management Guidelines (See Stress Tests Report 2017, p.121)? Are there any new important results?	DBA Management Guidelines, Guidelines on management of beyond design basis and severe accidents are updated as of 01/09/2017, in event-oriented form, and sent by the Operator to Gosatomnadzor in October 2017. October 2017. Currently, these documents are undergoing expert review for licensing operation of the unit No. 1 of the Belarussian NPP. The results of the expert review could be presented. The final version of the Guidelines would include recommendations from the PRT experts.
	Are any sufficient measures to cope with a loss of containment already in place?	In case of loss of containment integrity, all measures for protection of personnel and population in the area of the Belarussian NPP should be deployed. These measures are specified in internal and external emergency plans. External emergency plan was approved by the Decree of the Council of Minister of the Republic of Belarus No. 211 from March 22, 2018. Internal emergency plan is currently being finalized and would be sent for the expert review. However, containment is resistant enough both against external impacts (seismics) and internal impacts (internal pressurizing). Consequently, the loss of containment is not expected.
12 Compliance with state of the art	Which uncertainty is associated with the PSA/PRA results? In particular, can the 95% quantiles of CDF and LRF be provided and conclusions drawn from those?	The development of full-scale PSA-1 (for internal initial events, internal fires and floods, seismic PSA and PSA for external events) for the fuel inside the core and spent fuel pond, upon operation in power, reduced level of power and shutdown mode, as well as on its basis the full-scale PSA-2 (for internal initial events, internal fires and floods, seismic PSA and PSA of external impacts) is foreseen. The development of full-scale PSA-1 and PSA-2 was performed in 2017 and is being performed in 2018. Currently, the documentation of PSA-1 and PSA-2 are under expert review for licensing operation of the unit No. 1 of the Belarussian NPP. The results of the expert review could be presented.

	Are results available from preliminary safety reports of the NPPs Leningrad 2 under construction? Does a level 2 PSA/PRA exist for these reactors? Similar for the Hanhikivi NPP.	PSA-2 for the Leningrad-2 NPP was developed on the basis of PSA-1 of 2014. After the amendments to the NTD 2015-2017, the PSA-1 is being adapted to the newer requirements (seismic PSA and PSA of the external impacts), afterwards, PSA-2 would be also edited. PSA-2 for the Hanhikivi NPP is a consolidated one. Preliminary safety reports on units of the Leningrad-2 NPP and the Hanhikivi NPP were not sent to the Republic of Belarus.
	Are the functioning and reliability of passive safety systems and features demonstrated?	Operability and reliability of the passive safety systems is based upon the calculations and model experiments, information on which is presented in the Safety Assessment Report for the units of the Belarussian NPP. These systems were successfully tested during commissioning at the Leningrad-2 NPP.
	Which BDBA scenarios have been analyzed?	With regards to the worst consequences, Fukushima NPP is the example, the loss of the ultimate heat sink and blackout of the NPP were analysed. The SAR for the unit No. 1 of the Belarussian NPP, in which the analysis of BDBA is presented, is updated as of 01/09/2017 and sent for the expert review for licensing operation of the unit No. 1 of the Belarussian NPP.
	Are there any plans to include the WENRA recommendations in the regulations of Belarus?	Inclusion of all WENRA recommendations to the regulatory and legal acts, including technical regulatory and legal acts of the Republic of Belarus, is being discussed. Part of WENRA recommendations is accounted in the legislatory base of the Republic of Belarus. These recommendations are used to develop the norms and rules on provision of nuclear and radiation safety “Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material”.
	Is there any conflict between safety and economics regarding the goals of larger operational margins for reducing the frequency of abnormal events and reducing capital and operating expenditures?	There is no conflict.
	How will the embrittlement behavior of reactor pressure vessels be monitored?	Properties of metal of the reactor pressure vessel would be monitored by the surveillance specimens in the process of operation.
	What are the measures to avoid mistakes by manufacture?	Avoiding of mistakes during equipment manufacturing is ensured by complying with the quality assurance programs.
	Are internal hazards being systematically analyzed and controlled?	Yes, to avoid internal hazards, systematic control and analysis are performed.
	Are multiple failures being systematically analyzed and controlled?	Yes, to avoid multiple failures, systematic control and analysis are performed.

	Has the practical elimination for steam explosion in the reactor pressure vessel, hydrogen detonation and other phenomena been demonstrated?	Practical elimination of the explosion in the reactor pressure vessel is achieved due to the structure of the reactor pressure vessel and ban on water supply to the overheated core, after the exceedance of the temperature design limit value of the core. Practical elimination of explosions of hydro-air-steam mixture inside the containment is excluded due to the operation of the passive autocatalytical recombinators of hydrogen and measures of severe accident management, which limit the generation of hydrogen inside the core, additional inertisation of the containment atmosphere with the steam and redistribution of the in-core generated hydrogen by containment compartments.
	What concept of practical elimination was applied? Is the concept of practical elimination of WENRA applied?	In design, the concept of practical elimination of big and early emergency releases is implemented by the management systems of BDBA, which exclude all possible physical processes that could lead to the loss of integrity and localizing functions of containment (core catcher, hydrogen recombinators, SG PHRS, CS PHRS, etc.) The assessment of correspondence of applied WENRA concept of practical exclusion would be made by the PRT experts, after stress tests would be finalized.
	Where will the containment integrity during BDBA be monitored in case the MCR is not available?	The integrity of confinement and efficiency of its localizing functions, in case of MCR unavailability, could be controlled by RCR, as well as by the ARMS.
	Is the functioning of the core catcher confirmed with experiments and analysis?	Operation of the core catcher is supported by the series of design analyses and experimental investigations, which data is presented in the SAR of the units of the Belarussian NPP. Design calculations of the core catcher are made by applying HEFEST-EVA calculation code, which enables modelling of the melting processes, chemical reaction of the molt with the sacrificial materials.
	What is the reason that a filtered venting system will not be implemented?	Filtrating ventilation system of the annulus is inactive in case of blackout of the NPP (with the failure of all DGs). At the same time, blackout of the NPP does not lead to the damage of the fuel in reactor, which is due to the effective cooling of RF by the SG PHRS, thus ventilation system of the annulus is not required.

	Will Belarus follow the Finnish requirements?	Regulatory and legal acts, including technical regulatory and legal acts, of the Republic of Belarus are drafted considering international requirements and standards.
	For which systems was the independence between levels of defense-in-depth, to the extent reasonably practicable, not implemented – in particular regarding levels of DiD 3 (with sublevels 3a and 3b) and 4	For the systems performing main safety functions (A – Reactivity Control, B – Removal of heat from the core, C – Localizing activity within physical barriers), the design envisages their independence between levels of DiD. For example, to perform safety functions A – Reactivity Control, the design envisages: at level 3a the system of emergency protection of the core of reactor, for 3b level the JDH system of emergency boron injection. To perform safety functions B – Removal of heat from the core, the design envisages: at 3a level the system of emergency feeding water and BRU-A, for levels 3b and 4 the system of passive heat removal from steam generators. To perform safety functions C – Localizing activity within physical barriers, the design envisages: at 3a level the containment spray system, for levels 3b and 4 the containment system of passive removal of heat.
	To which degree was the separation of I&C-systems supporting different levels of defense-indepth realized?	All I&C systems are distributed by corresponding levels of DID. Look the Table (at the end of the current document)
	Are there any improvements envisaged concerning the independence of the DiD levels?	The design envisages the adequate level of independence of DID. Recommendations of PRT experts (if available) would be thoroughly examined and, if necessary, implemented.

13 Severe accident consequences	Why are higher source terms not presented in the Stress Tests Report?	The characteristics of the big emergency release are not listed in the Stress Tests Report of the Belarussian NPP because they have not passed the safety review. Stress tests of the Belarussian NPP were conducted on the basis of design documentation, actual as of 01 August 2016. The analysis of radiation consequences of the accident is reflected in the SAR for the unit No. 1 of the Belarussian NPP, sent to the Gosatomnadzor in October 2017, is being reviewed for safety for licensing operation of the unit No. 1 of the Belarussian NPP. In October 2017, during command-staff exercises, to the scenario characteristics were included of the maximal releases under the worst conditions of the atmosphere transfer of radionuclides with the following scenario of the worst radiological consequences for the population and the environment. The results of assessments would be applied for elaboration of the plan of protective measures upon radiological accident at the Belarussian NPP. In October 2017, during command-staff exercises, to the scenario characteristics were included of the maximal releases under the worst conditions of the atmosphere transfer of radionuclides with the following scenario of the worst radiological consequences for the population and the environment. The results of assessments are applied to elaborate the Plan of measures for protection of staff (personnel) and population from radiological accident at the Belarussian NPP.
	Which source terms have to be associated with the worst- case scenarios for the Belarusian NPP?	SAR of unit No. 1 of the Belarussian NPP, which includes the analysis of radiological consequences, was sent to the Gosatomnadzor in October 2017 and is currently under safety review for licensing into operation. After passing the review, the results could be granted.
	What are the justifications for the source term used in the Stress Test Report?	The source of characteristics of the radioactive release, indicated in the Report on stress tests of the Belarussian NPP, are design materials, indicated in PSAR of the unit No. 1 of Belarussian NPP passed the safety review in 2014.
	What are the results of PSA/PRA (Level 1 and 2) in particular the probabilities/frequency of core damages (CDF) and severe accidents with (early) large releases (LRF and LERF) including probability distribution (quantiles) and source terms for the most important release categories?	The development of full-scale PSA-1 (for internal initial events, internal fires and floods, seismic PSA and PSA for external events) for the fuel inside the core and spent fuel pond, upon operation in power, reduced level of power and shutdown mode, as well as on its basis the full-scale PSA-2 (for internal initial events, internal fires and floods, seismic PSA and PSA of external impacts) is foreseen. The development of full-scale PSA-1 and PSA-2 was performed in 2017 and is being performed in 2018. Currently, the documentation of PSA-1 and PSA-2 are under expert review for licensing operation of the unit No. 1 of the Belarussian NPP. The results of the expert review could be presented.
Chapter	**NGO “Ecodom” comments**	**Final reply**

General comments to content / structure of the document	There is no description of procedure or process as well as the methodology on performance of stress tests in the stress tests of the Belarussian NPP. This is not the indispensable part of the Report yet would help to see how the procedure was accomplished with the view on the EU methodology and the extent of its compliance with the transparency requirements. ***Suggestion: explain the procedure and methodology of performance of stress-tests of the Belarussian NPP***	The National Report of the Republic of Belarus on the targeted reassessment (stress-tests) of the Belarussian NPP contains general information on the procedure, process and methodology of stress-tests performance and peer review. As well, in the Report the regulatory and legal basis is indicated, which contains a detailed description of the methodology of performance of stress-tests, namely TKP 566-2015 "Assessment of the frequency of severe damage of the core (for external initial events of natural and technological origin)" (approved by the resoluton of the Ministry of Emergency Situations No. 21 from April 28, 2015) and follow-on Norms and rules on provision of nuclear and radiation safety "Requirements on performance of stress-tests (targeted reassessment of safety) of the nuclear power plant" (approved by the resoluton of the Ministry of Emergency Situations of the Republic of Belarus No. 12 from 12/04/2017). The core of both documents is ENSREG specification for stress-tests, which was developed with the support of the European experts within the framework of project of international technical assistance of the European Union. Both documents are in open access, links are provided in the current response. The procedural aspects of examination of the stress tests results, the order of joint actions of the Republic of Belarus and European Union is regulated by the agreed Practical Arrangements, which is in open access on the ENSREG site jointly with the Narional Report of the Republic of Belarus.

	Stress tests were performed with no public participation. The independent NGOs were not involved in the drafting of the report, their independent assessments, sent to the Ministry of Energy, made in the process of rutine monitoring and Public ecological expertise (PEE) of the design of Belarussian NPP, were not considered. In the meanwhile, the specification of the European stress-tests prescribes to account these assessments. In particular, the public was involved in stress testing in the Great Britain (http://www.onr.org.uk/fukushima/stress-tests-301211.pdf#%5B%7B%22num%22%3A374%2C%22gen%22%3A0%7D%2C%7B%22name%22%3A%22XYZ%22%7D%2C102%2C307%2Cnull%5D). In the Chaper 1.6 "Transparency and public involvement" of the Report is not mentioned any cooperation between the critics of the design and the NGOs. At the same time, the stress tests specification of the EU prescribes to make the process transparent for the puclic, which means its involvement in the process and consideration of the review of the independent experts "Transparency. Full transparencyas well as possibility of involvement of the public would allow the European stress tests to be accepted by the European citizens" (https://ec.europa.eu/energy/sites/ener/files/documents/ 20110525_eu_stress_tests_specifications.pdf). ***Suggestion: to elaborate more stress tests of the belarussian NPP and involve puclic by providing it the necessary information.***	In order to ensure the openness of the process of reviewing the results of stress tests and cooperation witht the public, the following measures are taken. The National Report of the Republic of Belarus on the targeted reassessment of safety (stress tests) of the Belarussian NPP (prepared by the interdepartmental working group), was published in open access on the main page of the Gosatomnadzor site (Russian version), as well as on ENSREG site (English version). On November 8, 2017, in Belarussian telegraph agency BELTA, Gosatomnadzor has organized a press-conference for the mass media with participation of the interdepartmental working group, which has prepared the National Report; during the press conference this document was presented to the mass media and public as well as further actions on its reviewing jointly with the EU. On the basis of the Practical Arrangements on peer review, the representatives of the public were given a possibility to ask questions regarding the National Report via ENSREG site. Gosatomnadzor confirms to respond to the questions asked. Questions asked regarding the National Report and responses to them, as well as – upon completion of the procedures – the Report on peer review will be published in the open access, in July 2018. MES and Gosatomnadzor consistently publish news on all important events related to the reviewing of stress tests in news line on their web sites and cooperate with the mass media to make information on stess test publicly avaliable.

Content of stress tests of the Belarussian NPP	In stress tests of the Belarussian NPP are described blackout or loss of the ultimate heat sink but no scenarios from the deterministic point of view, recommended by the European specification, where consecutive failure of safety systems (including passive ones) is described. Cliff-edge effect, which is required according to the European specification, is not considered as well. No scenario-like description of systems and possible actions of personnel, with indication of quantitative and time characteristics, is presented, no assessment of their assessment is presented as well. In current report is provided only overall situational analysis, where possibility of applying these or that means is described, taking these or that measures. More, cases when routine and reserve power supply for the RF and SFP is absent during more than 72 hours are not described. ***Suggestion: to complete the document, having described of deterministic approach scenarios and considered the cliff-edge effect.***	The loss of the ultimate heat sink (LOOP) is considered a design type accident, which is treated by applying the alternative inter-site power supply. For different LOOP scenarios, the availability of special systems for prevention of accident involving damage of the core demonstrates availability of time, when cooling of the core and of the spent fuel pond of the units 1 and 2 could be applied. If considering the system of passive removal of heat from the containment, steam generator (SG PHRS), core catcher or double containment, it is necessary to understand that these passive systems are not directly considered safety systems and are technical means for elimination beyond design basis accidents (BDBA) and localizing systems. The National Report (NR) describes the the failure of safety systems that mentioned in the question/comment. The analysis within the stress tests framework is performed independently from functional distribution of systems available in the design. So far as the “EU specification on stress tests” prescribes to apply realistic approach for the assessments, passive systems would thus be available. The failure of passive systems is considered by accounting the conditions of absence of maintenance of current systems (f.e. of feeding of tanks of emergency removal of heat PHRS). Hence, the time frame before reaching the cliff-edge effect (damage of the core, damage of fuel assemblies in the spent fuel pond), as required by the “EU specification on stress tests” is defined. To assess the cliff-edge effects (including corresponding time), according to the European specifications for the stress tests, the blackout of the NPP is considered as BDBA. Additional information on this issue is in responses to the comments of the peer review team, which will be published in the open access. Quantitative characteristics of performance of systems and conditions of the nuclear facility, under influence of the mentioned events, including those at the Fukushima NPP, are described in the National Report. The detailed descriprion of the actions of personnel in conditions of accidents is not the case of stress tests and would be considered in the corresponding emergency preparedness instructions. The assessment of efficiency and operability of equipment and systems enacted in the mentioned scenarios, is also presented in the NR. 72 hours is the amount of time available for operator to restore or organize the alternative removal of heat. The calculated time (72 hours for the RF and 41 hours for the SFP) allows to fully deploy the measures on the restoration of the heat removal, which are presented in the NR Current results correspond to the prescribed approaches of “EU specification on stress tests”. Additional information on current issue is in the responses to the comments of the peer review team, which will be published in the open access.

On passive heat removal system SG PHRS	SG PHRS holds the key role in reacting to the blackout and loss of the ultimate heat sink, according to the Report. Still there is no information, including quantitative characteristics and results of tests, on how SG PHRS operates. Deterministic approach requires to assess the scenario of the consecutive failure of all systems, including current one. In other words, under which conditions SG PHRS or its subsystems could fail? What would happen next? Which factors influence the operability and response of SG PHRS? Is the rate of evaporation sufficient for "sustainable cooling of the reactor facility"? What is the rate of evaporation, what is the calculated mirror area? How condensors of the SG PHRS would operate under condition of shutdown of the tower evaporators? What is meant by "After shutdown of the reactor coolant pump sets and end of their run-down, the essential circulation of coolant restores"? Does it mean convection? What is the rate of and if would be sufficient for the effective cooling? How during blackout SG PHRS condensers would operate, which are designed for additional cooling with the help of the reactor coolant pumps? Would that be enough for the removing of heat? By how much would the core temperature increase? Was SG PHRS tested? If not then was performed the computer simulation of its operation in emergency conditions, according to i. 6 and 7? Short description of the SG PHRS is available on page 109 but it is only of two paragraphs length, which is truly insufficient for the simulation of scenarios and understanding of operability conditions.	The requirement on inclusion of the detailed information in the description of the NPP systems, on the basis of which simulation for confirmatory calculation could be performed, is absent in "EU specification on stress tests". In the NR the results of deterministic analysis of safety for the NPP in the part related to the stress tests are presented. The detailed analysis of operability and efficiency of the SG PHRS is made within the framework of the design and evidenced by the results of safety analysis. Conditions, under which the failure of SG PHRS occurs and situation after its failure are described in the NR and "Report on targeted reassessment of safety (stress tests) of the Belarussian NPP". Tests of SG PHRS on the referent Leningrad-2 NPP were successful. SG PHRS is the system for management the BDBA and is applied under the EUR of the extended design. PHRS is not connected with the cooling towers. Additional information on this issue is in the responses to the comments of the peer review team, to the NR, which will be published in open access.

	In chapter 6.2.1 is mentioned that "productivity of SG PHRS and C PHRS was selected accounting the back-up principle under consideration of the most probable scenarios of BDBA, described in the design". There is no information on the most probable scenarios of BDBA as well as on parameters of productivity of these systems. Is this information available? Was included to the design of SG PHRS the requirement of EUR on the basic and extended design: "System of heat removal from containment under BDBA should be independent from the other systems used to prevent the melting of core and has no active elements inside the containment"? SG PHRS is connected with the SG and emergency cooling towers in the NPP-2006 design. In case of compliance with this requirement or not, please respond which risks it additionally creates accounting the scenarios described in i. 6 and 7?	Each of these systems consists of 4 absolutely independent from each other channels with productivity 4x33,3%. Three operating channels of the SG PHRS and C PHRS are enough for the systems to perform their functions in full volume, within any operating mode. In case of blackout of the system, the heat removal from the core is managed just by the sytem of passive removal of heat via steam generators (SG PHRS). The system consists of four independent channels (4x33%) – one for each steam generator – which operate on the basis of natural circulation principle. Each circuit consists of one water tank of around 540 m^3, 16 heat exchangers, path pipelines, condenced steam with start valves, pressure control valves, isolation valves of big and small diameter. Heat removal is made following the sequence: reactor – steam generator – system of passive heat removal via steam generators – atmosphere (heat consumer). Heat is released to the atmosphere by evaporation of water from all SG PHRS tanks. Along condensate path are installed, in parallel to each other, starting valve of big diameter with electric drive and starting valve of small diameter with solenoid actuator, which open upon the request and ensure automatic connection in channels correspondingly to the cooling mode. In the first moments after the blackout of the system and closure of the stop valve of the steam generator, the pressure in the second circuit starts to increase and leads to the actuation of valves of BRU-A on the SG, which are powered from the uninterrupted power supply source. The blackout of system leads to the actuation of SG PHRS, which starts to operate in full design capacity within 80 seconds. Operating of SG PHRS channels leads to the reducing of pressure in steam generators according to the parameters of SG PHRS operation, hence BRU-A are closed on all the pathes of the SG steam, the loss of tank feeding water in SG stops and the level stabilizes. Three channels of SG PHRS with the quantified amount of water in corresponding tank of SG PHRS ensure the design capacity of the safety system as well as adequate heat removal from the fuel elements within 24 hours. This amount of time may be increased to 72 hours by using the water from the fourth tank of the SG PHRS. To ensure this, all four tanks could be interconnected. The removal of heat via SG PHRS is autonomous, which is powered uninterruptedly by the specific battery with capacity sufficient for the 24 hours of operation, which could be charged from mobile DG of 500 kW, included to the channel No. 7. PHRS tanks are also designed for the removal of heat from the internat atmosphere of the containment, in case of the leakage from the first circuit and steam breakthrough into the reactor. The heat is transferred by the natural circulation from condensers of the containment PHRS (JMP 4 x 33%) to the SG PHRS tanks.

On spent fuel ponds. Comments to conclusions of 6.1.4	As could be seen from the analysis, there are no instructions or emergency plans of arrangement and launch of mobile diesel-driven station (MDDS) as well as their connection; no plan of feeding the pond after 41 hours of blackout – from ideas described in i. 6.1.5 – connection of the water engine, it is obvious that the emergency scenario for the SFP is not developed; SFP may become the source of full-scale radiological accident. It is also advised to change the flow diagram of the JNB50, nothing mentioned if engineering evaluations were help for this, if they were made then who did and what did they show, how it was agreed with the developers of the NPP-2006 design. Random tying in the system is impossible, since not clear how it would work. More, it is not clear, was the possibility of connection of the water engine to the pipeline for SFP feeding investigated in real? Such a connection is technically possible now or additional developments, devices should be considered? Special attention is for non-development of the chapter 7.4.2 “Management of accidents after the exposure of NF in the SFP”, where it is accepted that in case of full evaporation of water from the pond, the melting of fuel is possible; further development of events is not specified. At the same time, the SFP is not equipped with the core catcher as well as other barriers, which RF has. More, in the Report is stated that SFP is not designed for the 8-point MDBE. In other words, SFP are more vulnerable comparing to the core, hence, the consequences of severe accident could be more severe and of wider scale for SFP. This scenario is not specified in stress tests.	For conditions of BDBA with blackout and ultimate heat sink loss the design specifies routine feeders of SFP (JNB50 system). Heat removal from the SFP is performed during all 41 hours without SFP feeding (before reaching edge effects). Time reserve (41 hours) is sufficient to organize feeding of the SFP. The option of SFP feeding after exceedance of 41 hours of blackout are the same as stated in the NR for the time before exceeding the indicated time (JNB50). All suggestions according to the stress tests results as well as change of the flow diagram of JNB50 would be analysed with regards to their impact on safety within the framework of “Program of enhancing safety at the Belarussian NPP”, which chapter 8.2 states. All research within the framework of conducting stress tests is performed according to the corresponding national requirements. The results of stress tests were checked by the national expert organization as wel as by some independent expertises of international expert organizations, which concluded positively. As for now, “Peer review of results of Belarussina stress tests” is finalized. That is why the critics of validity of the research withing stress tests framework is not clear. According to the national regulatory base, amongst other targets of stress tests are identification of the safety margins of the NPP in the view of the events occurred at the Fukushima NPP. As for the chapter “Severe accidents management” it is necessary to determine the accidents (with no regards to their probability, by applying deterministic approach) which would lead to the melting of fuel in conditions of non-interference (inactivity) of the Operator. Consequently, it is important to specify time, before the damaging of the fuel in current conditions, which is available for the restoration of the lost functions of cooling of the core and SFP. These approaches correspond to the European approaches of reassessment of the NPP safety. Materials of NR demonstrate fulfillment of the above indicated targets of stress tests. More, the results of research reliably demonstrate the sufficiency of time margins (which are considerably bigger than those of analoguous designs) to perform the recovery measures. Considering “EU specifications on stress tests”, the interpreting of the results (time margins) of stress tests as safety deficits is not correct. Considering the seismic reliability of SFP andits equipment we inform the following: according to the “EU specifications on stress tests”, it is important to specify the seismic safety margins for the equipment and systems as compared to its design. The design seismic safety margin of MDBE is 7 points (including the SFP). According to the results of research, some of the equipment of the SFP is reliable enough for the 8-point MDBE. Consequently, stating that equipment of the SFP is not resistant to the 8-point MDBE is wrongful form the view of requirements of “EU specifications on stress tests”. Additional information on this issue could be found in the responses to the comments of the peer review team, to the NR, which will be published in open access.

Comments to chapter 6.2.1	In chapter 6.2.1 is stated: Design measures exclude the influence of destruction of the pipelines and equipment of the II category on the elements of the NPP of the I category of seismic resitance". Question: how the water supply would be maintained after 72 hours of PHRS operation, in other words, when the water tanks would be empty, or in 41 hours to the SFP? Via which pipelines and by which means – from initial source to the end-user? Are all pipelines seismically resistant and protected from external impacts? Please list them and provide their description.	In case of failure of the spray cooling ponds of the PE system, which is considered a BDBA, the removal of heat from the core and preservance of operability of the system of barriers is maintained by alternative measures, which are implemented automatically upon the reaching of corresponding parameters by the system, or is maintained by the actions of personnel. The alternative ultimate heat sink could be BRu-A or the passive heat removal system via SG (SG PHFS). Immediately, after the reactor is stopped and isolation valves of SG are closed, the pressure in the second circuit increases and actuates BRU-A valves on SG, which are operating to support the pressure inside SG. The loss of water on the side of PG in the second circuit would be fulfilled by feeding from EFWS (LAR/LAS 4 x 100) to the SG. Pumps are in UJE building. Pumps are designed as self-cooling due to the medium pumped. After the closure of BRU-A, engages SG PHRS, enabled automatically upon reaching by the system of the set parameters. Arrangement and functions of this system were presented above. SG PHRS reaches its full design capacity in 80 seconds. So far as the operation of SG PHRS channels reduces the pressure in SG in accordance to the parameters of operation of SG PHRS, BRU-A on all the paths of steam of SG remain closed and the loss of water in SG ceases. Consequently, the level of tank feeding water in SG, after some decrease due to the release of steam via BUR-A stabilizes, and filling up PG no considerable volume of water is required. Operation of three channels (33,3%) of SG PHRS with established volume of water in corresponding tank of SG PHRS maintain the design operability of the current safety system as well as adequate removal of heat from fuel elements within 24 hours. This time could be increased to 72 hours by using water in the 4th tank of SG PHRS. For this, all 4 tanks could be interconnected. PHRS possesses an adequate reserve of waterfor autonomous operation within 72 hours. More, the reserve of salt-free water is ensured for 7 days. Even the water from the spraying ponds could be used to feed the PHRS under extremely low temperatures due to heating and water layer thickness. PRT concluded that even some of the spraying ponds (4 x 20 000 m^3) could be involved in the removal of the residual heat for several months. The water from the spraying ponds would be also available for the PHRS in conditions of forming of the layer of ice on the surface. Information concerning the abovementioned comments is specified in responses to the comments of the PRT, to NR, which will be published in open access. In i. 6.2.3 of the NR is specified information on feeding emergency heat removal tanks: "Further operation of SG PHRS is ensured by feeding emergency heat removal tanks by JNB50 pump from LCU tanks"; in i. 6.2.3 is specified: "To exclude the damage of fuel in SFP under accident with loss of all systems of heat removal to the ultimate heat sink at the NPP, during operation of the reactor facility at power or during full unloading of the core in cold position, it is important to ensure feeding of SFP from LCU tanks by JNB50AP001 pump along FAK70 path"; regarding reliability of pipelines, i. 6.2.1 states the following: "The design systems of heat removal to the ultimate heat sink, their

		elements, are able to operate under external impacts and natural disasters. It is ensured by the design of buildings and constructions, intended for placement of the system elements. Equipment and pipelines of the systems of heat removal to the ultimate heat sink correspond to the I category of earthquake resistance and perform their functions during earthquakes”

Comments to chapter 6.2.1	Chapter 6.2.1 states: "Systems of heat removal to the ultimate heat sink during accidents with blackout of the station maintain their operability in the course of operation of DG EPSS and availability of water in emergency heat removal tanks, time of autonomous operation of spray ponds of PE system is indicated in chapter 6.2.2" Blackout should mean the inoperability of DG EPSS or their temporary inoperability. More, which heat removal systems, active, operating in design mode, or passive, in emergency mode, are meant? Does it mean that PHRS system would need DG and would not be able to operate autonomously?	Chapter 6.2 describes "Loss of residual heat removal loss of ultimate heat sink". Scenario "Loss of ultimate heat sink under blackout of the NPP" is described in chapter 6.3. In case of external loss of power, active systems of heat removal are engaged (spray ponds (PE system)). Availability for operation of current systems is dependent on the power supply from DG EPSS. In case of blackout, which disables operation of DG EPSS, heat removal is maintained by operation of passive systems of SG PHRS (containment). As indicated in 6.2.3 of the NR: "Independence period of residual heat removal of RF with help of SG PHRS is 72 hours since the start of accident. Further operation of SG PHRS is maintained by the feeding from emergency heat removal tanks by JNB50 pump from LCU tanks". Power supply of JNB50 pump in case of blackout "is maintained by the power supply channel for BDBA (from connected mobile diesel-driven station (MDDS) of the 7th channel of power supply)" i. 6.1.4 of the NR. Current pump, cooled by air, is located in steam chamber (UJE building) and connected with tanks of LCU system (LCU 01 and LCU 02), 700 m^3 volume each as well as with tanks of containment slumps. If necessary, after opening manually of the corresponding valves, LCU tanks could be feeded by the water of tanks of 2 x 700 m^3 volume, which are located in the turbine room. Consequently, in i. 6.2.1 it is assumed that the condition of operation of spray ponds of the LE system is the operation of DG EPSS; for operation of PHRS the availability of the water level in emergency heat removal tanks is required and no power supply is needed: PHRS is passive and operates autonomously.

Comments to chapter 6.2.2	Could the exact design characteristics, including operational characteristics, those of spray ponds, which would be used as the ultimate heat sink in emergency mode, be indicated? What are their dimensions, volume of water, what share of the design load of cooling towers on cooling of the core to be performed by spray ponds in case of accident with the loss of the ultimate heat sink?	Under the loss of the principal heat sink (cooling towers), the reactor facility is put in the shutdown mode. The ultimate heat sink in this case consists of steam generators of BRU-A system and PE system with spray ponds for the first circuit, as well as PE system and spray ponds for essencial consumers. The residual heat from the fuel elements in reactor would be removed via Reactor - First circuit - Side of steam generators of the second circuit - BRU-A valves - Atmosphere. Steam would be unloaded via BRU-A from the side of the steam generators of second circuit to the atmosphere (feeding-blowdown). After parameters of the first circuit fall below the threshold value of BRU-A actuation, and if it is planned to reach the shutdown condition, the residual heat would be delivered by the system of removal of residual heat (JNA, 4 x 100%) to the cooling system of the intermediary circuit (KAA, 4 x 100%); from KAA to PE systems (4 x 50%), from PE systems to the spray ponds which release heat to the atmosphere by spraying water.PE system cools such components as heat exchangers and pumps. The design envisages two spray ponds for 4 channels of back-up PE system, hence, for one pond are two back-up channels. Water from spray ponds could be used for PHRS feeding under extremely low temperatures due to heating and the thickness of the water layer. PRT concluded that even some of spray ponds could ensure effective removal of heat (reliable cooling of the core). According to the information in NR i. 6.2.2: "The design characteristics of spray pond (volume, dimensions, type and nozzles placement) are specified by the hydraulic calculations under all operation modes of the system, depending on the importance of cooling of the RF under MDBA"; "any two channel of PE system could be in operation and all heat load could be directed to one of the spray ponds"; "under failure of both feeders because of the general cause, f. e. under MDBE, the volume of each of the spray ponds ensures operation of system without feeding during sufficient period of time (not less than 8 days)". Information on the design characteristics is presented in volume corresponding to the requirements of conducting stress tests and is specified in chapter 6 of the NR.
Comments to chapter 6.2.2	The chapter is named "6.2.2 The loss of heat removal under different operating modes of RF" but different operating modes of RF and corresponding conditions of the loss of heat removal are not described. Could the scenarios of the loss of heat for the different modes of RF operation, including quantitative characteristics, be described?	During stress tests the analysis of a lot of different modes of the NPP operation, including emergency scenarios (including impacts, specific for the events at the Fukushima NPP) with application of deterministic approach (events are specified independently of their probabilities) is performed. At specifying the safety margins of the NPP, considering the cliff-edge effects, as well as meausres on preventing and elimination of accidents, are conservatively selected the most severe consequences of the abovementioned modes, from the point of view of safety. Current approach also corresponds to the methodology and targets of stress tests. The presented results of accidents scenarios in the NR correspond to the requirements for its content.

Comments to chapter 6.2.3	In the chapter are not described scenarios with different operational modes of the RF, hence the comment is the same as for the chapter 6.2.2	During stress tests the analysis of a lot of different modes of the NPP operation, including emergency scenarios (including impacts, specific for the events at the Fukushima NPP) with application of deterministic approach (events are specified independently of their probabilities) is performed. At specifying the safety margins of the NPP, considering the cliff-edge effects, as well as meausres on preventing and elimination of accidents, are conservatively selected the most severe consequences of the abovementioned modes, from the point of view of safety. Current approach also corresponds to the methodology and targets of stress tests. The presented results of accidents scenarios in the NR correspond to the requirements for its content.
Comments to chapter 6.2.4	In the chapter is stated: "Independently from the indicated in chapter 6.2 failures, the heat from the first circuit is removed by BRU-A, systems of routine and auxiliary feeding water, spray ponds or by SG PHRS". In the chapter the sequence of failures, their combination and corresponding sequential or simultaneous actuation of these or that systems of the emergency heat removal is not specified. The information on the sequence of failures should be presented more clearly, considering deterministic approach, how it is prescribed by the EU stress tests specification; please inform in which period of time which systems of the heat removal would operate, how efficiently and how long?	In cae of blackout of station, the heat removal from the core and the related operation of the system of barriers is ensured just by the system of passive heat removal via SG (SG PHRS). This system consists of 4 inter-independent channels (4 x 33%) – one per each SG, which operate under natural circulation principle. Each circuit consists of one water tank of around 540 m^3, 16 heat exchangers, path pipelines, condenced steam with start valves, pressure control valves, isolation valves of big and small diameter. Heat removal is made following the sequence: reactor – steam generator – system of passive heat removal via steam generators – atmosphere (heat consumer). Heat is released to the atmosphere by evaporation of water from all SG PHRS tanks. Along condensate path are installed, in parallel to each other, starting valve of big diameter with electric drive and starting valve of small diameter with solenoid actuator, which open upon the request and ensure automatic connection in channels correspondingly to the cooling mode. In the first moments after the blackout of the system and closure of the stop valve of the steam generator, the pressure in the second circuit starts to increase and leads to the actuation of valves of BRU-A on the SG, which are powered from the uninterrupted power supply source. The blackout of system leads to the actuation of SG PHRS , which starts to operate in full design capacity within 80 seconds. Operating of SG PHRS channels leads to the reducing of pressure in steam generators according to the parameters of SG PHRS operation, hence BRU-A are closed on all the pathes of the SG steam, the loss of tank feeding water in SG stops and the level stabilizes. Three channels of SG PHRS with the quantified amount of water in corresponding tank of SG PHRS ensure the design capacity of the safety system as well as adequate heat removal from the fuel elements within 24 hours. This amount of time may be increased to 72 hours by using the water from the fourth tank of the SG PHRS. To ensure this, all four tanks could be interconnected. The removal of heat via SG PHRS is autonomous, which is powered uninterruptedly by the specific battery with capacity sufficient for the 24 hours of operation, which could be charged from mobile DG of 500 kW, included to the channel No. 7. PHRS tanks are also designed for the removal of heat from the internat atmosphere of the containment, in case of the leakage from the first circuit and steam breakthrough into the reactor. The heat is transferred by the natural circulation from condensers of the containment PHRS (JMP 4 x

		33%) to the SG PHRS tanks.

Comments to chapter 6.2.4	In the chapter is mentioned: "To support the controlled condition after the BDBA in case of more than 72 hours of loss of the ultimate heat sink on two units of the NPP at the same time would be proposed the following measures". Who and when within the framework of which document, investigation or work would propose these measures and how their adequacy could be assessed?	Plans on elimination of accident specify actions on coordination both on-site and off-site were developed before the construction of the NPP. MES plays important role in this coordination (together with other governmental bodies, in cooperation with the Operator). "Corresponding measures" are proposed in chapters 7 and 8 of the NR upon consideration of BDBA management, at two units at the same time. As it is specified in i. 8.2 of the NR: "To enhance resistance of the NPP to the events occurring at some of the units of the NPP simultaneously, measures enhancing stress-resistance of the NPP to the loss of power and loss of the ultimate heat sink could be ensured, which are listed in chapter 8.3.3 of the NR. As for radiation protection of the personnel on site, this aspect is specified in Plan of actions in case of emergency on site of the Operator, amongst other liabilities of the Operator for licensing the operation. In the NR is also referenced "Plan of measures on personnel protection in case of accident at the Belarussian NPP" and "Protective measures on prevention of radiological accident at the state enterprise "Belarussian NPP". The Operator is also responsible for the safety of the population in the direct proximity to the NPP. According to the requirements, it is important to ensure training and exercise on actions in case of accidents to prevent and reduce to effects of the consequences of accidents, medical assistance, application of protection means, coordination between different emergency-rescue services (fire teams and medical teams) etc. During accidents management inside the NPP, personnel should perform corresponding actions on elimination of the accident. The control for actions on accident elimination is performed by the Head of the shift, Chief Engineer or the NPP Director, dependently on their presence in the specific period of time. Commission on emergencies at the NPP is created. The members of Commission facilitate emergency-rescue services by identifying the causes of the accident, assessing the condition of the NPP, forecasting of potential radiological consequences and identification of actions for the restoration of normal condition. Emergency-rescue teams of the NPP and the State system of emergencies prevention and responce (upon coordination by the MES) to ensure important external support and aid in case of emergencies. To receive the necessary external help, the services of the NPP could call the regional department of the Ministry, which is responsible for organization of the corresponding external support. There are backup communication channels between the NPP and the corresponding Ministry, regulating bodies and permanent regulating bodies.

Comments to 7.1.2 on mobile diesel-driven station (MDDS)	Actuation of MDDS of 500 kW capacity, operating within the range of temperature -50 to +41, plays big role in case of black out and loss of the ultimate heat sink. Aggregates of which base characteristics are planned to use? Specially to be designed for the Belarussian NPP or ready-to-use? If ready-to-use then which ones? What would be the carrier base – chassis, skid runners, runners? Which vehicles are planned for operative movement of the MDDS personnel? Is it planned to equip MDDS with additional heating facilities for the temperature below -10 ^{o}C? If planned then which technologies would be used? If not then how by other means would the operability of facilities in conditions of low temperatures be maintained? In the chapter is stated: In case of impossibility to supply MDDS is supposed connection of MDDS on the MDDS proper location. Where MDDS would be stored, would it be special storage facility or bulding?	MDDS is planned for construction specifically for the Belarussian NPP. MDDS is placed on site, out of constructions, on open concrete place, in no-obstacles zone. The final requirements for the arrangement of the place of storage of the MDDS would be approved and implemented after the purchase of the MDDS, considering its physical configuration and characteristics. MDDS would include the system of automatic heating to ensure its operability under low temperatures. The system of automatic heating ensures operability of the MDDS within the range of temperatures of the environment from -50 to +41 (i. 7.1.2 of the NR). MDDS operability (producer – LLC “Smartex Engineering”) is maintained by accounting the climate specificities of the site of the Belarussian NPP, MDDS would be placed on site of the NPP (outside the zone of theoretical collapse), in stationary mode, with constant connection to the corresponding aggregates of the channels of BDBA management, via cable of the underground seismic-resistant channel.

General comments to performance of stress tests	Document lists the measures, including technical and organizational, which could be applied under these or that conditions – blackout, loss of the ultimate heat sink, etc. But no assessment of application of these measures in specific cases, including assessment of efficiency, with considering modelling data and application practice, probabilistic or other assessment of equipment failure, including passive protection, is provided. In chapters that describe measures on reacting to accidents and in chapters on additional measures the same activities are described. That is why is not clear which measures are ensured and which could be ensured, since in both types of chapters same measure is indicated. It could be concluded from chapter “7.1.1 Organizational measures of the Operator on accidents management” that basic measures, including severe accident management guidelines (RUTA) and emergency operation procedures (ILA), including management procedures on severe accedents management, are not performed corresponding calculations not made. Consequently, basic measures to conduct stress tests are not performed. In chapters of the document RUTA and ILA are referenced many times, which are sill being drafted but they are referenced. In other words, measures on management accidents, including DBA, do not exist for the Belarussian NPP. It remains unclear how the measures, described in chapter “8.3.1 Possible measures on enhancing the NPP safety under earthquake” could be introduced at the NPP under construction, where specified systems and sites might be in high degree of readiness. It is unclear how in SFP could be changed the structure of bearings when bearings would be in high degree of readiness up to the moment the decision on such change would be made. Overall, the document is not developed, does not include important information. The basic measures on accidents management, as well as assessments of scenarios of development of the emergencies, including basic, design, are still not developed.	Emergency preparedness guidelines are not “basic measures required for stress tests”. In the framework of stress tests, the assessment of the NPP design was made from the view of events occurred at the Fukushima NPP. The development of emergency preparedness guidelines is foreseen according to the regulatory base of the Republic of Belarus, which regulates issues of nuclear energy use. Stress tests of the Belarussian NPP were made on the basis of design documentation, actual as of 01/08/2016. The safety analisys report (SAR) on unit No. 1 of the Belarussian NPP, which contains analysis of accidents, emergency operation procedures (ILA), Guidelines on management of beyond design basis and severe accidents (RUZA) actualized as of 01/09/2017 and delivered by the Operator to Gosatomnadzor, in October 2017. Currently, these documents are under safety review for licensing operation of the unit No. 1 of the Belarussian NPP. The procedure of “implementation” of measures on enhancing level of safety at the NPP, which were prposed according to the results of stress tests, would be implemented within the framework of “Program of enhancing safety at the Belarussian NPP”, which was indicated in chapter 8.2 of the NR. As for the probabilistic assessment, in correspondence with the IAEA recommendations, the reassessment of safety provision at the Belarussian NPP, with consideration of SAR, would be performed systematically as it is recommended by the international norms; Plans for protection under radiation accident at the NPP and actualized safety guidelines would be considered.

	Comment of Latvia	Final reply
	Since the planned NPP will be located not far from Latvia's territory, the safety issues of the NPP are very important for us. The Stress-test report is one of the valuations of NPP, the conclusions of which, together with the follow-up actions, are important pre-conditions for reaching higher safety at the facility. Taking into account that the report will be evaluated further by a group of international experts, Latvia will follow the results of this group in order to ensure implementation of safety standards at the NPP. At the same time we wish to draw attention to the fact that the external emergency plan has not yet been developed in case an accident occurs in the reactor nor if the consequences of such are outside the reactor.	Plan of protective measures in case of radiological accident at the Belarussian NPP off-site emergency plan) is developed, tested during command-staff held in October 2017 exercises and is approved by the Decree of the Government of the Republic of Belarus No. 211 from 22/03/2018. In the course of its development, the recommendations of international standards in the field of emergency response, listed in the IAEA documents, Organization of the Heads of European Regulatory Authorities in the field of radiation protection (HERCA) and the Association of Western European Nuclear Regulators (WENRA) were taken into account. To develop the Plan, the consequences of the reference accident, being maximally conservative from the view of radiation safety and characterized by the release limit were taken into account.

1 level **5-6 feeding channel**	**2 level** **1-4 feeding channel**	**3 level** **1-4 feeding channel**	**4 level** **7-8 feeding channel**
Unit High Level Control System	Unit High Level Control System	▫	▫
Shared Use Display	Shared Group Display	▫	▫
Technical means of operational dispatching supervision	Technical means of operational dispatching supervision	Technical means of operational dispatching supervision	Technical means of operational dispatching supervision
Normal operation system	Normal operation system	▫	Beyond design basis accidents (BDBA)
▫	▫	Initiating part of emergency reactor shutdown (SCRAM) of (Engineering safety features actuation system)	▫
		Ref A Ref B	▫
▫	▫	Actuation Part of Engineering safety features actuation system	
▫	Initiating part of preventive reactor protection (PZ)	▫	▫
▫	▫	Engineering antiseismic protection system	▫
Ex-core system - neutron flux monitoring system	Ex-core system - neutron flux monitoring system	Ex-core system - neutron flux monitoring system	▫
▫	Reactor power control (ARM)	▫	▫
▫	Group and individual control of control rods	▫	▫
▫	Actuation part of emergency reactor shutdown and preventive reactor protection (PZ) and AZ	Actuation part of emergency reactor shutdown and preventive reactor protection (PZ) and AZ	▫
▫	▫	Emergency reactor level control system	Emergency reactor level control system
Software and hardware complex for data collection	▫	▫	▫
Monitoring control and diagnostic reactor system (SKUD)	Monitoring control and diagnostic reactor system (SKUD)	Monitoring control and diagnostic reactor system (SKUD)	▫
Automatic radiation monitoring system	Automatic radiation monitoring system	Automatic radiation monitoring system	▫
Fire protection control system	Fire protection control system	▫	▫
Water treatment process control system	▫	▫	▫
Water-chemical process control system	▫	▫	▫
Diagnostic-vibration monitoring system for rotating equipment	Diagnostic - Vibration monitoring system for rotating equipment	▫	▫
	Secondary circuit leakage		

	detection system (LBB-2)		
Site high level control system			
Control system of common systems			
Control system of site electrical power			
Site Fire protection control system			