



NATIONAL REPORT OF THE REPUBLIC OF BELARUS

ON THE IMPLEMENTATION OF THE CONVENTION ON NUCLEAR SAFETY

**MINSK
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TABLE OF CONTENTS

ABBREVIATIONS	4
INTRODUCTION	6
SUMMARY	7
ARTICLE 6. EXISTING NUCLEAR INSTALLATIONS	10
ARTICLE 7. LEGISLATIVE AND REGULATORY FRAMEWORK	14
Article 7 (1) Establishing and maintaining a legislative and regulatory framework	14
Article 7 (2) (i) National Safety Requirements and Regulations	16
Article 7 (2) (ii) Licensing System	16
Article 7 (2) (iii) System of regulatory control and assessment	19
Article 7 (2) (iv) Enforcement of applicable regulations and terms of licenses	21
ARTICLE 8 REGULATORY BODY	23
Article 8 (1) Establishment of a regulatory body	23
Article 8 (2) Status of a regulatory body	31
ARTICLE 9. RESPONSIBILITY OF THE LICENCE HOLDER	33
ARTICLE 10. PRIORITY TO SAFETY	35
ARTICLE 11. FINANCIAL AND HUMAN RESOURCES	41
Article 11 (1) Financial Resources	41
Article 11 (2) Human Resources	42
ARTICLE 12 HUMAN FACTORS	46
ARTICLE 13. QUALITY ASSURANCE	49
ARTICLE 14. ASSESSMENT AND VERIFICATION OF SAFETY	51
Article 14 (1) Safety assessment	51
Article 14 (2) Verification of safety	54
ARTICLE 15. RADIATION PROTECTION	56
ARTICLE 16. EMERGENCY PREPAREDNESS	62
Article 16 (1) Emergency Plans and Programs	62
Article 16 (2) Informing the Public and Neighboring States	64
ARTICLE 17 SITING	66
Article 17 (1) Evaluation of site related factors	66
Article 17(2) Impact of the installation on individuals, society and environment	67
Article 17(3) Re-evaluation of site related factors	68
Article 17(4) Consultation with other Contracting Parties likely to be affected by the installation	68
ARTICLE 18. DESIGN AND CONSTRUCTION	69
Article 18 (1) Implementation of the defense-in-depth	69

Article 18 (2) Incorporation of proven technologies	70
Article 18 (3) Design for reliable, stable and manageable operation	70
ARTICLE 19. OPERATION.....	72
Article 19 (1) Initial authorization.....	72
Article 19 (2) Operational limits and conditions	74
Article 19 (3) Procedures for operation, maintenance, inspection and testing.....	75
Article 19 (4) Procedures for responding to operational occurrences and accidents	76
Article 19 (5) Engineering and technical support.....	77
Article 19 (6) Reporting of incidents significant to safety	77
Article 19 (7) Operational experience feedback.....	77
Article 19 (8) Management of spent fuel and radioactive waste on site	78
CONCLUSION	81
LIST OF THE REGULATORY LEGAL ACTS OF THE REPUBLIC OF BELARUS IN THE FIELD OF NUCLEAR AND RADIATION SAFETY	82

ABBREVIATIONS

AMS - Automatic measuring stations
 JSC - Joint-Stock Company
 APC - Automatic power controller
 ARSMS - Automated radiation situation monitoring system
 ARMS - Automated radiation monitoring system
 CAPCS - Computer-Aided Process Control System
 NPP - Nuclear Power Plant
 MSLIV - Main steam line isolation valve
 MCR - Main control room
 FAARU - Fast-acting atmospheric reducing unit
 FACRU - Fast-acting condenser reducing unit
 PSA - probability safety assessment
 WWER - Water-Water Energetic Reactor
 HEE - Higher educational establishment
 SSI JIPNR Sosny - State Scientific Institution Joint Institute for Power and Nuclear Research
 Sosny of the National Academy of Sciences of the Republic of Belarus
 EV - Enclosure vessel
 Gosatomnadzor - Department of Nuclear and Radiation Safety of the Ministry for Emergency
 Situations of the Republic of Belarus
 RUE – Republican unitary enterprise
 SE – State Enterprise
 MSH - Main steam header
 SEPCS - State Emergency Prevention and Control System of the Republic of Belarus
 SI DCNPP - State Institution “Directorate for the Construction of the Nuclear Power Plant”
 SI RCRSEM – State Institution "Republican Centre for Radiation Survey and Environmental
 Monitoring"
 UNECE - United Nations Economic Commission for Europe
 LRW - Liquid radioactive waste
 PLC - Private limited company
 BDB - Beyond-design-basis event
 PCPEA - Protected command post for emergency actions
 KGB - Committee for State Security of the Republic of Belarus
 CFDS - Cladding failure detection system
 CA - Critical assembly
 CNS - Convention on Nuclear Safety
 LRC - Local response centres
 IAEA - International Atomic Energy Agency
 MIA - Ministry of Internal Affairs of the Republic of Belarus
 ICRP - International Commission on Radiological Protection
 MES - Ministry for Emergency Situations of the Republic of Belarus
 RI - Research Institute
 R&D - Research and development
 R&D project - Research and development project
 NEMS - National Environmental Monitoring System
 NRC - National Response Centre
 SCR - Safety case report
 GSP - General safety provisions
 EIA - Environmental impact assessment
 CPS CE - reactor control and protection system control elements
 TSO - Technical support organization

SNF - Spent nuclear fuel
SG - Steam generator
MPC - Maximum permissible concentration
SCA - Subcritical assembly
PCA - Pre-commissioning activities
NPP QAP - Nuclear Power Plant Quality Assurance Program
PSAR - Preliminary safety analysis report
NACR - Neutron absorber control rod
RW - Radioactive waste
BCP - Backup control panel
RS - Reactor system
RUE “Belarusian NPP” - Republican Unitary Enterprise “Belarusian Nuclear Power Plant”
RCMER – Republican Centre for Management and Emergency Response of the Ministry
for Emergency Situations of the Republic of Belarus
RRC - Regional Response Centres
ECCS - Emergency core cooling system
CIS - Commonwealth of Independent States
PHRS - Passive Heat Removal System
SSCR - Self-sustaining chain reaction
FA – Fuel Assembly
FE - Fuel Element
TCP - Technical code of common practice
SRW - Solid radioactive waste
TUK - transport cask
APP - Accelerated preventive protection
SCS - Safety control system
STC - Simulation training centre
FFSF - Fresh fuel storage facility
OO - Operating organization (Operator)
NF - Nuclear Fuel

INTRODUCTION

The 8th National Report of the Republic of Belarus on the Implementation of the Convention on Nuclear Safety has been prepared in accordance with Article 5 of the Convention and illustrates the implementation of country obligations under the Convention in 2016-2019, taking into the account the decision made by Belarus on the construction of its own NPP and implementation of this project. The document has been prepared based on the Guidelines for National Reports Submitted in Accordance with the Convention on Nuclear Safety (Information circular INFCIRC / 572 / Rev.6 dated February 7, 2017).

The Belarusian NPP under construction is the only facility that meets the definition of Article 2 of the Convention on Nuclear Safety. Belarus also has scientific nuclear facilities, the safety issues of which are also reflected in this National Report.

During the three-year period since the submission of the previous National Report (August 2016), Belarus continued to develop the nuclear and radiation safety infrastructure and all its components: regulatory framework, regulatory infrastructure, state systems for emergency preparedness and response, accounting and control of nuclear materials, etc. On the basis of licenses for construction of power units No. 1 and No. 2 issued in 2013-2014 to the operating organization (the State Enterprise “Belarusian NPP”), the construction of the Belarusian NPP, which began in November 2013, was continued. Proper supervision of its construction, manufacture and acceptance of equipment for the Belarusian NPP was ensured, including in the permanent mode. At the same time, preparations were underway for the commissioning of the Belarusian NPP. Commissioning of power unit No. 1 is scheduled for 2019, and power unit No. 2 – for 2020.

The Republic of Belarus at the national level is taking the necessary measures to ensure that the fundamental principles of nuclear safety are in place at all stages of the life cycle of the NPP under construction, including implementation of the recommendations of the IAEA missions conducted in Belarus during the reporting period:

Integrated Regulatory Review Service (IRRS mission) 2016;

Site and External Events Design Review Service (SEED mission) 2017;

Emergency Preparedness Review (EPREV Mission) 2018;

International State System for accountancy and control of nuclear material Advisory Service (ISSAS mission) 2019.

In 2016-2018 the Republic of Belarus performed on voluntary basis the stress-tests of the Belarusian NPP according to the methodology of the European Nuclear Safety Regulators Group (ENSREG) and the European Commission and passed the peer review of its results by the European regulators in the sphere of nuclear safety.

The report article by article reflects the activities of the State in implementing the provisions of the Convention. Attention is paid to changes in the legislative and regulatory framework related to ensuring nuclear and radiation safety in the use of atomic energy. The work and activities to develop a technical support system for the regulatory authority in the field of nuclear and radiation safety, staff training, ensuring safety priority, implementing radiation protection, organizing emergency preparedness systems, etc, are reflected.

Articles 6, 7, 14, 17, 18 and 19 provide the information on the implementation of the principles contained in the Vienna Declaration on Nuclear Safety of February 9, 2015.

SUMMARY

Belarus joined the Convention on Nuclear Safety (CNS) in 1998. Belarus prepared and submitted a total of 7 National Reports on the implementation of the CNS (1999, 2001, 2004, 2007, 2011, 2013, 2016), as well as one extraordinary report devoted to the lessons of the Fukushima-Daiichi NPP accident (Japan).

At the beginning of 2008 Belarus adopted a decision on implementation of its own nuclear power program. The previous, [7th National Report](#) contained the information on various aspects of ensuring safety during the construction of the Belarusian NPP, which began in November 2013. This 8th National Report provides similar information for 2016-2019, as well as the information on preparations for the upcoming operation of the nuclear power plant.

The Belarusian NPP under construction is the only facility that meets the definition of Article 2 of the Convention on Nuclear Safety. It is being constructed according to the Russian project AES-2006. ASE EC JSC (Atomstroyexport, Russian Federation) is the general contractor, and the State Enterprise "Belarusian NPP" is the customer and is also defined as the operating organization. RUE Belarusian NPP has licenses for the full cycle of construction of power units No. 1 and No. 2, has filed an application for a license to operate power unit No. 1 (currently the application is under consideration).

As the first nuclear energy program is being implemented, appropriate measures are being taken to develop the nuclear safety infrastructure. These measures are based on international recommendations, in particular, the IAEA mission on integrated nuclear infrastructure review (INIR mission) for the Republic of Belarus of 2012, international assessment missions and peer reviews conducted in 2016-2019 and mentioned in the [Introduction](#), as well as Conclusions of the Review Meetings of Contracting Parties to the Convention on Nuclear Safety. During the consideration of the [7th National Report of the Republic of Belarus on the implementation of the Convention on Nuclear Safety](#) for Belarus, the following 5 challenges were noted:

- 1) Finishing construction and commissioning of new reactors with assuring that VDNS principle 1 is met;
- 2) Further development of TSO system of the regulatory body;
- 3) Continue efforts to establish bilateral cooperation on nuclear safety with the Republic of Lithuania, finalizing bilateral agreements, in particular;
- 4) Preparation and hosting of all planned peer review missions in the conditions of intensive schedule of activities related to the Belarusian NPP construction and implementation of the recommendations and suggestions including those from the missions already conducted;
- 5) Ensure adequate regulatory review of the application being submitted by licensee and oversight of the entire process for the issuance of the operating license.

In addition, the 7th meeting of the parties to the CNS formulated 2 suggestions:

- 1) Have the stress-test report, which is under preparation, subject to transparent peer review in accordance with the joint declaration of 2011;
- 2) Complete performing a Level-2 PSA, including extreme natural as well as man-made external hazards.

The following is a summary of actions taken in response to the challenges and suggestions listed above.

Challenge 1. At the time of preparation of the National Report, the construction of the Belarusian NPP is ongoing. According to the updated schedule, commissioning of the power unit No. 1 is planned in 2019, power unit No. 2 – in 2020 (for detailed information on this issue, see [Article 6 "Existing Nuclear Facilities" of the National Report](#)).

Challenge 2. Belarus continued to develop a technical support system for the regulatory authority in the field of nuclear and radiation safety. Since 2016, measures have been taken to move from the only organization that provides expert support to the regulatory authority (SSI JIPNR Sosny), to the system of organizations. On December 2, 2016, Resolution of the Council

of Ministers of the Republic of Belarus No. 991 “On provision of scientific and technical support to the Ministry for Emergency Situations in the field of nuclear and radiation safety” was adopted, which defines a list of 16 organizations in the country that shall provide technical support to the regulatory authority in the field of nuclear and radiation safety. To carry out coordinating functions between scientific and technical support organizations, as well as to increase the efficiency and effectiveness of scientific and technical support to the regulatory authority in the field of nuclear and radiation safety, the Scientific and Technical Institution "Centre for Nuclear and Radiation Safety" was created in the structure of the Ministry for Emergency Situations by Decree of the President of the Republic of Belarus dated October 5, 2017 No. 361. Details on this issue are provided in [Article 8 "Regulatory Authority"](#) of this National Report.

Challenge 3. Steps have been taken to institutionalize bilateral cooperation on nuclear safety with the Republic of Lithuania, namely, rapprochement of positions regarding the draft agreement proposed by the Belarusian side in 2014 between the regulatory authorities in the field of nuclear safety: The Ministry for Emergency Situations of the Republic of Belarus and the Lithuanian State Nuclear Power Safety Inspectorate (VATESI). At the moment of preparation of this National Report, the latest version of draft Agreement has been sent to Lithuania through the diplomatic channels in January 2019 and is under consideration by Lithuanian side. The Republic of Belarus confirms openness to completion of the works on institutionalization of bilateral cooperation between nuclear regulatory authorities.

Challenge 4. In order to assess and further improve the nuclear and radiation safety infrastructure in the context of an intensive schedule of activities related to the construction of the Belarusian NPP, in 2016-2019 Belarus received the following IAEA missions:

Integrated Regulatory Review Service (IRRS) in October 2016;

Site and External Events Design Review Service (SEED) in January 2017;

Emergency Preparedness Review (EPREV) in October 2018;

as well as International State System for accountancy and control of nuclear material Advisory Service (ISSAS) in May 2019 (ISSAS mission report is under preparation).

On August 5, 2019 IAEA Pre-Operational Safety Review (Pre-OSART) began its work at the Belarusian NPP.

As part of the transparency and openness policy, the Republic of Belarus voluntarily made publicly available the reports of the previous assessment missions (see reference links to the mission reports [IRRS](#), [SEED](#), [EPREV](#)).

In addition, in the short term (2019-2020), the IAEA Integrated Nuclear Infrastructure Review (INIR mission) is planned for phase 3 of the nuclear power program development of the Republic of Belarus. The implementation of suggestions based on the results of review missions contributes to further harmonization of the nuclear and radiation safety standards of the Republic of Belarus with international requirements and achievement of high safety standards. Administrative mechanism of implementation of the recommendations includes development and implementation of corresponding national plans containing the actions with the preset implementation terms. These plans are approved and controlled by the Government of the Republic of Belarus.

Challenge 5. The Belarusian regulatory authority in the field of nuclear and radiation safety organized proper consideration of the application for a license to operate Unit 1 of the Belarusian NPP (see details in [Article 7 \(2\) \(ii\) “Licensing System”](#) of the National Report) and supervision of the entire process (see details in [Article 7 \(2\) \(iii\) “Regulatory Control and Assessment System”](#) of the National Report).

Suggestion 1. In 2016-2018 the Republic of Belarus performed on voluntary basis stress-tests of the Belarusian NPP according to the methodology of the European Nuclear Safety Regulators Group (ENSREG) and the European Commission and passed the peer review of its results by the European regulators in the sphere of nuclear safety. Peer Review Team (PRT) included the representatives from Austria, Belgium, Bulgaria, UK, Hungary, Germany, Greece, Spain, Lithuania, Slovakia, Ukraine, Finland, France, Czech Republic, Sweden. During the peer

review, the European experts applied new safety reference levels to the Belarusian NPP which were developed by the Association of Regulators of Western Europe (WENRA) in 2014. Peer Review results ([Peer Review Report](#), [Summary Conclusions](#), [Joint Press Release of Gosatomnadzor and ENSREG](#)) has in general a positive character. It highlights various good practices and also suggests future potential improvements in the context of continuous safety improvement that were suggested during the review, considering the new WENRA reference safety levels. In line with the European practice, the Ministry for Emergency Situations (Gosatomnadzor) prepared a National Action Plan addressing to the results of the stress tests (a set of measures determined to improve security of NPP and the terms of its implementation) and together with the Belarusian NPP and other parties concerned started its implementation.

Suggestion 2. In preparation for licensing the operation of power unit No. 1 of the Belarusian NPP in accordance with the requirements of the legislation, the operating organization developed a Level 2 Probability Safety Assessment (PSA), which is submitted to the regulatory authority as part of the set of documents for license application.

Thus, in 2016-2019, the Republic of Belarus planned and carried out activities to further improve the nuclear and radiation safety infrastructure and all its components, taking into account the IAEA safety standards, suggestions of international missions and peer reviews, as well as challenges and suggestions established by the 7th Review Meeting of Contracting Parties to the Convention on Nuclear Safety.

ARTICLE 6. EXISTING NUCLEAR INSTALLATIONS

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

Nuclear facilities currently existing in the Republic of Belarus in accordance with Article 2 of the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management are shown in Table 1.

Table 1
Nuclear facilities in the Republic of Belarus

Item no.	Name of facility	Current status
1.	Belarusian NPP	Under construction
2.	Yavar non-irradiated nuclear material storage	In operation
3.	Spent nuclear fuel storage facility	Decommissioned in 2018 (fuel transferred to the Russian Federation in 2010)
4.	Nuclear material storage facility	Under construction
5.	Yalina Subcritical test facility	In operation
6.	Giatsint Critical test facility	In operation
7.	Kristall Critical test facility	Long-term shutdown

Of the listed facilities, only the reactors of the Belarusian NPP meet the definition of Article 2 of the Convention on Nuclear Safety, the others are scientific nuclear facilities and are located at the State Scientific Institution Sosny Joint Institute for Energy and Nuclear Research of the National Academy of Sciences of the Republic of Belarus.

Scientific nuclear facilities

Such facilities are situated at the Scientific Institute JIPNR Sosny, they are:

Yavar non-irradiated nuclear material storage;

Yalina Subcritical test facility;

Giatsint Critical test facility;

Kristall Critical test facility;

In 2017 - 2018, the spent fuel storage facility was decommissioned and excluded from nuclear facility list. A new nuclear material storage facility is under construction.

Yavar non-irradiated nuclear material storage facility is used to store non-irradiated nuclear material. Nuclear material is delivered to the Giatsint critical test facility and the Yalina subcritical test facility for work on scientific programs.

The nuclear material storage facility under construction. A special authorization (license) was obtained for the construction of a new nuclear material storage facility, dated 13/07/2015. Work is underway on the construction of the new nuclear material storage facility and development of documentation for its commissioning.

The ***Giatsint Critical test facility*** is in operation. The Giatsint Critical test facility is intended for research in the physics and safety of neutron multiplication systems and provides an experimental base for solving a wide range of problems in the development of nuclear technologies of a fundamental and applied nature. At the critical test facility, experiments can be conducted on more than 20 critical assemblies with a water moderator, with a zirconium hydride moderator and without a moderator. A system for heating uranium-water critical assemblies to a temperature of 90 °C is being created. Projects have been developed for new critical and subcritical assemblies based on fast neutrons with 19.75% enrichment in uranium-235, simulating the physical features of a new generation of fast reactors and electronuclear gas-cooled systems. In 2017-2019, experimental studies of uranium-water critical assemblies with 19.75, 36 and 90% enrichment in uranium-235 were carried out as part of the following programs: State scientific research program “Energy systems, processes and technologies” (subprogram 1.3 “Nuclear energy and nuclear physics technologies”) and the State program “High technology and equipment” for 2016-2020 (subprogram 6 “Scientific support for the development of nuclear energy in the Republic of Belarus ”). Also at the critical test facility, work was carried out under a contract with Idaho National Laboratory (USA) and research agreements with IAEA.

The ***Kristall critical test facility*** is in the long-term shutdown mode. A project was developed to modernize the Kristall critical test facility, including modernization of the control and protection system. Projects have been developed for new critical and subcritical assemblies based on fast neutrons with 19.75% enrichment in uranium-235, simulating the physical features of a new generation of fast reactors and electronuclear liquid metal-cooled systems. Work was carried out under a contract with the Idaho National Laboratory (USA).

The ***Yalina subcritical test facility*** (SCTF) consists of two zero-power subcritical assemblies YALINA-T and YALINA-Booster and the NG-12-1 neutron generator. The basic systems of life support, management, security and physical protection are common to both subcritical assemblies. The Yalina subcritical test facility (SCTF) (assemblies YALINA-T, YALINA-BT) is intended for research in the physics of subcritical systems controlled by external neutron sources, and for studying the characteristics of transmutation of long-lived radioactive waste from nuclear power. The facility can be used to solve a number of applied problems - neutron activation analysis of geological samples, research and testing of radiation resistance of materials and products for various purposes, developing technologies for the production of integrated circuits. Research is carried out as part of the State Program of Scientific Research for 2016-2020 “Energy Systems, Processes and Technologies”, subprogram 1.3 “Nuclear Energy and Nuclear Physics Technologies” and the State Program “Scientific Support for the Development of Nuclear Energy in the Republic of Belarus for 2009-2010 and for the period until 2020 ”

Spent nuclear fuel storage facility The fuel was transferred to the Russian Federation in 2010. The spent nuclear fuel storage facility was decommissioned in March 2018, and operation of the storage facility for the intended design purpose was terminated.

Construction of a nuclear power plant in the Republic of Belarus

In March 2011, in Minsk (Republic of Belarus), an Agreement was signed between the Government of the Russian Federation and the Government of the Republic of Belarus on cooperation in the construction of a nuclear power plant in the territory of the Republic of Belarus. The agreement fixed that the construction of the Belarusian nuclear power plant is carried out on a turn-key basis by the Russian party. The general contractor is Atomstroyexport JSC (ASE JSC), the customer is the State Enterprise “Belarusian NPP” (at the time of signing the agreement – the State Institution “Directorate for the Construction of the Nuclear Power Plant”), defined as well as the operating organization. The Belarusian NPP will consist of two power units with a total electric capacity of up to 2400 (2x1200) MW.

For the construction of the Belarusian NPP, the project “AES-2006” of the Joint-Stock Company Saint-Petersburg Research and Design Institute of Energy Technologies

ATOMENERGOPROEKT (ATOMENERGOPROEKT JSC) was selected, which is characterized by enhanced safety characteristics and technical and economic parameters. The construction of a nuclear power plant under this project provides:

creation of a 3+ generation nuclear power plant, characterized by a new reactor facility with additional safety systems: passive heat removal system; passive system for filtering leaks into the intershell space; double protective containment; a fuel melt trap in case of a beyond-design-basis event;

maximum implementation of the in-depth defense principle - creation of a system of barriers to the spread of ionizing radiation and radioactive substances into the environment and a system of technical and organizational measures to protect the barriers, as well as maintain their effectiveness during direct protection of the population.

The system of barriers for NPP in the "AES-2006" project includes a fuel matrix, shells of fuel elements, the boundary of the reactor coolant circuit, tight enclosure of localizing safety systems.

The barriers ensure safety functions such as reactivity management, removal of residual heat and localization of radioactive materials in operational states, during and after a design-basis event and, as far as practicable, in the event of emergency conditions of beyond-design-basis events.

The main technical characteristics of the power units of the Belarusian NPP are given in table 2.

Table 2

Main technical characteristics of the power unit of the Belarusian NPP with WWER-1200

Parameter	Value
Number of units, pcs.	2
Service life, years: – reactor system	60
– steam-turbine plant	50
Power unit capacity, MW:	
– electric (gross)	up to 1,200
– thermal	3,200
Power unit heating capacity, MW	46.6
Installed capacity utilization factor, RU	0.9
Electricity consumption for own needs (including costs of circulating water supply and site water supply), %	7.0
Number of fuel assemblies in the core, pcs.	163
Number of fuel assemblies with CPS CE, pcs.	121
Duration of the fuel-element lifetime, years	3-4
Main parameters of the primary coolant (when the RS is operating at rated capacity):	
core inlet temperature, ° C	298.2
core outlet temperature, ° C	328.9
core coolant heating, ° C	30.7
coolant flow rate through the reactor, m ³ / h	88,000
core outlet pressure, MPa	16.2
SG outlet steam pressure, MPa	7.0
SG steam capacity, tph	1,602
feed water temperature, °C	225
steam humidity at SG outlet, %, NMT	0.2

The AES-2006 project was also the basis of the Leningrad NPP-2 project, which is being constructed in the Leningrad Region of the Russian Federation. During its development, a

comparison was made of the main characteristics and parameters of the NPP power unit WWER-1200 with the data of the reference NPP equipped with WWER-1000 (V-428) and with foreign nuclear power plants.

The project complies with international standards and recommendations of the IAEA, as well as principle 1 of the Vienna Declaration on Nuclear Safety dated February 9, 2015: “new nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions.”

According to the General Contract for the Construction of the Belarusian Nuclear Power Plant between RUE “Belarusian NPP” (Republic of Belarus) and ASE JSC (Russian Federation), the General Contractor undertakes to perform all necessary work, including prospecting, develop working documentation, perform construction, commissioning, supply equipment, as well as perform other work provided for by this contract for the construction and commissioning of the NPP in the Republic of Belarus consisting of two units under the conditions of the General Contractor’s full responsibility (“turnkey”) at the NPP industrial site.

In November 2013, Presidential Decree of the Republic of Belarus No. 499 dated November 2, 2013 was signed (which was preceded by issuance of a license to erect the foundations and basements of buildings and structures of Unit 1 of the Belarusian NPP) and construction works began at the site of Unit 1.

In February 2014, a license was obtained to erect the foundations and basements of buildings and structures of Unit 2014 of the Belarusian NPP. In June 2014, construction works began at the site of Unit 2.

In April 2014, a license was obtained for the construction (full cycle) of Unit 1, and in December 2014 - for the construction (full cycle) of Unit 2.

In April 2019, sub-stage A-1 of commissioning of Unit 1 of the Belarusian NPP was launched.

Commissioning of power unit 1 of the Belarusian NPP is scheduled for 2019, and power unit 2 is scheduled for 2020.

In 2015 the Decree of the Council of Ministers of the Republic of Belarus No. 460 of 02/06/2015 [57] brought into force the Strategy of Radioactive Waste Management at the Belarusian NPP which determines the ways of development of the RWM system at the Belarusian NPP. It describes the manner of managing various types of RW at the Belarusian NPP at all stages of the waste life cycle; establishes the term for the construction of the disposal facility, determines the resources required to achieve the established goals (for details see the [Article 19 \(8\) Management of spent nuclear fuel of this National Report](#)).

According to the [Summary](#) of this National Report, the Republic of Belarus performed on voluntary the stress tests of the Belarusian NPP according to the methodology of the European Nuclear Safety Regulators Group (ENSREG) and the European Commission and passed a peer review of its results by the European regulators in the sphere of nuclear safety, during which the regulators applied new 2014 WENRA safety reference levels to the Belarusian NPP.

ARTICLE 7. LEGISLATIVE AND REGULATORY FRAMEWORK

- 1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.*
- 2. The legislative and regulatory framework shall provide for:*
 - i) the establishment of applicable national safety requirements and regulations;*
 - ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;*
 - iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses;*
 - iv) the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.*

Legal framework for activities in the field of nuclear and radiation safety is carried out on the basis of international best practices and taking into account the recommendations of the IAEA. Safety principles defined in the IAEA publication No. SF-1 “Safety Fundamentals”, as well as main provisions of other IAEA safety standards. They are addressed in the Law of the Republic of Belarus dated July 30, 2008 No. 426-Z “On the Use of Nuclear Energy” and regulations on republican government authorities in the field of nuclear energy. The government announced the adoption of a global nuclear safety regime, commitment to implementation of the nuclear energy program in compliance with international conventions and treaties [1, 2, 6, 7, 10, 11] through their adoption and ratification in Belarus.

Article 7 (1) Establishing and maintaining a legislative and regulatory framework

Legislation in the field of nuclear and radiation safety has an hierarchical structure and is based on the principle of compliance of regulatory legal acts of lower legal power with the requirements of acts of greater legal power. The system of legislation in the field of nuclear and radiation safety includes:

- laws of the Republic of Belarus;
- regulatory legal acts of the President of the Republic of Belarus;
- resolutions of the Government of the Republic of Belarus;
- regulatory legal acts of republican government authorities carrying out state regulation of activities to ensure safety in the nuclear energy;
- rules and regulations for ensuring nuclear and radiation safety, as well as other technical regulatory legal acts in the field of nuclear energy.

After the decision in 2008 on the implementation of a nuclear energy program in the Republic of Belarus [28], the regulatory legal basis in the field of nuclear and radiation safety has undergone significant adjustments.

At the same time, by 2019, the main basis of legislative acts (including laws, decrees and Presidential Decrees of the Republic of Belarus) has mostly been formed. It is based on the following:

Law of the Republic of Belarus “On the Use of Nuclear Energy” [29];

The Law of the Republic of Belarus dated January 5, 1998 No. 122-3 “On Radiation Safety of the Population” [20], which ceases to be valid in connection with the adoption of a new Law of the Republic of Belarus dated 18 June 2019 No. 198-3 “On Radiation Safety” [21] (will be placed in force from June 27, 2020).

Decree on licensing of certain types of activities issued by the President of the Republic of Belarus on 1 September 2010 No.450 [30];

Decree on Ensuring Safety During the Construction of the Belarusian Nuclear Power Plant issued by the President of the Republic of Belarus on 16 February 2015 No.62 [39].

Presidential Decree of the Republic of Belarus dated October 5, 2017 No. 361 “On the

Establishment of an Institution”.

Law “On the Use of Nuclear Energy” regulates relations connected with the design, location, construction, commissioning, operation, limitation of operational characteristics, extension of service life and decommissioning of a nuclear facility and (or) storage facility, as well as relations connected with handling nuclear materials during the operation of a nuclear facility and (or) storage facility, spent nuclear materials and (or) operational radioactive waste, and other relations in the field of nuclear energy.

Law “On Radiation Safety of the Population” defines the basis of legal regulation in the field of radiation safety of the population, aimed at creating conditions that protect the life and health of people from harmful effects of ionizing radiation. A new Law of the Republic of Belarus "On Radiation Safety" has been prepared containing innovations related to delimitation of competencies of State authorities in the field of radiation safety assurance, establishment of radiation hygiene monitoring as an independent element of the radiation safety system, determination of the types of exposure situations, application of a differentiated approach to development of actions regarding emergency preparedness and response, establishment of a regulation system and certain kinds of technical regulations in the field of nuclear and radiation safety, inspections of safety of ionizing radiation sources; introduction of consultancy, etc.

Requirements in the field of radiation safety (health physics) are implemented in a new Law "On Radiation Safety" in accordance with the international safety standards, in particular, the safety requirements of IAEA GSR Part 3, GSR Part 7, etc.

Legislation acts in the field of nuclear safety and radiation safety are available (in Russian) on the website of Gosatomnadzor <https://gosatomnadzor.mchs.gov.by/zakonodatelstvo>.

The Republic of Belarus has identified, acceded, ratified and is implementing activities under the following international treaties, agreements and conventions, to which it is a party:

Convention on Nuclear Safety, adopted in Vienna on June 17, 1994 (the Republic of Belarus acceded to the Convention by signing the Presidential Decree of the Republic of Belarus dated September 2, 1998 No. 430);

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, adopted in Vienna on September 5, 1997 (ratified by the Law of the Republic of Belarus dated July 17, 2002 No. 130-3);

Convention on Early Notification of a Nuclear Accident, adopted in Vienna on September 26, 1986 (ratified by Decree of the Presidium of the Supreme Council of the Republic of Belarus on December 18, 1986 No. 1216-XI);

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, adopted in Vienna on September 26, 1986 (ratified by Decree of the Presidium of the Supreme Council of the Republic of Belarus of December 18, 1986 No. 1216-XI);

Vienna Convention on Civil Liability for Nuclear Damage, adopted in Vienna on May 21, 1963 (ratified by the Law of the Republic of Belarus dated November 11, 1997 No. 76-3);

Convention on the Physical Protection of Nuclear Material, adopted on October 26, 1979 in Vienna (ratified by Decree of the Presidium of the Supreme Council dated June 14, 1993 No. 2381-XII);

The Republic of Belarus carries out multilateral and bilateral cooperation on nuclear safety and radiation safety issues. Bilateral agreements have been concluded and are being implemented with the Russian Federation (the country supplying nuclear technologies to the Republic of Belarus), as well as with Armenia, Austria, Germany, the People's Republic of China, Poland, France, Ukraine [4, 8, 9, 12 – 19], Hungary, Slovenia, Slovakia, Latvia, regulatory authorities of the Northern Europe countries (Norway, Sweden, Finland).

Article 7 (2) (i) National Safety Requirements and Regulations

In order to implement the standards contained in the laws of the Republic of Belarus and decrees of the President of the Republic of Belarus, since 2017, resolutions of the Council of Ministers of the Republic of Belarus [39-61] have been prepared and adopted on the following issues:

- interaction of republican government authorities, other state authorities and organizations upon detection of ionizing radiation sources, as well as in case of their seizure when transported across the State border of the Republic of Belarus;

- procurement of services for the use of nuclear energy;

- scientific and technical support of the regulatory authority;

- about inspection procedure;

- about public hearings on regulation decisions related to the Belarusian Nuclear Power Plant;

- on several issues of physical protection of nuclear facilities, and others.

The main efforts are currently focused on the development of regulatory legal acts, including technical regulatory legal acts (TRLA): standards and regulations for ensuring nuclear and radiation safety, the preparation of which is carried out by the regulatory authority with involvement of technical support organizations: SSI JIPNP Sosny (under the State program “Scientific Support for the Development of Nuclear Energy in the Republic of Belarus for 2009-2010 and for the period until 2020”, from April 2016 - subprogram 6 of the State program “High technology and equipment” for 2016 - 2020), the Centre for Nuclear and Radiation Safety, Belarusian-Russian University. The Republican Centre for Hydrometeorology, Radioactive Contamination Control and Environmental Monitoring, as well, as within their competence, the Ministry of Health, the Ministry of Natural Resources and Environmental Protection and other organizations also take part in the development of TRLA. In accordance with the legislation of the Republic of Belarus, TRLAs are subject to approval by concerned state authorities and other organizations.

In 2017 - 1st half of 2019, 21 decisions of the Ministry for Emergency Situations were adopted, which approved standards and regulations for ensuring nuclear and radiation safety, as well as amendments to 3 technical code of common practice (TCP).

The adoption and enactment of these documents led to further harmonization of the regulatory basis of the Republic of Belarus with modern international requirements to achieve high safety standards.

Work on improving the regulatory basis in the field of nuclear safety and radiation safety is carried out on a planned basis under annual Plans for organization of development / reworking of regulatory legal acts.

Improvement of the regulatory basis in the field of nuclear safety and radiation safety in the Republic of Belarus is carried out on the basis of a regular analysis of the need to develop new and (or) adjust existing regulatory legal acts at various levels, taking into account IAEA recommendations. This fact is evidence of compliance with principle 3 of the Vienna Declaration on Nuclear Safety dated February 9, 2015: “national requirements and regulations for addressing this objective throughout the lifetime of nuclear power plants are to take into account the relevant IAEA Safety Standards and, as appropriate, other good practices as identified inter alia in the Review Meetings of the CNS.”

Article 7 (2) (ii) Licensing System

A system of licensing activities in the field of nuclear energy, sources of ionizing radiation, and nuclear and radiation safety has been formed in the Republic of Belarus. The Regulation on licensing of certain types of activities approved by the Presidential Decree of the Republic of

Belarus dated September 1, 2010 No. 450 “On licensing of certain types of activities” [33] defines the basic regulatory requirements in the field of nuclear safety. Activity in the field of the use of nuclear energy and sources of ionizing radiation is defined as a licensed type of activity. Ministry for Emergency Situations of the Republic of Belarus is the regulatory and licensing authority in the field of nuclear and radiation safety. For direct implementation of the imposed tasks in this sphere, the Department of Nuclear and Radiation Safety (Gosatomnadzor) has been established in the Ministry for Emergency Situations.

Considering that the Belarusian NPP is being constructed using a Russian project, the licensing system for activities in the field of the use of nuclear energy and ionizing radiation sources in the Republic of Belarus is built by analogy with the Russian system.

The main licensed activities are:

- activities in the field of use of nuclear energy;
- activities in the field of use of ionizing radiation sources;
- radioactive waste management activities;
- activities for design and manufacture of process equipment for nuclear facilities, design and manufacture of radiation protection equipment;
- activity associated with safety review and assessment in field of nuclear energy use and ionizing radiation sources.

Activities in the field of nuclear energy use include the following works and (or) services: design, location, construction, operation, decommissioning of nuclear facilities;

design, location, construction, operation, decommissioning of nuclear material storage facilities;

handling of nuclear materials, nuclear fuel, spent nuclear materials, spent nuclear fuel, operational radioactive waste;

work and services to operating organizations that affect safety, including construction of facilities.

These activities are illegal without a license.

See Fig. 1 for a flowchart of the licensing procedure in relation to the use of nuclear energy in the Republic of Belarus.

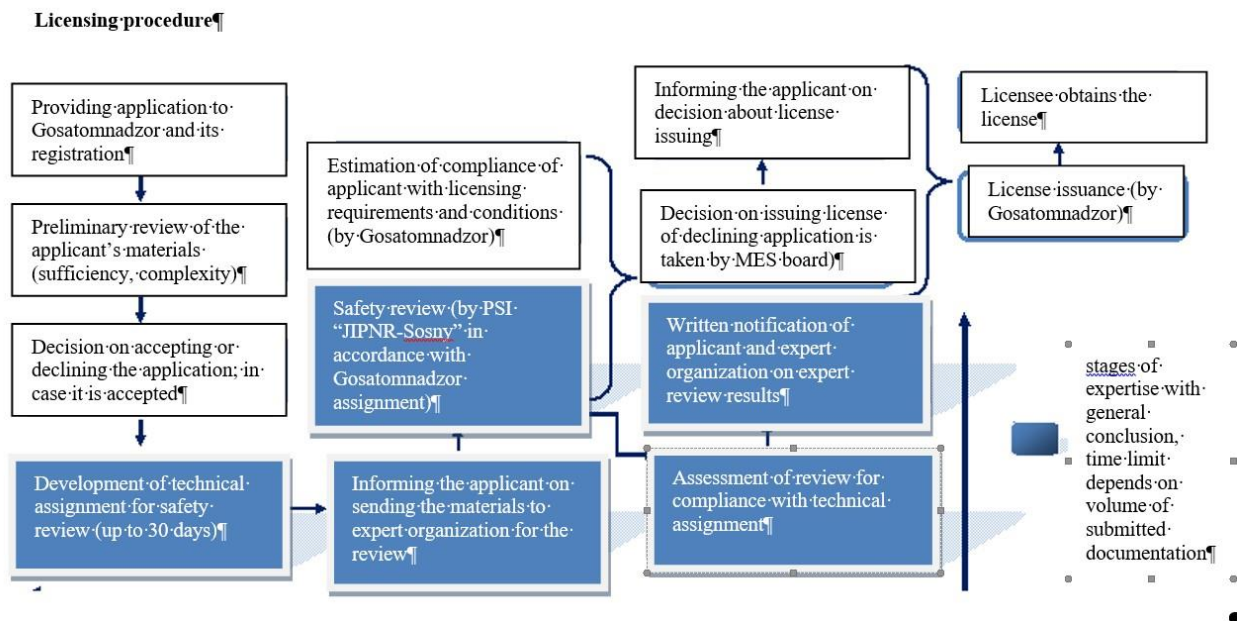


Fig. 1 - Licensing process for the use of nuclear energy and ionizing radiation sources in the Republic of Belarus.

The Government of the Republic of Belarus has approved the procedure for the review of documents substantiating nuclear and radiation safety in activities in the field of use of nuclear energy and ionizing radiation sources [50].

SSI JIPNP Sosny has been defined as the organization that provides scientific and technical support to the regulating authority, organizes and carries out scientific and technical support for the regulation of nuclear and radiation safety in accordance with legislative acts, including analysis and justification of criteria and requirements of such safety, research to improve the efficiency of state regulation in the field of nuclear and radiation safety of nuclear facilities, as well as safety reviews in the field of nuclear energy and sources of ionizing radiation use. SSI JIPNR Sosny is the only organization in the Republic of Belarus that has a special authorization (license) to conduct safety reviews in the field of nuclear energy use.

The license of RUE “Belarusian NPP” being an operating organization is issued only in case of positive results of the inspection performed for nuclear facility safety assurance. At the stage of the construction of nuclear facilities during licensing, an assessment was made of design decisions and measures taken to ensure their safety.

Issue of operating licenses will be carried out after the completion of the safety review of the documents submitted by the operating organization.

The object of the safety review of a nuclear facility are the documents substantiating the safety of the nuclear facility, design, engineering, process and operational documentation for the nuclear facility, submitted by the license applicant. The safety review is carried out in order to determine the safety level of a nuclear facility by comparing the design decisions and the results of their implementation with the requirements of legal acts, including technical legal acts in the field of nuclear and radiation safety.

In case of licensing SSI JIPNR Sosny, safety review is performed by Gosatomnadzor with the assistance of other scientific and technical support organizations.

The Law of the Republic of Belarus "On the Use of Nuclear Energy" of July 30, 2008 provides for a periodic safety assessment of the nuclear facility which is performed at all life cycle stages of the nuclear facility and (or) storage facility.

Non-governmental organisations and other organizations are entitled to put forward their representatives to participate in safety reviews at the stage of siting, design, construction, operation, decommissioning or limiting the operational characteristics of a nuclear facility, as well as conduct independent reviews.

On February 18, 2019, the Decree of the President of the Republic Belarus No. 70 amending the Decree of the President of the Republic Belarus No. 62 of February 16, 2015 was signed [38]. In accordance with the specified documents, the licensing authority has a right:

- to make changes and (or) additions to special licensing requirements and conditions, the details of which are indicated in the special permit (license) to carry out activities in the field of the use of nuclear energy and sources of ionizing radiation;

- to determine the list of work performed and the services provided to operating organizations affecting safety, including construction of facilities in the field of nuclear energy use, which require a special permit (license) to carry out activities in the field of use of nuclear energy and ionizing radiation sources;

- to determine a list of process equipment for nuclear facilities the design and manufacture of which requires a special permit (license) to carry out activities in the field of nuclear energy and ionizing radiation sources.

Gosatomnadzor empowered with the right to set the time frame for review and (or) assesment of compliance of the license applicant’s capabilities with the licensing requirements and conditions, including examination of documents substantiating nuclear and radiation safety, based on the volume of documents submitted by the applicant the special authorization (license) to carry out activities in the field of use of nuclear energy.

Article 7 (2) (iii) System of regulatory control and assessment

At the construction site of the Belarusian NPP, a special procedure has been established for the organization and implementation of safety control during the construction and commissioning of the plant (Decree of the President of the Republic of Belarus of February 16, 2015 No. 62 [38]), which allows all supervisory authorities to carry out constant supervision in their field using sanctions and other measures of enforcement. The procedure for its organization and implementation is determined by a separate Regulation, which was approved by the Resolution of the Council of Ministers of the Republic of Belarus dated February 25, 2015 No. 133 [55]. The adoption of these documents allowed continuing sequential steps to implement IAEA recommendations in national legislation to achieve high safety standards. Supervisory measures involve control (supervisory) authorities and their units presented in table 3.

Table 3

Supervisory authority	Including	Supervisory functions
State Committee for Standardization	Construction Control and Supervision Department (specialized inspectorate)	<ul style="list-style-type: none"> – Supervision of compliance with the requirements of TRLA during construction – Supervision of compliance with approved project documentation for construction and installation works – Supervision of compliance of materials, products and structures used in construction with design solutions and the requirements of TRLAs in the field of technical regulation and standardization
	State Metrological Supervision Authorities	<ul style="list-style-type: none"> – State metrological supervision
	State supervision authorities for compliance with technical regulations and standards	<ul style="list-style-type: none"> – Supervision of compliance with the requirements of TRLAs in the field of technical regulation and standardization – Monitoring (supervision) of compliance with the requirements of the legislation on conformity assessment related to mandatory confirmation of compliance
Ministry of Health		<ul style="list-style-type: none"> – Monitoring the quality of medical care provided to Belarusian NPP workers and their families in organizations engaged in medical activities, as well as medical examination of such workers and their families
	State sanitary supervision authorities and institutions	<ul style="list-style-type: none"> – State sanitary supervision of compliance with legislation in the field of sanitary and epidemiological welfare of the population
Ministry for Emergency Situations	Department for Supervision of Safe Work in Industry	<ul style="list-style-type: none"> – State supervision in the field of industrial safety
	Department of Nuclear and Radiation Safety	<ul style="list-style-type: none"> – Supervision of compliance with legislation in the field of nuclear and radiation safety
	State Fire Control Service Authorities	<ul style="list-style-type: none"> – State fire control service, supervision of compliance with the law in the implementation of activities to ensure fire safety

	Authorities and units for state supervision and control over activities to protect the population and territories from emergency situations	– State supervision and control in the field of protecting the population and territories from natural and man-made emergencies, as well as civil defense
Ministry of Natural Resources and Environmental Protection	Including its territorial units	– Supervision in the field of environmental protection, rational use of natural resources
Ministry of Labour and Social Protection	State Labour Inspection Department	– Supervision of compliance with labour legislation and labour protection
Ministry of Energy	State energy and gas supervision authorities	– State energy and gas supervision
Ministry of Internal Affairs	General Directorate of the Commander of the Internal Military Forces	– Supervision of compliance with design estimates for construction and installation work for equipping the Belarusian NPP with a set of engineering and technical means for physical protection

2 types of inspections are established - comprehensive inspection and permanent supervision. Comprehensive inspections are carried out by control (supervisory) authorities according to the decision of the Working Group for Coordination of Supervision of Construction of the Belarusian NPP in accordance with its competence based on the inspection program. Their distinguishing characteristic is that they simultaneously involve several supervisory authorities, which allows to instantly obtain a full picture of the safety at the Belarusian NPP. Permanent supervision is carried out by supervisory authorities with the aim of promptly assessing the safety status in order to prevent and suppress violations and eliminate their consequences at a frequency established by supervisory authorities. These inspections are carried out within the competence of supervisory authorities, which independently establish requirements for their implementation. Gosatomnadzor, in order to quickly assess the safety status of the Belarusian NPP and to carry out permanent supervision, created and organized the work of the corresponding territorial unit - the Division for Supervision of Nuclear and Radiation Safety at the NPP site (6 inspectors).

The main directions of inspections carried out by the regulatory authority during construction and commissioning of the Belarusian NPP are:

- compliance with license requirements and conditions, requirements of issued authorizations;

- compliance with the requirements of previously issued regulations;

- organization and functioning of quality assurance systems;

- ensuring nuclear and radiation safety requirements at the construction site of the Belarusian NPP during installation, adjustment, testing of systems, equipment and other elements, and incoming control of safety-critical equipment; preparation for commissioning and commissioning of the Belarusian NPP;

- manufacturing for the Belarusian NPP of equipment and other elements of the 1st, 2nd and 3rd safety grades, as well as the 4th safety grade, which are part of systems of 1st, 2nd and 3rd safety grades and (or) for which quality plans are developed;

- ensuring physical protection, accounting and control of nuclear materials;

ensuring radiation protection of personnel and population located in the area of influence of the Belarusian NPP;

planning of protective measures to ensure the safety of working personnel and population in the event of nuclear or radiation accidents.

Overall coordination of the supervision of the construction of the Belarusian NPP is carried out by the Ministry for Emergency Situations of the Republic of Belarus through the Working Group for Coordination of Supervision of Construction of the Belarusian NPP. In particular, the Working Group is responsible for decisions on:

- comprehensive inspection at the construction site of the Belarusian NPP;
- organization of the committee for conducting such inspection from among the representatives of regulatory (supervisory) authorities;
- appointment of inspection supervisor.

Article 7 (2) (iv) Enforcement of applicable regulations and terms of licenses

In accordance with the Regulation on the Department of Nuclear and Radiation Safety of the Ministry for Emergency Situations of the Republic of Belarus (approved by Decree of the President of the Republic of Belarus No. 756 [26]), Gosatomnadzor is empowered to supervise the implementation of legislation in the field of nuclear and radiation safety.

If violations of the legislation are revealed during the course of supervisory activities, an inspection act is drawn up based on the results of the inspection. On the facts of the revealed violations, an administrative offence report (reports) can be drawn up and (or) a judgement on the case of an administrative offense may be issued. Based on the act drawn up, a decision or requirement is made to eliminate the violations that were identified during the inspection. The decision on the inspection act, as well as the requirement, is binding.

The legislation provides that in cases when violations constitute a threat to national security, harm to life and health of the population, the environment, a requirement is made to suspend the activities of the inspected entity, production sites, equipment, operation of vehicles, production and sale of goods (works services) on the day when the violation is detected. This requirement must indicate the time period for suspension and the time period for informing the supervisory authority that violations have been eliminated. The presence of facts that indicate signs of a crime gives the right to the supervisory authority to transfer the verification materials to the prosecution authorities.

The inspected entity has the right to appeal the decisions of the supervisory authorities under the inspection act, as well as the requirements to eliminate violations, actions or inaction of the inspectors.

In case of violations of the legislation on licensing, licensing requirements and conditions by the licensee (his employee, a separate division), the licensing or other controlling (supervisory) authority shall issue a requirement (order) to the licensee in the prescribed manner to eliminate the violations and establish a term for their elimination. This term may not exceed 6 months.

If the licensee fails to eliminate the violations specified in the requirement (order) to eliminate the revealed violations, or the licensing or other controlling (supervisory) authority does not receive written notification of the elimination of such violations, or the licensing or other controlling (supervisory) authority has revealed a violation of special licensing requirements and conditions by the licensee (his employee, a separate division), the licensing authority on its own initiative or at the request of another controlling (supervisory) authority decides to suspend the license for up to 6 months.

If the licensee fails to eliminate the violations resulting in the suspension of the license in the specified term, or the written notice on elimination of such violations has not been submitted to the licensing or other controlling (supervisory) authority, the licensing authority that issued the license decides to terminate it.

A license is canceled by decision of the licensing authority if:

the license is issued on the basis of false information provided by its applicant that is necessary (relevant) for deciding whether to issue a license;

the licensee did not apply for a license within 6 months from the date of the decision to issue it;

the license was issued on the basis of an inspection opinion, that is recognized invalid.

For non-compliance with the requirements of the legislation in the field of nuclear and radiation safety, administrative liability is provided in accordance with the Code of the Republic of Belarus on Administrative Offenses or criminal liability in accordance with the Criminal Code of the Republic of Belarus [23, 25]. Criminal liability arises when facts that indicate the signs of a crime as defined in the Criminal Code of the Republic of Belarus are established during the inspection.

ARTICLE 8 REGULATORY BODY

Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities.

2. Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.

Article 8 (1) Establishment of a regulatory body

In accordance with the Law of the Republic of Belarus "On the Use of Nuclear Energy" of July 30, 2008 [29], the Ministry for Emergency Situations of the Republic of Belarus is an authority engaged in state management in the field of use of nuclear energy and in charge of regulation activities for safety assurance when using nuclear energy.

The status of the Ministry for Emergency Situations as the regulatory authority in the field of nuclear and health physics, its tasks and functions are enshrined in the Decree of the President of the Republic of Belarus of 12/11/2007 No.565 "On Several Measures Aimed at the Nuclear Power Plant Construction" [27].

For direct implementation of the imposed tasks in this sphere, the Department of Nuclear and Radiation Safety (Gosatomnadzor) – a separate department with the rights of a legal entity, has been established in the Ministry for Emergency Situations. The tasks and functions of Gosatomnadzor are enshrined in its Provision.

Gosatomnadzor:

- analyzes the accumulated experience of legislation implementation in the field of nuclear and radiation safety assurance and makes suggestions on its improvement, develops corresponding projects of standards and regulations in the field of nuclear and radiation safety, guidances for its performance, accompanies adoption (issuance) of regulatory legal acts, including technical regulatory legal acts, reference and other documents necessary for implementation and improvement of the activities in the field of nuclear and radiation safety assurance.

- performs licensing of the activities in the field of use of nuclear energy and ionizing radiation sources (adopts and reviews the documents provided, assigns examination of the documents substantiating nuclear and radiation safety, performs assessment of compliance of organizational and technical capabilities of the license applicant / licensee with the license requirements and conditions, issues properly prepared licenses, forms and maintains the license register, considers a question of termination of license);

- organizes and maintains state supervision in the field of nuclear and radiation safety;

- participates in planning of protective actions to provide safety of maintenance personnel in case of nuclear and radiation accidents;

- organizes and performs scientific researches to justify the principles and criteria of nuclear and radiation safety to increase the efficiency of state supervision;

- ensures functioning of State System of Registration and Control of Nuclear Materials of the Republic of Belarus, as well as Unified State System of Registration and Control of Ionizing Radiation Sources;

- ensures fulfilment of international obligations of the Republic of Belarus in the field of nuclear and radiation safety;

- informs the public in accordance with the legislation about the safety status of radiation facilities, nuclear facilities, etc.

The structure of Gosatomnadzor in view of pre-commissioning of the unit No. 1 of the Belarusian NPP and its further operation has been revised from March 11, 2019 (see fig. 2) with the enhancement of division responsible for organization of supervision over nuclear and radiation

safety of nuclear facilities by reallocation of human resources considering current knowledge and competences, as well as consolidation of inspection workforce capacity in one division of supervision over nuclear and radiation safety of ionizing radiation sources and nuclear facilities in regions and in Minsk.

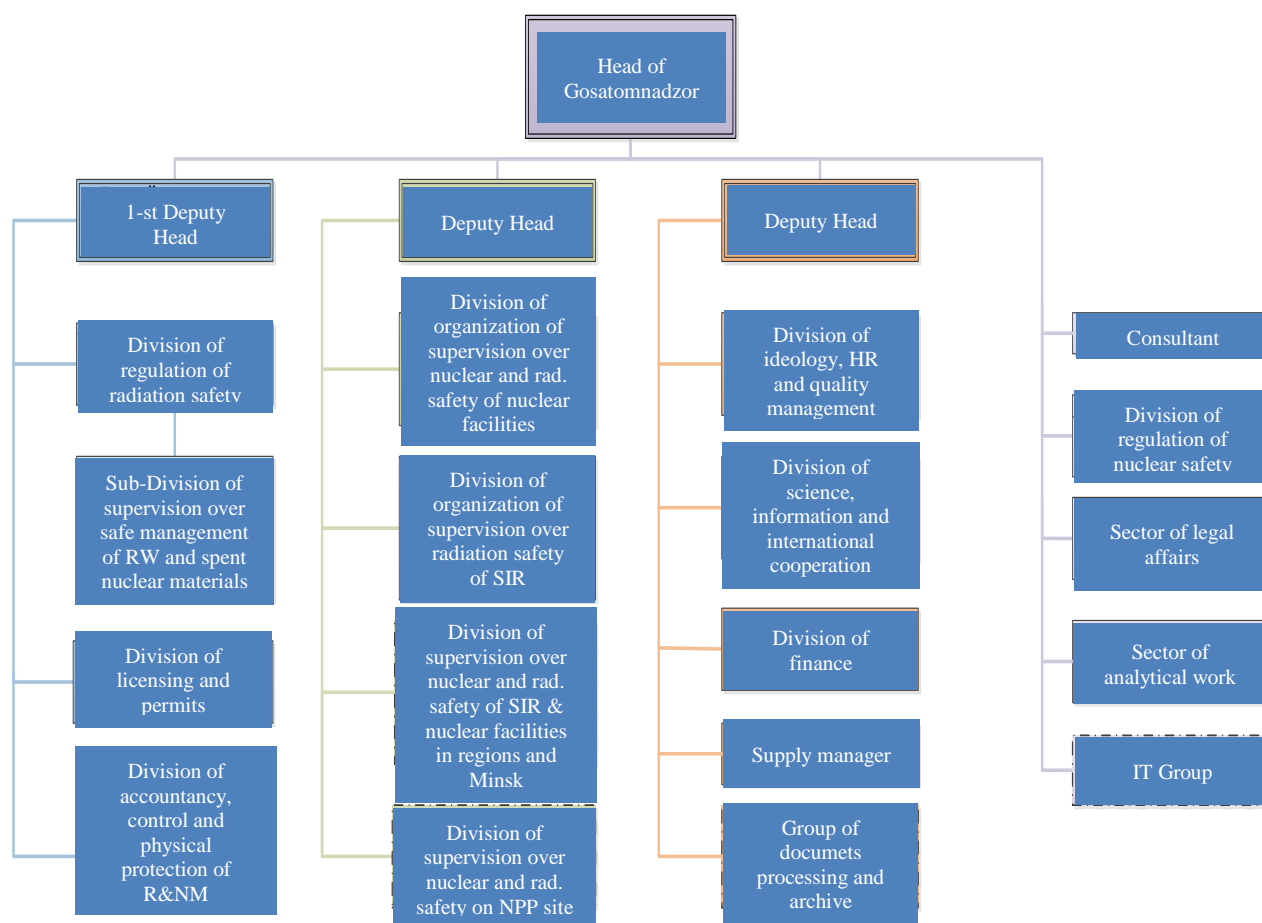


Fig. 2 Structure of the Department of Nuclear and Radiation safety of the Ministry for Emergency Situations of the Republic of Belarus (Gosatomnadzor) since 11/03/2019

Independence of regulatory authority (adoption of decisions, information channels, etc.)

The regulatory authority performs its functions in such a way as not to compromise its efficient independence.

State supervision in the field of nuclear and radiation safety is performed by scheduled, unscheduled inspections of design, allocation, construction, commissioning, operation and decommissioning of nuclear facilities. The main method of state supervision is inspection of compliance with the legal requirements performed by the inspected entity, as well as the actions (failure to act) of its public officials and other persons.

The Ministry for Emergency Situations is headed by the Minister. The Minister reports directly to the President of the Republic of Belarus and regarding the issues relating by the Constitution of the Republic of Belarus, laws of the Republic of Belarus and acts of the President of the Republic of Belarus to the competence of the Council of the Republic of Belarus – to the Prime Minister of the Republic of Belarus.

Gosatomnadzor is headed by the Head appointed and dismissed by the President of the Republic of Belarus at the suggestion of the Minister for Emergency Situations.

Gosatomnadzor Head reports to the Minister for Emergency Situations, manages Gosatomnadzor activity and is personally liable for implementation of its tasks and functions.

The activity of Gosatomnadzor is financed from the State budget and other sources in accordance with the legislation, independently of the funds of organizations and authorities responsible for promotion and implementation of nuclear and radiation technologies.

Financing from the republican budget is annually justified and requested for the actions associated with nuclear and radiation safety to ensure the activities of Gosatomnadzor (labour remuneration, business travel expenses, equipment and software procurement, etc.), as well as financing for obtainment of expert and consulting assistance, arrangement of scientific research, professional development and enrichment of the employees.

The Government of the Republic of Belarus supported implementation of important additional national instruments to ensure scientific and technical support in implementation of nuclear program, as well as continuous education of specialists. These are two state programs with assignment of corresponding republican budget:

State training program for nuclear power industry of the Republic of Belarus for 2016-2020;

State program "Scientific Support of Nuclear Power Industry Development for 2016-2020", subprogram "High Technologies and High-Technology Equipment".

In addition, in 2018 a joint Russian and Belarusian program of nuclear and radiation safety improvement was developed for its further implementation.

Human Resources and Nuclear Knowledge Management

Currently the regulatory authority has sufficient number of competent and qualified employees commensurating with the character and the number of facilities and the scope of activity for efficient and successful implementation of all corresponding types of activities in the fields associated with safety at proper time.

A set of planned training event is continued aimed at acquisition and continuous improvement of knowledge and skills necessary for job performance and improvement of its qualification with the purpose to ensure task execution considering transfer to preparation stage to commissioning and operation of the unit No.1 of Belarusian NPP: the fields of professional competence are determined; position profiles are developed; individual plans of professional training of the personnel are developed and implemented annually considering all financial sources and previous training (participation of Gosatomnadzor employees in training events as part of international and bilateral cooperation was noted at the 7th Meeting of the Contracting Parties to the Convention on Nuclear Safety in 2017 as "area of good performance").

For intensive development and support of competences, both internal and external sources are used:

the sources of subprogram 10 "Personnel Training for Nuclear Power Industry" of the State Program "Education and Youth Policy" for 2016-2020 approved by the Resolution of the Council of Ministers of the Republic of Belarus of March 28, 2016 No. 250. Intensive training in the country supplying nuclear technology (Russian Federation);

European Commission international technical assistance projects ("Support and assistance in enhancing the capabilities of the Belarusian nuclear regulatory authority of the MES/Gosatomnadzor in the field of licensing and supervision of the construction of the Belarusian Nuclear Power Plant (NPP)" BY3.01/13, "Support and assistance in strengthening the capacity of the Belarusian nuclear regulatory authority" BY3.01/16);

IAEA international technical assistance project "Improving the competencies of the regulatory authority and its technical support system at the stage of commissioning and operation of the Belarusian NPP";

the European Commission's regional project "Training and Internships" ("T&T"), training events for international IAEA and European Union technical assistance projects.

Significant number of workshops within the projects of international technical support of IAEA and the European Union is organized in the Republic of Belarus (Minsk, Ostrovets) allowing to increase not only the competence of the Gosatomnadzor staff and the concerned emergency authorities and divisions, organizations being a part of the Ministry for Emergency Situations system, but also the employees of the Ministry of Health, the Ministry of Economy, the Ministry of Natural Resources and Environmental Protection, Ministry of Foreign Affairs, SSI JIPNR Sosny, RUE Belarusian NPP, Research Institute for Nuclear Problems of the Belarusian State University, State Institution “N. N. Alexandrov National Cancer Centre of Belarus”, Public Health Institution Minsk City Clinical Oncologic Dispensary, and other organizations, as well as to perform the leading functions in the regulation in the field of nuclear and radiation safety.

Regarding supervision over construction of the Belarusian NPP and production of equipment, development of regulatory documents, advisory support is provided by the technical support organization of the regulatory authority of the Russian Federation FSUE VO "Safety".

Interaction is being carried out within the framework of the Regulators Cooperation Forum (RCF), the Regulators Cooperation Forum of Countries Operating Nuclear Power Plants with WWER Reactors (WWER Forum), and the Western European Nuclear Regulators Association (WENRA).

Within the framework of the European Commission's project BY3.01/16, a permanent expert mission is working in the Republic of Belarus, which includes representatives from France, Germany, and Ukraine. Mission experts provide assistance to Gosatomnadzor by consulting on strategic and business issues in all the fields of regulatory activities in nuclear and radiation safety.

To improve efficiency of performance of regulatory functions of Gosatomnadzor, training plans for Gosatomnadzor personnel were prepared and implemented according to the special programs (operation examination of equipment and systems of Belarusian NPP) in the training centre of Belarusian NPP.

Special attention in Gosatomnadzor is given to professional training of the staff engaged in safety assessment and analysis, execution of state supervision in the field of nuclear and radiation safety.

Efficiency assessment of actions taken to achieve and maintain competence of Gosatomnadzor employees is performed by regular knowledge testing (including with participation of external experts) and appraisals (as a rule, once in three years), analysis and processing of claims to Gosatomnadzor activities (if any), the results of external audits (IAEA mission, inspection of Gosatomnadzor activities by the Ministry for Emergency Situations, other competent authorities of the Republic of Belarus). Therefore, it is guarantee that the employees have necessary skills, knowledge and experience to perform their professional duties.

Due to the long-term nature of the nuclear power programme human resources spanning over several generations are required which entailed Gosatomnadzor's work on forming a comprehensive and systematic approach to identification, acquisition, creation, distribution, use and preservation of knowledge related to the achievement of the established goals in line with the strategic documents as follows: Policy, Development Strategy and Regulating Strategy, as well as a range of more specific thematic strategies.

Management System of the Regulatory Authority

The Gosatomnadzor management system is developed in accordance with the tasks and functions defined by the requirements of the legislation of the Republic of Belarus, it is being evaluated and constantly improved. Area of responsibility, subordination, level of authority and interaction are established by the provisions on structural divisions, job descriptions, the order of the Head of Gosatomnadzor “On the Distribution of Duties between the Gosatomnadzor head and deputies” and other in-house documents.

Activities of Gosatomnadzor are performed within the Prospective Programme of the Activities of the Ministry for Emergency Situations for 2016 - 2020 (developed for the five-year

period), the instructions of the President of the Republic of Belarus, of the Council of Ministers of the Republic of Belarus, of the administration of the Ministry for Emergency Situations of the Republic of Belarus based on strategic planning. Gosatomnadzor has developed the Regulating Strategy and the Gosatomnadzor Development Strategy, 8 thematic strategies on supervisory issues, human resources and knowledge management, information and communication, international cooperation, etc. (the documents have been approved by the Board of the Gosatomnadzor) on which basis a strategic plan of events for Gosatomnadzor for the years 2016 to 2020 was formed, annual plans of Gosatomnadzor activities are developed, as well as six-months-plans of activities of the Gosatomnadzor structural divisions. Due to the commissioning and operation of the Belarusian NPP, changes in the legislation regarding the use of atomic energy and the sources of ionizing radiation, considering the studied international experience in the field of regulation, it is planned to update the top level strategic documents with support of the European experts (within the framework of the European Union international technical assistance project BY3.01/16 Support and Help for the Development of the Potential of Belarusian Regulating Authority in the Field of Nuclear and Health Physics, approved by Decree of the Council of Ministers of the Republic of Belarus No. 700 of 26/09/2018).

By the order of Gosatomnadzor a decision had been taken on adoption the management system to the IAEA safety requirements. Implementation of an integrated management system (IMS) is provided (in line with the Plan of Actions on Coordination of the Gosatomnadzor Management System with the IAEA Requirements GSR-2 Part 2).

Gosatomnadzor Head and deputy heads are the members of the Gosatomnadzor Coordination Council on the IMS integration, which function include the determination of the procedure and term of works aimed at the coordination of the Gosatomnadzor management system development in accordance with the IAEA requirements; agreement of the Gosatomnadzor Policy and goals; resource planning necessary for the realisation of plans and the achievement of the established goals; provision of support for the creation and operation of the Gosatomnadzor IMS; coordination of actions within the Gosatomnadzor at implementation of its Policy, goals and tasks, etc. Responsibilities on the coordination of the development and implementation of the management system are established by the provisions on the Coordination Council on the IMS Implementation, on the administration representative on IMS, on the IMS process manager, by the provisions on Gosatomnadzor structural divisions and job descriptions.

The Coordination Council on the IMS implementation has approved a list of 17 IMS processes which have to be documented. When documenting, priority is given to the main processes.

The IMS documents are being developed (updated) with expert support within the IAEA and the European Union international technical assistance projects.

The activities on monitoring, analysis and improvement includes:

assessment of the degree of achievement of the planned indicators;

confirmation of the compliance of the Gosatomnadzor activities with the legislative requirements of the Republic of Belarus and satisfaction of the concerned parties;

determination of the possibilities for the improvement of the department's activities.

For the improvement of the performance of its functions by Gosatomnadzor, its activities are continuously evaluated by the administration of Gosatomnadzor and of the Ministry for Emergency Situations.

Gosatomnadzor also continuously improves its activities by utilising the results of:

internal audits;

external audits (Gosatomnadzor activities inspections conducted by the Ministry for Emergency Situations, other competent authorities of the Republic of Belarus. IAEA missions IRRS (2016), EPREV (2018), ISSAS (2019) have taken place; national plans on the implementation of recommendations and suggestions of the IRRS and EPREV missions were developed and are in place);

analysis of reports from the concerned parties (including claims, reclamations, etc.), requests from the Gosatomnadzor web-site, information obtained at on-site general meetings at the Belarusian NPP construction site, meetings on the issues of nuclear and radiation safety during the construction of the Belarusian NPP;

the study of experience of the regulating authorities in other countries, etc.

An obligation of continuous IMS improvement is established by the Policy of the Department for Nuclear and Radiation Safety of the Ministry for Emergency Situations of the Republic of Belarus for the years 2015 to 2018 and until 2020, approved by the decision of the Gosatomnadzor Board.

To improve competence on the implementation and improvement of the integrated management system, it is arranged that Gosatomnadzor employees continuously undergo training within the framework of sub-programme 10 Personnel Training for Nuclear Power Industry of the Education and Youth Policy State Programme for the years 2016 to 2020, approved by Decree of the Council of Ministers of the Republic of Belarus No. 250 of 28.03.2016 (earlier, State Programme of Personnel Training for the Nuclear Power Industry of the Republic of Belarus for the years 2008 to 2020, approved by Decree of the Council of Ministers of the Republic of Belarus No. 1329 of 10.09.2008), and of other budget funds allocated to Gosatomnadzor, the IAEA and the European Union international technical assistance projects.

According to the National Action Plan on the fulfillment of recommendations and suggestions from the IAEA IRRS mission, approved by Deputy Prime-Minister of the Republic of Belarus No. 33/213-272/78 of 09.02.2018, the deadline for the completion of the creation, implementation and assessment of the integrated management system is 2020.

All the above activities shall ensure the preparedness to the necessary regulating actions and decisions related to the preparation for the commissioning of Unit No. 1 of the Belarusian NPP including:

regulation of the fresh nuclear fuel supply (a complex of regulating activities is in place which components are licensing of the Belarusian Railways (December 2018), a comprehensive inspection of the facility preparedness to the acceptance and storage of the fresh fuel for the Unit No. 1 of the Belarusian NPP (November 2018), a planned thematic inspection in advance of the fresh fuel supply);

licensing of the Unit No. 1 of the Belarusian NPP operation (Gosatomnadzor has approved the Terms of Reference for the safety review; the safety review is conducted by the expert organisation SSI JIPNR Sosny; Gosatomnadzor has methodological support from the European experts during the review within the European Commission technical cooperation projects);

prepare and hold public hearings (a legal basis has been created for the public hearings to be held as a result of the safety examination: Presidential Decree No. 70 of 18 February 2019 and Decree of the Council of Ministers No. 258 of 24 April 2019 have been adopted. The activity was based on the IRRS recommendations for the 'Ministry for Emergency Situations/Gosatomnadzor to continue and finalise implementation of plans on informing and consulting the public when making important regulatory decisions');

established priority of on-the-job training for the inspectors and experts in the field of safety review (utilising the well-established tool of multi- and bilateral cooperation emphasizing close cooperation with the regulating authority of the supplying country, Rostehnadzor of the Russian Federation).

Simultaneous continuous improvement of the regulating infrastructure takes place in compliance with the main safety principles and the IAEA requirements. Expert assessment instruments are widely used with compliance with their recommendations: INIR 2012, IRRS 2016, EPREV 2018, ISSAS May 2019, INIR Phase 3 and IPPAS are being prepared. Also in 2018, a peer review of the stress tests results at the Belarusian Nuclear Power Station was conducted by a group of the European experts ENSREG.

Special contribution to the current development and future sustainability of the regulating activities of the country is made by the large-scale international assistance through comprehensive

IAEA, EC, RCF technical cooperation projects and within the framework of 14 bilateral agreements with the foreign regulatory authorities and TSOs.

Technical Support of the Regulatory Authority

In order to improve state regulation in the field of nuclear and radiation safety, the Decree of the Council of Ministers of the Republic of Belarus dated December 2, 2012 No. 991 "On the Provision of Scientific and Technical support to the Ministry for Emergency Situations in the Field of Nuclear and Radiation Safety" defines a list of 16 leading organizations of the country to provide technical support to the regulatory authority for nuclear and radiation safety matters.

To implement international requirements and recommendations, carry out coordinating functions between scientific and technical support organizations, as well as to increase the efficiency and effectiveness of scientific and technical support organizations to the regulatory authority in the field of nuclear radiation safety, the Scientific Technical Institution "Centre for Nuclear and Radiation Safety" was created by Decree of the President of the Republic of Belarus dated October 5, 2017 No. 361 "On the Creation of the Enterprise" in the structure of the Ministry for Emergency Situations. The Centre provides scientific and technical support to the regulatory authority in assessing the safety of nuclear facilities and ionizing radiation sources, assessing safety while management of radioactive waste and nuclear materials, provides support in making decisions on emergency planning and response, and develops draft technical regulatory legal acts in the field of nuclear and radiation safety, conducts scientific research in the field of nuclear and radiation safety, including the preparation and maintenance of international scientific programs.

One of the leading organizations providing scientific and technical support to the regulatory authority is **the State Scientific Institution "The Joint Institute for Power and Nuclear Research – Sosny" of the National Academy of Sciences of Belarus**. The Institution has a license to conduct safety review in the field of atomic energy use. Scientific and technical support of the Institute to the regulatory authority includes conduction of safety review in the field of atomic energy use, conduction of scientific research to justify the principles and criteria of nuclear and radiation safety, participation in the development of technical regulatory legal acts in the field of nuclear and radiation safety. Currently, the Institute is conducting a review of documents substantiating nuclear and radiation safety in carrying out activities in the field of the use of atomic energy with regard to the operation of a nuclear facility (Unit No. 1 of the Belarusian NPP), handling of nuclear materials, spent nuclear materials, nuclear fuel, spent nuclear fuel, operational radioactive waste from the Belarusian NPP as part of the licensing process, in accordance with the terms of reference, approved by the Head of Gosatomnadzor dated 17/11/2017.

In addition to the mentioned above organizations, the following organizations are involved in the provision of scientific and technical support to the regulatory authority:

State Scientific and Production Association of Powder Metallurgy, State Scientific Institution "Powder Metallurgy Institute" of the National Academy of Sciences of Belarus, which provides support on the validity and safety of using various materials in the manufacture of mechanical equipment for NPP, composite and superhard materials, protective coatings, welding, pulsed technologies ;

State Scientific Institution "Institute of Applied Physics of the National Academy of Sciences of Belarus", whose activity is focused on the applicability of methods and means of non-destructive testing and technical diagnostics of materials, products and technological processes, consideration of technical documents substantiating the strength of pressure vessels for NPP, the formation of regulatory requirements in this area;

State Scientific Institution "Institute of Heat and Mass Transfer named after A.V. Lykov of the National Academy of Sciences of Belarus", which provides support on the dynamics, transfer and elementary processes of heat and mass transfer in atomic energy systems, in the formation of safety requirements for heat and mass transfer technologies, equipment and apparatus used in NPP, in the application of numerical methods and software packages for the

numerical simulation of physical and chemical and heat transfer processes of NPP when justifying safety;

State institution “Centre for Geophysical Monitoring of the National Academy of Sciences of Belarus”, whose activities are focused on the justification of geophysical matters, including seismic safety of NPP;

State Institution “Republican Centre for Hydrometeorology, Control of Radioactive Pollution and Environmental Monitoring”, which provides support on the development of regulatory requirements for the limitation of radioactive pollution of the environment and related monitoring, as well as verification of their implementation;

State Educational Institution “University of Civil Protection of the Ministry for Emergency Situations of the Republic of Belarus”, Institution “Research Institute of Fire Safety and Emergency Situations” of the Ministry for Emergency Situations of the Republic of Belarus, whose activities are focused on the consideration of documents and their assessment, from the point of fire safety and protection of the population and territories in case of emergency;

Belarusian State University, providing support in the consideration of documents justifying the safety of a nuclear reactor and in conducting neutron-physical safety analysis;

Educational Institution “International State Ecological Institute named after A.D. Sakharov” of the Belarusian State University, whose activities are focused on forecasting and the validity of preliminary assessments of damage to the environment as a result of design and beyond design accidents at NPP;

Republican Scientific Research Unitary Enterprise "Institute of Radiology" of the National Academy of Sciences of Belarus, providing support on agricultural production safety issues in the surveillance zone, in improving the methodology for informing the public about environmental safety in the construction and operation of NPP;

State Educational Institution "Republican Institute of Higher Education" in terms of advanced training of employees of the regulatory authority, organization and conduction of educational inspections in the direction of control (supervision) over nuclear and radiation safety, accounting and physical protection of nuclear materials, radioactive substances and radioactive waste, in the issues of assessment of professional competencies, assessment of quality management systems of licensees;

Belarusian National Technical University, whose activities are related to the issues of conducting thermal-hydraulic and probabilistic safety analyzes of NPP, assessing the reliability of structures, buildings and facilities;

Educational Institution “Belarusian State University of Informatics and Radio Electronics”, which provides support on the justification of the safe operation of the automated control system of NPP technological process (CAPCS), instrumentation and automation of NPP (Electrical Control & Instrumentation);

Research Institute "Institute of Nuclear Problems" of the Belarusian State University, whose activities are focused on the modeling of nuclear-physical processes and the conduct of neutron-physical safety analysis of NPP;

State Institution of Higher Professional Education “Belarusian-Russian University”, providing support in the development of regulatory legal acts in the field of materials science, requirements for alloyed composite materials used at the NPP site, conducting production tests as part of the examination of technical solutions justifying the durability of materials used on NPP.

Currently, Gosatomnadzor is actively working on concluding agreements with each organization, within the framework of which it will cooperate in the implementation of activities to provide scientific and technical support to Gosatomnadzor in the field of nuclear and radiation safety. Currently, agreements have been concluded on the interaction of Gosatomnadzor with: State Educational Institution "Republican Institute of Higher Education", the Research Institution "Institute of Nuclear Problems" of the Belarusian State University, the State Scientific Institution "Institute of Heat and Mass Transfer named after A.V. Lykov of the National Academy of Sciences of Belarus". Is preparing to sign an agreement on the interaction of Gosatomnadzor with the

Belarusian State University, the Educational Institution "International State Ecological Institute named after A.D. Sakharov" of the Belarusian State University.

In accordance with the IAEA requirements, the presence of an expert community with a wide range of competencies in the field of nuclear and radiation safety and related fields is considered an integral attribute of regulatory infrastructure in countries experienced in nuclear energy.

In the Republic of Belarus, 65 experts of the leading organizations of the country received the right to conduct safety review in the field of atomic energy use, 12 experts in the field of use of ionizing radiation sources. Due to the lack of sufficient experience in this field, before its acquisition (5 years), 3 candidates were enrolled in the reserve (State Educational Institution "Civil Protection University of the Ministry for Emergency Situations of the Republic of Belarus", Educational Institution "Belarusian State University of Informatics and Radio Electronics", Centre for Nuclear Safety and Health Physics). The formation of expert pool by the regulatory authority continues.

Gosatomnadzor annually provides internships, trainings, advanced training of experts and specialists of scientific and technical support organizations of the Ministry for Emergency Situations of the Republic of Belarus in the field of nuclear and radiation safety in accordance with plans developed in the framework of the European Union's Training and Internship Projects (T&T), IAEA regional projects and international technical assistance projects.

Article 8 (2) Status of a regulatory body

The scheme of key government and regulatory authorities involved into nuclear and radiation safety provision, as well as in the use of atomic energy in the Republic of Belarus has not changed and is presented in Fig. 3.

The Ministry for Emergency Situations in its activities is subordinate to the Council of Ministers of the Republic of Belarus, maintains direct communication with state (government) authorities of a higher level in cases where such communication may be necessary for the effective implementation of the functions of the regulatory authority.

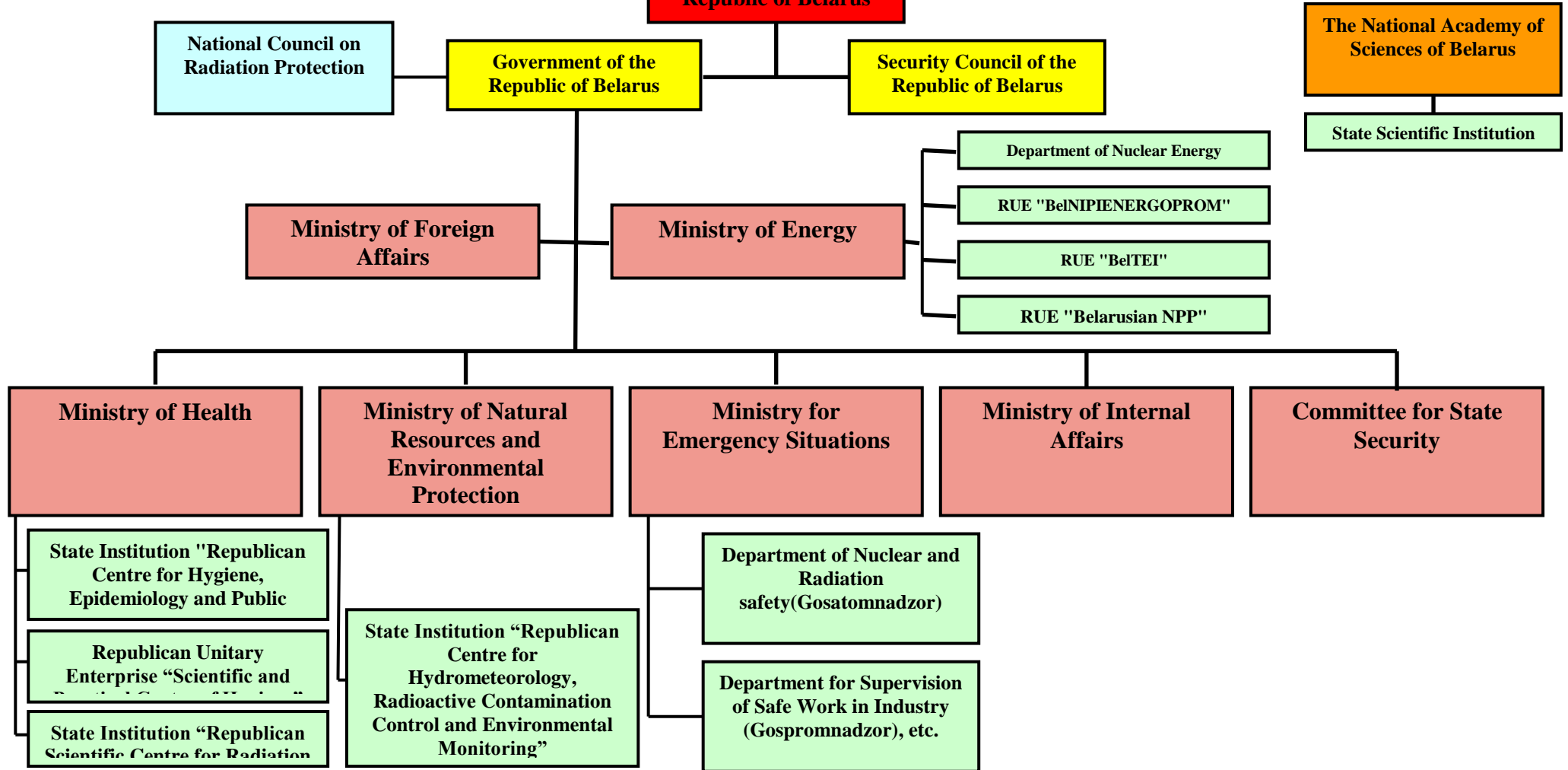


Fig. 3 Scheme of key government and regulatory authorities on issues of nuclear and health physics, use of atomic energy

ARTICLE 9. RESPONSIBILITY OF THE LICENCE HOLDER

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

In the Republic of Belarus, licensing of activities in the field of the use of atomic energy and ionizing radiation sources is regulated by the Provisions on the licensing of certain types of activities, approved by Decree of the President of the Republic of Belarus No. 450 dated September 1, 2010. The features of the licensing process, the main licensed activities, works and (or) services are described in [Article 7 \(2\) \(ii\)](#) of this National Report.

In accordance with the Law of the Republic of Belarus “On the Use of Atomic Energy”, the operating organization develops and implements measures to maintain and enhance the safety of a nuclear facility, creates, if necessary, appropriate services that monitor safety, and submits information on the state of safety of these facilities to State regulatory authorities when using atomic energy within the terms set by them.

The operating organization provides:

- use of a nuclear facility and (or) storage facility only for the purposes for which it is intended;
- the organization and conduction of work in such a volume and quality that meets the requirements of technical regulatory legal acts at all stages of siting, design, construction, commissioning, operation, limitation of operational characteristics, extension of the lifetime for the operation, decommissioning of a nuclear facility and (or) storage point;
- development and implementation of measures to prevent the occurrence of a radiation accident during the implementation of activities for the use of atomic energy and to reduce its negative consequences for employees (personnel), citizens and the environment;
- safe management of nuclear materials, spent nuclear materials and (or) operational radioactive waste for employees (personnel) and citizens;
- formation and targeted use of the decommissioning fund for a nuclear facility and (or) storage facility and the fund for financing work to maintain and improve the safety of a nuclear facility and (or) storage facility;
- realization of the rights of employees (personnel) for social guarantees;
- accounting of individual radiation doses of employees (personnel);
- development and implementation of measures to protect employees (personnel) and citizens in the surveillance zone in case of a radiation accident during the implementation of activities for the use of atomic energy;
- accounting and control of nuclear materials, spent nuclear materials, operational radioactive waste and other sources of ionizing radiation;
- physical protection of nuclear facilities;
- development and implementation of fire safety measures at a nuclear facility and (or) at a storage facility;
- radiation survey and radiation monitoring in the sanitary protection zone and surveillance zone;
- selection, training, retraining and maintaining the appropriate qualifications, as well as the necessary number of employees (personnel);
- informing of citizens in the surveillance zone about the radiation situation;
- fulfillment of other obligations established by the legislation.

The operating organization, in accordance with the law, is responsible for non-compliance with the requirements for ensuring the safety of a nuclear facility and (or) storage facility.

If the decisions on the suspension or termination of a special permit (license) that gives the right to operate a nuclear facility and (or) a storage facility are made in the prescribed manner, the republican government authority or other state organization that is responsible for these facilities takes measures to ensure their safety. If the renewal of such a special permit (license) is not possible,

the relevant republican government authority or other state organization that is in charge of these facilities takes measures to create a new operating organization.

In accordance with the legislation on licensing, the licensing authority or other state authorities, other state organizations, within their competence, exercise control over fulfilment of the legislation on licensing, licensing requirements and conditions by licensees [33]. On the part of the regulatory authority, state supervision of compliance with licensing requirements and conditions in the field of the use of atomic energy and sources of ionizing radiation by licensees, within their competence, is organized and carried out by Gosatomnadzor in accordance with the tasks assigned to it (Decree of the President of the Republic of Belarus dated November 12, 2007 No. 565 [26]). For their implementation, Gosatomnadzor has the right to attract qualified specialists in the established manner to participate in conducting safety supervision over nuclear facilities and nuclear infrastructure.

If the application submitted by the license applicant contains false information necessary (relevant) to make a decision on the issuing of a license, the licensing authority decides to refuse to issue a license to the applicant.

The specifics of compliance practices when the violations of the legislation on licensing or the established requirements and conditions for the implementation of the licensed type of activity by the licensee are identified by the licensor or other state authority that is authorized to control the implementation of the licensed type of activity, are described in [Article 7 \(2\) \(iv\)](#) of this National Report.

The licensee maintains an open and transparent communication with the public through the planning and implementation of his information activities using various channels. In particular, RUE "Belarusian NPP" implements it through its own website <http://www.belaes.by/>, information centers in Ostrovets and Minsk, through interaction with the media, participation in information and other events.

ARTICLE 10. PRIORITY TO SAFETY

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

Licensee's (Republican Unitary Enterprise "Belarusian NPP") measures to implement the priority of nuclear safety

Legislative framework

According to the Decree of the President of the Republic of Belarus dated March 29, 2011 No. 124 "On measures for the implementation of international treaties in the field of civil liability for nuclear damage" [34] Republican Unitary Enterprise "Belarusian NPP" is the operator (operating organization) of nuclear facilities - units No. 1 and No. 2 of the Belarusian NPP. The main objectives of this enterprise as an operating organization are to carry out on its own, or with the involvement of other organizations, the activities related to the location, construction, commissioning of the NPP, and other activities provided for by the Law of the Republic of Belarus dated July 30, 2008. "On the Use of Atomic Energy" [29].

The General Safety Provisions (GSP NPP) [65] defines that the operating organization ensures the safety of the NPP, including measures to prevent accidents and reduce their consequences, accounting and control, physical protection of nuclear materials, radioactive substances and radioactive waste, radiation control of the state of the environment in the sanitary protection zone and in the surveillance zone, and also ensures the use of the NPP only for those purposes for which it was designed and constructed. The operating organization is fully responsible for the safety of the NPP. The responsibility of the operating organization is not removed in connection with the independent activity and responsibility of organizations performing work or providing services for the NPP, as well as state safety regulatory authorities.

The principle of ensuring safety, as the highest priority, surpassing, if necessary, all other factors, was declared by the leadership of the Republican Unitary Enterprise "Belarusian NPP" in the Safety Policy of the organisation.

Radiation safety

Ensuring radiation safety of personnel, the public and the environment is regulated by the requirements of regulatory legal acts, including technical regulatory legal acts of the Republic of Belarus, local regulatory legal acts of the Belarusian NPP.

Belarusian NPP has issued a radiation safety policy. The aim of the radiation safety policy is to protect current and future generations of people from the harmful effects of ionizing radiation. The main objective of the implementation of the radiation safety policy is to create conditions under which the achievement of the policy objective is most effectively ensured. Implementing a radiation safety policy, the Belarusian NPP follows three basic principles:

- the prohibition of all types of activities on the use of ionizing radiation sources, in which the benefits obtained do not exceed the risk of possible harm caused by additional exposure to the natural radiation background;

- ensuring that the basic maximum permissible doses will not be exceeded;

- maintaining at the lowest possible and achievable level the radiation doses and the number of exposed persons, taking into account economic and social factors, when using sources of ionizing radiation.

In addition, the Policy stipulates that any employee initiatives aimed at maintaining and improving radiation safety will be reviewed and supported.

Until the commissioning of the Belarusian NPP, control of the provision of nuclear and radiation safety shall be arranged including:

- technological radiation survey;

- dosimetry radiation monitoring;

- radiation survey of premises and industrial sites;
- radiation survey to prevent the spread of radioactive contamination;
- radiation survey of the environment.

Nuclear Safety

Nuclear safety is understood as the fulfillment of a set of organizational and technical requirements and measures to exclude the possibility of a nuclear accident. Its aim is to protect citizens and the environment from the harmful effects of ionizing radiation by ensuring the proper operating conditions of the nuclear facility and (or) storage facility, as well as proper handling of nuclear materials and used nuclear materials.

For the construction of the Belarusian NPP, a project was selected that corresponds to the current level of development of nuclear energy and meets the modern safety requirements. The project was developed in accordance with the requirements of the regulatory documents in the field of the use of atomic energy in the Russian Federation which are mandatory in the design, construction and operation of NPPs. International experience in operating reactors of the WWER-1000 type, the IAEA recommendations and safety standards, the requirements of European operating organizations for new generation nuclear power plant designs with LWR reactors, as well as the NRC materials were used. The Belarusian NPP was designed to be resistant to the impacts similar to those at Fukushima Daiichi NPP.

The design of the Belarusian NPP provides for the availability of safety systems and involves engineering solutions and the system of the necessary measures which implementation brings the reactor unit into a controlled state characterized by stabilization of its parameters in the accidents within and beyond the design. The use of special technical systems and tools allowed by the project makes it possible to reserve the basic safety functions and ensure the appropriate level of nuclear safety of the Belarusian NPP. Such systems include:

- passive residual heat removal system from containment (SPOT 30);
- passive residual heat removal system via steam generators (SPOT PG);
- core melt localization device;
- containment hydrogen control system.

The project stipulates a double containment dome, which together with other localizing systems provides reliable retention of radioactive products during normal operation, anticipated operational occurrences, accidents within and beyond the design.

At the stage of obtaining a license for the construction of the Belarusian NPP, the following documents were developed that justify the safety of the Belarusian NPP: "Preliminary safety analysis report" (PSAR) and "Probabilistic safety analysis of level 1 for internal initiating events" (PSA-1). At the stage of obtaining a license for the operation of the Belarusian NPP, the following documents were developed: "Final safety analysis report (preliminary edition)", the information provided in the report corresponds to the actual state of the NPP according to the results of the construction, manufacturing, installation, pre-commissioning activities and inspections at the power unit; "Probabilistic safety analysis level 1 for internal initiating events, internal fires and flooding, external hazards of natural and man-made nature, seismic impacts"(PSA-1), "Probabilistic safety analysis of level 2 for internal initiating events, internal fires and flooding, external hazards of natural and man-made nature" (PSA-2). According to the results of the analysis of the accidents beyond design-basis modes of the Belarusian NPP outlined in the PSA, the ability to manage accidents beyond design has been demonstrated, which in turn allows to effectively limit their consequences. The project takes into account significant external impacts: explosions; floods; air crashes; hurricanes, whirlwinds, tornadoes; snow and ice loading; seismic effects. When the safety analysis of the Belarusian NPP was performed, the considered basic list of possible initiating emergency events, based on the requirements of regulatory documents, was expanded taking into account:

- design features of the constructed nuclear power plant;
- safety system configurations in the project of the constructed nuclear power plant;
- many years of experience in the design and exploitation of operating power units of nuclear power plants with WWER reactors;

licensing projects for power units with the WWER reactors in the Russian Federation;
the IAEA recommendations;
results of the PSA of levels 1 and 2.

In accordance with the results of the quantitative assessment performed in the framework of PSA-1 and PSA-2 for nuclear fuel in the core and spent fuel cooling pool, when operating at the nominal power level, reduced power levels and in the shutdown mode: the average value of the total frequency of nuclear fuel damage is 1.77×10^{-6} (1 / year); the average value of the total frequency of excess of a large accidental release is 9.70×10^{-8} (1 / year). PSA has been conducted with consideration of the primary initiating events, primary fires and floods, external extreme influences of the natural and anthropogenic nature and of seismic influences during the unit operation at nominal power level, reduced power levels and in the shutdown mode for the nuclear fuel in the active zone and in the spent fuel cooling pool. This parameter corresponds to the III+ generation reactors (reactors with passive safety systems).

Safety culture

The process of creating and maintaining a safety culture at the Belarusian NPP consists of the following main areas of activity:

- the formation of professional and psychological preparedness of personnel on safety culture issues;
- building a commitment to the safety culture in everyday activities;
- safety culture monitoring;
- holding the concluding day on safety culture;
- development and implementation of corrective and preventive measures to improve the safety culture.

The operating organization has introduced local legal acts and teaching materials that provide: compulsory education, training and knowledge assessment of newly hired employees on the Safety Culture course, where the basic principles of the safety culture, commitment to the safety culture at all levels, the role of the human factor in ensuring the safety culture at nuclear power plants are studied;

- regular assessment of the level of personnel safety culture in the performance of their routine work;

- improving the safety culture of personnel as part of the implementation of maintenance and continuing education programs;

- management of work with the organization's personnel, based on the principles of safety culture.

The obligations of the employees of the operating organization regarding the management of work on the formation of the safety culture, as well as on the implementation of the safety culture during training, are determined by the requirements of the job descriptions of the employees of the enterprise.

In order to create the necessary conditions for continuous improvement of safety culture at the plant and individual levels, to develop a commitment to safety culture at the Belarusian NPP, as well as to create an atmosphere of trust and openness when considering (discussing) issues related to safety, a consultative coordinating body will be created at the Belarusian NPP accountable to the Director General - Council for the Safety Culture of the SE "Belarusian NPP".

In order to facilitate the effective functioning of the system for the formation and maintenance of the safety culture, executives in charge of safety culture (safety culture officers) will be appointed in the structural units of the Belarusian NPP.

In order to determine the state of the safety culture at the Belarusian NPP, the dynamics of its change, timely identification of problematic issues, negative trends and positive practices in the field of safety culture for making decisions aimed at developing the safety culture at the Belarusian nuclear power plant, it is planned to analyze, assess and monitor the state of culture safety.

In accordance with the Regulation on the formation and maintenance of the safety culture of the State Enterprise "Belarusian NPP", on April 22, 2019, the Director General of the SE "Belarusian

NPP" approved the "Action Plan for the formation and maintenance of the safety culture at the State Company "Belarusian NPP" for 2019".

Independent Safety Assessments:

For continuous improvement of safety of the Belarusian NPP independent supervisory commissions are invited for the consideration of separate issues of safety provision, including such under the IAEA authority:

October 2016 – Integrated Regulatory Review Service (IRRS);

January 2017 – Site and External Events Design (SEED) mission;

October 2018 – Emergency Preparedness Review (EPREV);

May 2019 – Nuclear Material Accounting and Control (ISSAS).

Targeted implementation of recommendations and consideration of suggestions from the mission have been ensured.

On August 5, 2019 IAEA Operational Safety Review Mission (Pre-OSART) began work at the Belarusian NPP.

In 2016 to 2018, stress tests have been conducted at the Belarusian NPP by the methodology of the European Nuclear Safety Regulators Group (ENSREG). The European Nuclear Safety Regulators have conducted a peer review of the results.

Control and supervision over the measures implemented at the SE "Belarusian NPP" with the purpose of prioritised attention to safety

In 2015, by Decree of the President of the Republic of Belarus No. 62 of 16/02/2015 On Provision of Safety during the Construction of the Belarusian Nuclear Power Plant [38], a special procedure for the arrangement and performance of control (supervision) of the safety provision during the construction and commissioning of the Belarusian NPP has been established; details of its arrangement and implementation are described in [Chapter 7 \(2\) \(iii\) of this National Report](#). During implementation of the control and supervision actions, special attention is paid to the issues regarding the realisation of measures by the operating organisation for the formation and implementation of the safety policy, introduction and development of the safety culture, safety control and self-assessment, introduction of a process-oriented management system.

A range of tools is used for the regulating control over the measures for the provision of safety priority.

Within the framework of issuing permits for work to the managing staff of the operating organisation, terms and conditions of validity of such permits are formed, in particular on maintaining and developing the qualification level, safety culture, safety responsibility, requirement of self-assessment (reports) of safety, etc.

A requirement of annual safety assessment by the operating organisation is established, as well as by the organisations providing services to the operating organisation, including submission of the corresponding report to the regulating authority. Such report shall contain:

self-assessment of the compliance of the organisational and technological resources of the licensee with the license requirements and conditions of the activities in the field of atomic energy including the works, services provided by the licensee and forming the licensed activities, of the regulatory legal acts including the technical regulatory legal acts and documents justifying the provision of nuclear and radiation safety;

self-assessment of the safety culture level.

The regulating authority is continuously conducting assessment of the measures providing the management systems operation, leadership, safety culture through the analysis of results of the inspections conducted. Inspections of the manufacturers and suppliers of the equipments important for the safety are also conducted with graded approach.

The key principle of the development of the compensating measures when deviations of the design and other documents are identified is the licensee's assessment of the impact on safety.

Engineering solutions containing such assessments are subject to consideration by the regulating authority prior to their implementation.

Safety issues are the key issues at the regular meetings of the regulating authority officials and the management of the operating organisation.

Based on the targeted safety re-assessment by the operating organisation, stress-tests, a National Action Plan has been prepared aimed at increasing the level of safety at the Belarusian NPP. Actions from the mentioned Plan are under control by the regulating authority by establishing the regulating requirements for the operating organisation.

Safety priority within the regulator's own activities

Gosatomnsdзор understands the importance of the development of the effective safety culture. Critical attitude, thorough approach to its own obligations and communication with the concerned parties are of growing urgency. The administration and employees of Gosatomnadzor play an important role in establishing and maintaining a high level of safety culture by expressing their commitment to safety, regular consideration of the processes affecting safety, showing direct interest in the most significant issues of the nuclear and radiation safety.

High safety priority is reflected in the Gosatomnadzor strategic documents. Thus, the issues of the development and support of a high level of safety culture at Gosatomnadzor are reflected in the Policy of the Department of Nuclear and Radiation Safety of the Ministry for Emergency Situations for the years 2015 to 2018 and until 2020; in the Gosatomnadzor Regulating Strategy and Gosatomnadzor Development Strategy for the years 2015 to 2018 and until 2020, approved by the decision of the Gosatomnadzor Board of 28/01/2016.

In accordance with the functions performed by the Department, the rights and liabilities of the Gosatomnadzor top management, its structural division heads and employees are distributed clearly.

The management at all levels promotes such behaviour, values and basic beliefs, which facilitate the development and maintenance of the effective safety culture. Gosatomnadzor employees can raise issues without the fear of prosecution; information about discipline in the bodies, divisions and organisations of the Ministry for Emergency Situations is discussed collectively.

For the collective discussion of the most urgent issues, a Commission has been established at Gosatomnadzor consisting of the Head of Gosatomnadzor (Chair of the Commission), his deputies and other administrative employees of Gosatomnadzor. To adopt decisions affecting safety, if necessary, working groups are being formed from the employees of the concerned Gosatomnadzor structural divisions.

When adopting decisions, main attention is drawn to the formation of responsibility and safety culture among the users of ionizing radiation sources, employees of organisations working in the field of the use of atomic energy.

Is necessary, Gosatomnadzor initiates consideration of safety issues at the meetings of the National Commission of Belarus on Radiation Protection at the Council of Ministers of the Republic of Belarus, at the meetings of Cross-agency Commission on the Coordination of the Plan of the Main Organisational Measures on the Construction of NPP in the Republic of Belarus, of the Working Group for the Coordination of Supervision over the Construction of the Belarusian NPP, at the field meetings of high-level officials at the NPP construction site.

Gosatomnadzor is continuously developing the safety culture within itself utilising the results of external audits (the IAEA missions, inspections of Gosatomnadzor activities by the Ministry for Emergency Situations, other competent authorities of the Republic of Belarus), of the analysis of the Gosatomnadzor activities to provide its efficiency (within the self-assessments conducted by the Gosatomnadzor administration and the heads of its structural divisions as well) and by detection of non-compliance and elaborating the prompt measures for the improvement of activities, of the experience of the foreign regulating authorities.

Actions on the improvement of the safety culture level are foreseen. It is planned, in particular:

a local conference on the status and development of the safety culture with participation of all concerned parties (governmental authorities and organisations involved in the implementation of the nuclear power programme) in 2020;

a self-assessment of the safety culture at Gosatomnadzor in 2021.

A systematic improvement of the level of competence of the Gosatomnadzor employees (including those for the administration of Gosatomnadzor and of the Ministry for Emergency Situations) is arranged. Safety culture issues are included in the training programmes for the Gosatomnadzor employees.

Special events for younger Gosatomnadzor employees are organised (information hours with the head of Gosatomnadzor, professional skills competitions, training, etc.) to show commitment to the safety culture.

ARTICLE 11. FINANCIAL AND HUMAN RESOURCES

1. Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.

2. Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.

Article 11 (1) Financial Resources

Financing of the construction of the nuclear power plant in the Republic of Belarus is carried out from republican budget, as well as attracted credit resources (including foreign ones).

The operating organization ensures the management and conduct of work to such an extent and of such quality that meets the requirements of technical regulatory legal acts at all stages of siting, design, construction, commissioning, limitation of operational characteristics, extension of the operational life, decommissioning of a nuclear facility and (or) storage facility.

The requirements of the Technical Code of Common Practice 170-2009 “General Provisions for Ensuring the Safety of Nuclear Power Plants” [65] established that the operating organization creates structural units to carry out activities at the NPP site for the construction and safe operation of NPPs, giving them the necessary rights, financial assets, material and human resources, and also oversees these activities.

The operating organization created structural units for the management and control of the construction and preparation for operation of the nuclear power plant. Structural units are empowered with the necessary rights, financial assets, material and human resources.

Financing of the construction of residential properties, housing, transport and industrial infrastructure of the nuclear power plant is carried out from republican budget within the framework of the State Investment Program, which is approved annually by the Decree of the President of the Republic of Belarus, in accordance with the applications received.

Financing of the construction of the nuclear power plant is carried out at the expense of the state export credit granted in accordance with the Agreement between the Government of the Republic of Belarus and the Government of the Russian Federation on the provision of the Republic of Belarus with a state export credit for the construction of the nuclear power plant in the Republic of Belarus dated November 25, 2011. A loan is provided to finance 90% of the contract for the construction of the nuclear power plant. To finance advance payments under the General Contract for the Construction of the Belarusian NPP, in the amount of 10 percent of the construction, the State Development Corporation VEB.RF and Belvnesheconombank Open Joint Stock Company (as settlement bank) provided an external state loan dated May 15, 2014.

In order to finance research, development and other works to maintain and improve the safety of nuclear facilities and the storage facility of the Belarusian NPP before commissioning of nuclear facilities, a fund to finance the work to maintain and improve the safety of a nuclear facility and (or) storage facility will be established.

To carry out works on decommissioning, early decommissioning or limiting the operational characteristics of nuclear installations, the Belarusian NPP will create a fund for decommissioning a nuclear facility. The nuclear facility decommissioning fund is used only to finance measures provided for by decommissioning programs, early decommissioning, or limiting the operational characteristics of a nuclear facility and (or) storage facility.

The source of financing the funds of the Belarusian NPP will be the profit from the sale of electric energy from the NPP.

In order to create a mechanism of financial provisions against liability for nuclear damage in the implementation of activities on the use of atomic energy in the Republic of Belarus, Presidential Decree of January 14, 2019 No. 15 “On liability for nuclear damage” was adopted. In accordance with the Decree, the form of financial provisions against liability for nuclear damage of the Belarusian NPP is civil liability insurance.

Thus, sufficient financial resources were provided for the implementation of the nuclear energy project at the current stage of development of the national nuclear infrastructure.

Gosatomnadzor, Department of Nuclear Energy of the Ministry of Energy of the Republic of Belarus, the Belorussian NPP and the Joint Institute for Power and Nuclear Research – Sosny of the National Academy of Sciences of Belarus are state institutions and are funded from the state budget.

Article 11 (2) Human Resources

A national training system has been formed in the Republic of Belarus, essential to provide nuclear energy field with highly qualified specialists, as well as to further maintain an appropriate level of knowledge for the safe, reliable and efficient operation of the nuclear power plant. The training system includes a set of organizational and technical measures conducted by the government, higher and secondary specialized educational institutions, and other state organizations.

In order to organize a comprehensive training system that provides the knowledge and skills necessary for the construction and safe operation of the nuclear power plant, nuclear and health physics, the safety of nuclear power plant personnel, the public and the environment, a series of activities is under implementation within subprogram 10 “Training personnel of the nuclear energy field” of the State Program “Education and Youth Policy” for 2016-2020, approved by the resolution of the Council of Ministers of the Republic of Belarus dated March 28, 2016 No.250 (previously, from 2008 to March 2016 - State Program for training personnel of the nuclear energy field).

According to the needs on the basis of applications from state authorities (organizations), a state order for training personnel was formed: the scope of training, retraining, advanced training (additional support) of specialists, scientists of higher qualification in accordance of specialties and employees' needs is determined by year; educational institutions that are currently providing training services are identified; the plans of yearly training in the appropriate educational institutions are finalized.

Within Subprogram 10 “Training personnel of the nuclear energy field”:

in higher educational institutions of the country (educational institutions “Belarusian National Technical University”, “Belarusian State University of Informatics and Radio Electronics”, “Belarusian State University”, “International State Ecological Institute named after Sakharov of the Belarusian State University” (in the past - “International Ecological University named after Sakharov”)) students continue to prepare for 8 new specialties in the field of nuclear energy, including “Nuclear physics and technology”, “Construction of thermal and nuclear power plants”, “Steam turbine installations of nuclear power plants” (instead of this specialty, a new one “Operation of Nuclear Power Plant” will be introduced in 2020), “Electronic control systems at nuclear power plants”, etc.;

internships for teachers and scientific workers of higher educational institutions abroad, internships for students in countries with developed nuclear energy were organized;

further training, internships and training seminars are available for specialists of the regulatory authority in the field of nuclear and health physics; state bodies carrying out control (supervisory) activities over the conduct of work at all stages of the life cycle of the Belarusian NPP, as well as their jurisdictional (subordinate) organizations and territorial authorities.

The training program for specialists with higher education for the operation of nuclear power plants includes basic (5-5.5 years) training at universities in the Republic of Belarus, including practical training abroad, special (0.5-3 years) training for specialists with work experience in power enterprises of the Republic of Belarus, studying at foreign universities, internships at existing nuclear facilities abroad, individual training programs at the educational centre of the Belarusian nuclear power plant.

Based on the paramount importance of training for the nuclear energy program, the Republic of Belarus, in addition to the activities outlined above, extensively uses the IAEA technical assistance (technical cooperation programs) to train specialists for the nuclear energy program. These programs provide expert and consulting assistance on the creation of a training system for nuclear energy, taking into account international experience and the IAEA recommendations, and include seminars

and training sessions, visits of Belarusian scientists and university professors to the NPP training centres and research institutes abroad, visits of Belarusian specialists to operating and under-construction nuclear power plants, as well as the development and delivery of a computer training system for organizations, participating in the implementation of the project of the construction of the Belarusian nuclear power plant.

Specialists of the organizations engaged in the use of atomic energy receive training in nuclear and radiation safety no later than one month from the date of their appointment and periodically in accordance with the requirements of regulatory legal acts, but at least once every five years. Training of specialists is carried out in educational institutions (centres) that have permission issued by Gosatomnadzor for the right to conduct training, retraining and advanced training of persons responsible for nuclear and radiation safety, as well as persons responsible for radiation monitoring at production facilities and locations supervised by Gosatomnadzor. These permits are issued by Gosatomnadzor as part of the administrative procedures.

Within the framework of the IAEA technical cooperation project BYE/0/006 “Development of human potential and a system for training specialists for the nuclear energy program”, an applied computer training system and the necessary software for the training of Belarusian specialists involved in the nuclear energy development program, which was tested and implemented in the Republic of Belarus and introduced in the Belarusian NPP since March 2016.

Since 2015, the Belorussian NPP has been a member of the World Association of Nuclear Power Operators (WANO), and therefore has the opportunity to:

- receive support in preparing for the IAEA expert missions at various stages of the construction and commissioning of the Belarusian NPP;

- participate in support programs for nuclear power plants organized and implemented by WANO;

- receive information on the operating experience of all nuclear plants in the world;

- participate in programs of technical visits to other nuclear power plants;

- participate in emergency response exercises as part of the Regional Crisis Centre;

- participate in training workshops held by WANO.

Large-scale cooperation of the Republic of Belarus with the IAEA and the European Union, other organizations and international associations is also carried out in terms of enhancing the competence of the Belarusian regulatory authority in the framework of technical cooperation projects and programs, as well as through the exchange of regulatory experience in the framework of the Regulators Cooperation Forum (RCF) of the Western European Nuclear Regulators' Association (WENRA), the Forum of Regulatory Authorities of Countries Operating the WWER Reactors.

In accordance with the legislation of the Republic of Belarus, the operating organization provides for the selection, training, retraining and advanced training of workers (personnel), as well as maintaining their required number at all stages of the NPP life cycle. The presence of qualified personnel in the field of nuclear and radiation safety is a general requirement for obtaining a special permit (license) for the right to carry out activities in the field of the use of atomic energy and sources of ionizing radiation.

The selection, training, clearance to work unsupervised and maintaining the qualifications of operating personnel are provided by the management of the Belarusian NPP. The Director General of the enterprise is the chief administrative leader and is personally responsible for nuclear safety and provides general guidance on how to ensure it, including general guidance on the training of the NPP personnel. Administration is subordinate to the Director General. The chief engineer of the nuclear power plant is the technical manager of the nuclear power plant and reports to the Director General. The Deputy Chief Engineer for Personnel Training organizes work on the training and advanced training of personnel, conducting training to ensure the maintenance of the safe and reliable operation of the nuclear power plant.

The system of selection and training of the NPP operating personnel is aimed at achieving, monitoring and maintaining the level of its qualifications necessary to ensure the safe operation of the plant in all modes, as well as to take actions aimed at mitigating the consequences of accidents when they occur.

Personnel training is carried out in the structural divisions and the training centre of the Belarusian NPP under the guidance of qualified specialists with experience in foreign NPPs. The training is organized in proportion to the recruitment of the personnel, taking into account education and work experience at existing energy facilities, and is carried out according to individual training programs.

Training of the Belarusian NPP personnel is carried out in the following main areas:

- within the framework of the State Program "Education and Youth Policy" for 2016-2020, Subprogram 10 "Training personnel for the nuclear energy field";

- within the framework of contractual obligations for the construction of the Belarusian NPP (General contract for the construction of the Belarusian NPP dated July 18, 2012 No. 77-598/1110700 concluded between the Belarusian NPP and Nizhny Novgorod Engineering Company "Atomenergoproekt", the managing company of ASE (Rosatom State Corporation Engineering Division);

- at workplaces in structural divisions and at the training centre of the Belarusian NPP;

- at third-party educational institutions of the Republic of Belarus and the Russian Federation.

In the framework of the State Program "Education and Youth Policy" for 2016-2020, Subprogram 10 "Training personnel of the nuclear energy field", professional training was conducted for the specialists of the Belarusian NPP in the specialty "Nuclear Power Plants and Installations" (direction "Operation of NPPs") of 16 people at Obninsk Institute of Atomic Energy, a branch of the National Research Nuclear University MEPhI, the Federal state autonomous educational institution of higher education and 16 people in the Federal state budgetary educational institution of higher education "Ivanovo State Energy University named after Lenin". Within the framework of this program, by the end of 2019, it is planned to train 16 more people at the National Research Nuclear University MEPhI.

The training of Belarusian specialists according to the General Contract, including internships at the existing power unit and the training at full-scale and analytical simulators, is provided by the Rosatom State Atomic Energy Corporation. The training is carried out by the instructors of the Novovoronezh Training Centre of JSC "Atomtehergo" in accordance with the Generalized Training Schedule for the Operational Staff of the Belarusian NPP for 2015-2019 and annual training schedules developed on its basis.

The number of industrial and production personnel of the two power units of the Belarusian NPP will be 2,321 people. The administration of the Belarusian NPP and operational workshops are staffed by qualified and experienced personnel with higher and/or secondary specialized education in the relevant field and related branches of knowledge, as well as experience in the relevant field. When calculating the number of operational personnel the following points were taken into account:

- three-shift work, in which each employee works eight hours a day based on a five-day work week;

- flexible working hours, rest days, holidays and sick days;

- provided that the employee works in the zone of controlled access, additional days of rest are added to the standardized vacation and days-off, since their working week will be formed on the basis of a six-hour working day;

- training in an educational centre.

Thus, one operational workplace is stuffed by six or seven employees.

The key positions of the operational personnel of the main control room with long training periods for the launch of power unit No. 1 of the Belarusian NPP are staffed by qualified specialists who underwent practical training including practice of the interaction as part of the shift (47 people) on the full-scale simulator of the Belarusian NPP and passed examinations to the board consisting of the leaders of the Belarusian NPP, Novovoronezh Training Centre of JSC "Atomtehergo", and ASE. Since January 2019, the training was continued for the personnel of the main control room of power unit No. 2 of the Belarusian NPP under the General Contract.

From 2016 to 2019, 658 managers and specialists of the Belarusian NPP underwent professional training at educational institutions of the Republic of Belarus.

To carry out their duties (participation in incoming inspections, conducting equipment input

control, analyzing design, factory and working documentation, overseeing equipment installation, etc.), 923 specialists (including 432 specialists within the framework of the General Contract) were trained according to individual educational programs and cleared to work unsupervised in the structural units of the service of the chief engineer of the Belarusian NPP.

Since the beginning of 2019, the Gosatomnadzor has issued permits for the right to conduct work on the use of atomic energy to the employees (personnel) of the Belarusian NPP. In February-April 2019, Gosatomnadzor issued permits for the following types of work:

- management of the operating organization;
- ensuring accounting and control of nuclear materials and spent nuclear materials;
- ensuring physical protection for nuclear facilities, nuclear materials, spent nuclear materials, and operational radioactive waste.

Prior to the issuance of the license for the operation of power unit No. 1 of the Belarusian NPP, permits will be issued for the right to conduct work on:

- the implementation of production control of nuclear and radiation safety during the operation of an atomic energy facility, the handling of nuclear materials, spent nuclear materials and operational radioactive waste;

- conducting a technological process at an atomic energy facility;
- ensuring accounting and control of operational radioactive waste.

ARTICLE 12 HUMAN FACTORS

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

Regulatory Requirements

In the Republic of Belarus, the regulatory requirements for taking into account the human factor in terms of its impact on nuclear and radiation safety are established both in relation to the activities in the field of atomic energy use and in relation to the design basis of a nuclear facility.

Thus, according to Article 11 of the Law of the Republic of Belarus On the Use of Atomic Energy, key works affecting safety can only be performed by the workers (personnel) of the operating organisations and of the organisations performing works and (or) providing services during the activities on the use of the atomic energy, provided such workers (personnel) have permits for the work within the activities on the use of atomic energy issued by the authorised governmental authority regulating safety during the use of atomic energy.

The list of works for which the workers (personnel) of organisations mentioned in the law On the Use of Atomic Energy require a permit for the activities on the use of the atomic energy, the requirements for such workers (personnel) including their education and the procedure to obtain the mentioned permits are defined by the decree of Government of the Republic of Belarus [58]. With that, issue of such permit is only possible in the presence of the documents on medical examination passed and on the absence of medical contraindications in the worker (personnel), as well as on the psycho-physiological examination passed [52].

Taking into account the influence of the human factor by selecting and ensuring the necessary level of qualification of the NPP personnel for activities during normal operation and violations of normal operation, including pre-emergency situations and accidents, the formation of the safety culture, is one of the requirements for the operating organization as one of the components of the principle of defence in depth (level 1), in line with the Norms and Rules in the field of atomic energy use "General Provisions for Ensuring the Safety of Nuclear Power Plants" of the country supplying technologies (the Russian Federation) (hereinafter, NP-001-15). In addition, the regulatory requirements establish the components of the formation and maintenance of the safety culture, the essence of which is based on the employee's influence on safety, consideration and timely elimination of the consequences of errors made by such an employee.

Impact of the human factor shall be taken into account within the operational experience analysis and in the event of deviations in the NPP's work [88, 93].

The human factor in the design of a nuclear facility

The regulatory requirements have been established for consideration of the influence of the human factor at the design stage of nuclear power plants. Thus, in the project of a nuclear power plant, measures should be stipulated to facilitate the adoption by the personnel of the right decisions and impede the adoption of the wrong ones, technical means should be provided to detect, correct and compensate for errors. The reliability assurance system should ensure the protection of the nuclear power plant against employee error, and minimize the likelihood of negative social and hygienic consequences of the error. A nuclear power plant should be insensitive to personnel errors, in particular, due to the operation of automatic control or protection systems that are designed taking into account the human factor. In these cases, tampering the NPP's work by the personnel is only allowed when there is enough time for diagnostics and corrective actions [101].

In particular, the design solutions of the power unit stipulate the measures to prevent possible personnel errors that violate its normal operation, and to limit their consequences. Technical measures are provided to prevent and limit the consequences of erroneous personnel actions that violate safety functions and can lead to accidents.

Measures of the licensee to take into account the influence of the human factor in the operation and maintenance of a nuclear facility

The presence of the qualified personnel, who perform their functions in good faith and clearly understand their place, role and responsibility in the overall production and safety process, is a decisive condition for the implementation of the Nuclear Power Plant Quality Assurance Program (hereinafter - NPP QAP (G)) of the licensee. Thus, one of the ways to reduce the influence of the human factor on ensuring safety by the licensee includes quality assurance activities in the selection and training of personnel. NPP QAP (G) establishes the requirements for the specified activity, as well as the basic principles, directions for its implementation and responsibility for its result.

General personnel requirements

The organization of work and the selection of personnel are determined by the requirements of the industry guideline, normative, technical and regulatory documents. The quality of work is ensured by the trained and authorized operational personnel, as well as the personnel of the organizations involved in commissioning NPPs, with practical skills and necessary qualifications. The safety culture is forming for all personnel through the necessary selection, education and training.

Medical requirements for personnel

Persons involved in the work for maintenance, commissioning, testing and repair of the NPP equipment undergo a preliminary medical examination in accordance with the approved lists indexes) of industries and professions and in the future they must undergo periodic medical examinations on time.

Workers employed at nuclear power plants in the positions that require obtaining permits for the right to work in the field of atomic energy use must undergo mandatory preliminary examinations in order to identify any medical, including psycho-physiological, contraindications.

Knowledge Testing Requirements

The administrations of organizations participating in the commissioning of the Belarusian NPP must ensure the preparation and testing of the personnel knowledge of safety standards and rules in the field of atomic energy use.

The results of the knowledge testing are recorded in the corresponding protocol. When carrying out work at the NPP site, personnel should have a certificate of knowledge testing with them and provide it to supervisors upon request.

In general, in accordance with the types of work performed, the following knowledge should be verified: rules for ensuring the operation of nuclear power plants; production and job descriptions; labor protection requirements; fire safety rules and regulations; norms and rules of radiation safety; safety standards and rules in the nuclear energy field; pre-commissioning programs and techniques for specific equipment or systems of the Belarusian NPP.

Responsibility of organizations for personnel composition and placement

The quantitative and qualitative composition of the personnel, their placement is determined by the administration of organizations involved in the commissioning of power units of the Belarusian NPP. Organizations involved in the commissioning of power units are responsible for the qualification of the personnel and their adherence to the rules, norms and production instructions.

Operating personnel

The administration of the Belarusian NPP organizes its work with the personnel, the main forms of which are selection, preparation, support and advanced training in accordance with the QMS PO 37/03.6-01-17 "Regulation on the organization of work with personnel of the SE "Belarusian NPP". The recruitment of personnel involved in the commissioning of the power unit is carried out in accordance with the requirements of the unified tariff and qualification reference book of jobs and professions.

Prior to the start of each phase of commissioning a power unit, workplaces should be fully staffed by the operational personnel in accordance with the schedule for opening and staffing workplaces by the operational personnel at the stages of commissioning a power unit of the Belarusian NPP. The administration of the Belarusian NPP is obliged to complete all work related to the employment and training of the personnel and their clearance to work unsupervised according to the

established procedure before the delivery of nuclear fuel to the NPP.

The operational personnel of the Belarusian NPP, before their clearance to work unsupervised, undergo knowledge testing to the extent necessary for the position held.

The executives of all ranks who are responsible for the safe operation of the Belarusian NPP or ensure departmental safety control, and operators must undergo a medical and psycho-physiological examination, as well as have special permits for their activities.

Commissioning organization personnel

Preparation of commissioning organization personnel engaged in commissioning works of Belarusian NPP includes recruitment, training and knowledge assessment considering NPP work schedule. Personnel training is performed according to job descriptions, standards, instruction, schemes and other valid regulatory and technical documentation regarding personnel field of work.

Regulatory supervision activities on consideration of influence of human factor

Assessment of the influence of human factor on safety by the licensee is provided both within licensing and permitting activities, as well as within inspections.

Thus, as part of safety review of the documents justifying safety the regulatory authority evaluates compliance of project basis with the requirements of technical regulations, including the issues connected with consideration of human factor.

One of the components of regulatory activities is the procedure of issue of personal permits to perform works on nuclear energy use. During such procedures apart from the medical component the regulator evaluates personnel training in the form of a testing, as well as in the form of an interview – in addition for the senior officials of the licensee providing demonstration of the leadership in security issues. During such additional interview candidate's adherence to safety issues is evaluated, if necessary, additional requirements are established which are registered in the personal permit.

One of the components of issue of personal permit is a positive knowledge evaluation of safety regulations and standards in the field of nuclear energy use of Belarusian NPP, which is performed in the regulator's commitment.

As part of the inspection activity, consideration of human and organizational factors in case of violations of the requirements in the field of nuclear and radiation safety is evaluated when conducting inspections in the context of performance efficiency of their management systems (quality management systems). Such inspections are conducted for the licensees engaged in construction of the Belarusian NPP – as a rule, annually (taking into account the works performed by the licensee). Regarding the operating organization and the general contractor, as a rule, every inspection is conducted in the context of performance of the procedures of quality management systems. When revealing clear signs of insufficient level of safety culture among the workers who violated the requirements of the regulatory legal acts, technological regulations in the field of nuclear and radiation safety, the suggestions are made to the licensee management about performance of unscheduled knowledge assessment of such workers to anticipate further potential influence of insufficient training level of these workers on the general safety level. If necessary, the regulator applies also for disciplinary actions regarding such workers.

Therefore, the actions taken by the regulator are generally enough to provide regulatory supervision over consideration of influence of human factor on nuclear and radiation safety assurance by the licensee.

ARTICLE 13. QUALITY ASSURANCE

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

The activities in the field of regulatory consideration and control

The requirements of qualitative performance of works in compliance with the established technical regulatory legal acts at all stages of the nuclear facility life cycle are demanded by the Law of the Republic of Belarus of July 30, 2008 “On the use of atomic energy” [29]. Such requirement is established both for operating organization and for any organizations providing the services when exercising an activity on nuclear energy use.

The Decree of the President of the Republic of Belarus [33] states the acting management system and (or) licensed activities quality control system as one of the license requirements and conditions for the performance of activities in the field of the use of atomic energy, as well as establishes the requirements for the quality assurance programmes.

The specified license requirement is estimated by the regulatory authority both at the assessment stage of license applicant compliance with license requirements and conditions (LRC) prior to the issue of license, and during implementation of activity in the field of nuclear energy use by the licensee. At the same time, such assessments of LRC observation for licensees are conducted, as a rule, on an annual basis. For operating organization and the general contractor the issues of the quality management system efficiency are considered, as a rule, upon each repeated detection of the same-type violations of the regulations in the field of nuclear and radiation safety.

Noncompliance with the specified LRC according to [33] for the license applicant leads to refuse in special permit (license), and for the licensee in suspension of the special permit (license) issued earlier.

General requirement to NPP quality assurance systems (elements) and the works performed is recognized at the level of technical regulatory legal acts as well. In particular, the specified requirement is one of the components of the first level of the concept of defence in depth used in the project of Belarusian NPP [NP-001-15].

The requirements directly to quality system as a composite element of general system of management and nuclear power plant operation are established by [63]. Quality assurance program system providing all the stages of nuclear facility life cycle is established by the specified document. Programs are developed by all organizations participating in construction and operation of nuclear facility and have the hierarchy and structure established by the requirements [63].

The general program of quality assurance at the site of NPP construction being the main document defining the principles, the purposes and the general provisions of operating organization activities regarding development and implementation of the quality assurance program at all stages of nuclear power plant life cycle, as well as the requirements to quality assurance by other organizations participating in works of NPP life cycle is subject to approval by the regulatory authority [63].

The operating organization annually provides the Report to the regulatory authority on assessment of current state of nuclear facility safety containing also the data on the actions taken in the field of quality and their efficiency. The regulatory authority takes into consideration this information when planning supervisory activities regarding both directly operating organization and subcontracting organizations. If necessary, the regulatory authority has the powers to take actions in the context of regulatory enforcement upon review of this report.

Therefore, the actions to provide development and implementation of quality assurance programs to make sure that the requirements specified there in regarding the activities important for nuclear safety are met throughout the whole nuclear facility life cycle have been developed and its fulfilment is ensured.

Actions of operating organization RUE "Belarusian NPP"

RUE "Belarusian NPP" has adopted organizational and technical solutions aimed at creation of quality assurance control infrastructure, as well as at assurance of functioning of such infrastructure by documenting the procedures of quality management system, training and knowledge assessment of the personnel, establishment of responsibility for implementation of quality assurance actions to ensure the quality of NPP construction.

The quality policy of RUE "Belarusian NPP" defined safety assurance at all facility life cycle stages as the highest priority.

The operating organization has developed a General Quality Assurance Program NPP QAP (G), which documents the total organizational structure, responsibilities, procedures and resources providing general quality management in process of construction and subsequent operation of NPP.

The organizations performing works or rendering the services for operating organization has developed individual quality assurance programs as part of NPP QAP (G) regarding the corresponding activity types. In addition, the Quality Assurance Program for NPP commissioning (QAP(COM)) and operation of power units of Belarusian NPP QAP(OP), the Quality Assurance Program when handling nuclear materials (nuclear fuel) QAP NM (NF), the Quality Assurance Program when handling operation radioactive waste QAP (ORAW), the Quality Assurance Program when handling ionizing radiation source QAP (IRS) have been developed.

Planning, execution of works on assessment of the results achieved is performed at all levels of quality administration management system.

Program of audits of operating organization RUE "Belarusian NPP"

Quality system efficiency assessment of the General Contractor and subcontracting organizations is one of the aspects of operating organization activities in the field of quality.

To check execution of quality assurance programs and assess its efficiency, the RUE "Belarusian NPP" and subcontracting organizations performed internal and external (in case of conclusion of contracts with subcontracting organizations) inspections of execution of quality assurance programs. The inspection results are documented. According to the inspection results, corrective actions are developed to eliminate the discrepancies revealed.

The information about such audits is also provided to the regulatory authority as part of the procedure for provision of the Report on assessment of current state of nuclear facility safety.

Inspection activities

The inspections of operating organization, General Contractor for construction of Belarusian NPP and subcontracting organizations – licensees in the field of nuclear energy use in the context of efficiency of their management system (quality management system) are performed as part of the inspection activities. The inspections are performed, as a rule, annually (taking into account the character of the works performed by the licensee). During such inspections, efficiency of quality management system procedures (mainly the procedures associated with quality assurance when performing operations (activities) with equipment and systems being important for safety, including incoming control of such equipment, control when performing erection works, test, and etc.) is checked. In addition, the analysis of violations registered within supervision activities at the site for the expired year is performed as part of such inspections and a comprehensive assessment of sufficiency of the actions taken regarding quality assurance is given. Regarding the operating organization and the general contractor, as a rule, every inspection is conducted in the context of performance of the procedures of quality management systems.

Therefore, the actions taken by the regulator are in general sufficient to ensure regulatory supervision over quality assurance at Belarusian NPP facility site as related to the activity being important to ensure nuclear safety.

ARTICLE 14. ASSESSMENT AND VERIFICATION OF SAFETY

Each Contracting Party shall take the appropriate steps to ensure that

i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

All life cycle stages of the nuclear facility including design, location, construction, operation and commissioning are subject to licensing in accordance with current legislation (Provisions on Licensing of Certain Types of Activities approved by the Decree of the President of the Republic of Belarus of September 1, 2010 No. 450).

In 2016-2018, execution of terms and conditions of license validity issued to RUE “Belarusian NPP” for the right to construct nuclear facility (units No. 1 and 2) was checked. At the same time, preparation for licensing of operation of unit No. 1 came to the end. On October 20, 2017 Gosatomnadzor received an application of RUE “Belarusian NPP” with necessary documents to obtain the license for nuclear facility operation (unit No. 1 of Belarusian NPP); handling nuclear materials, nuclear fuel, spent nuclear materials, spent nuclear fuel, operational radioactive waste.

The most important component of licensing process regarding the activities on nuclear energy use is review of the documents justifying nuclear and radiation safety when exercising this activity (safety review). During the safety review the completeness of justifications of safety of nuclear facilities and compliance of documents with the requirements of the legislation of Republic of Belarus and the Russian Federation in the field of nuclear energy use and ionizing radiation sources, as well as with the international recommendations is checked. According to the legislation, effective as of the beginning of the licensing process and within safety review, the safety review timeframe should not exceed 1 year.

By the Decree of the President of the Republic of Belarus No. 70 of 18 February 2019 the requirements to the timeframe of safety review have been changed. In line with the new provisions, the timeframe of safety review shall be determined by Gosatomnadzor based on the scope of the documents justifying safety.

The safety review is performed by the experts who received corresponding permits at the stage of preparation for safety expertise. The decision on the issue of license will be made by the Board of the Ministry for Emergency Situations based on the opinion of Gosatomnadzor based on the results of the safety review, as well as on the assessment of the licensee's compliance with the license requirements and conditions.

In 2016-2018, the Republic of Belarus has voluntarily conducted stress-tests of the Belarusian NPP (targeted assessment of the NPP stability in the extreme external natural impact and the combination of such in the light of the accident at the Japanese Fukushima Daiichi NPP) by the methodology of the European Nuclear Safety Regulators Group (ENSREG) and of the European Commission and has passed the peer review of its results by the European Nuclear Safety Regulators. Stress-tests are an additional tool aimed at the assessment of the safety margin above the requirements established by the legislation. During the stress-tests, safety margin with regard to the extreme natural impact was assessed typical for the area of the NPP location, as well as the sufficiency of the design and organisational measures at full power blackout and for the event of heat removal (water) loss to prevent and accident outside the design and for its successful overcoming in the event of it will occur.

Article 14 (1) Safety assessment

The requirements to safety assessment and check are regulated by a number of legal documents including the decrees of the President of the Republic of Belarus, Decisions of the

Government, technical regulatory legal acts [29, 30, 38, 50, 52, 77, 80, 81, 92]. Safety assessment is an integral part of the licensing process of nuclear energy use activities (see [Article 7 \(2\) \(ii\)](#) of this National Report). The activity associated with safety assessment in field of nuclear energy use and ionizing radiation sources is subject to licensing.

The rules for preparation and requirements to the content of the safety analysis report for nuclear power plant (SAR) with WWER reactors are established. Based on the information contained in SAR, the regulatory authority should have an opportunity to assess sufficiency of justifications for location, construction, commissioning, operation and decommissioning of NPP units on a certain site to avoid exceeding the established radiation doses of personnel and population and standards for emission and content of radioactive substances in the environment under normal operation and design basis accidents, as well as limitation of this impact in case of beyond-design accidents. Works on preparation, formation, review and revision of SAR should be performed at all NPP life cycle stages.

Deterministic and probability safety analyses should be provided in SAR. Safety review should be executed for all operational states of NPP and take into account all locations of nuclear materials, radioactive substances and RW available at NPP where violation of normal operation of NPP can occur. Deterministic safety analyses should be executed based on a conservative approach. Probabilistic safety analyses should include probability estimate of large accidental emission. Safety analyses should be followed by accuracy assessment and uncertainties of the results obtained. The software used in safety case should be certified.

In accordance with the application of RUE "Belarusian NPP", Gosatomnadzor has started the licensing procedure for operation of unit No.1 of Belarusian NPP from October 20, 2017.

In the context of the licensing procedure for carrying out activities in the field of the use of nuclear energy with regard to the operation of a nuclear facility (Unit No. 1 of the Belarusian NPP), handling of nuclear materials, spent nuclear materials, nuclear fuel, spent nuclear fuel, operational radioactive waste (hereinafter, document examination), a review of the documents substantiating nuclear and radiation safety is organized in accordance with the terms of reference prepared by Gosatomnadzor and approved by the Head of Gosatomnadzor on November 17, 2017.

Review of documents substantiating nuclear and radiation safety is conducted by SSI JIPNR Sosny which is the owner of the licence for the right to conduct safety review in the field of nuclear energy use. Also other organizations which are a part of the system of the scientific and technical support of the Ministry for Emergency Situations according to the Resolution of Council of Ministers of the Republic of Belarus of December 2, 2016 No. 991 "On the Provision of Scientific and Technical Support to the Ministry for Emergency Situations in the Field of Nuclear and Health Physics" are engaged in safety review.

Safety review is conducted considering and based on the state-of-the-art achieved. The review takes into consideration the operation experience of the Russian and foreign nuclear facilities; all available data on the events which took place at the Russian and foreign nuclear- and radiation-hazardous facilities; assessment of sufficiency of actions for assurance of nuclear safety and radiation safety when exercising the peaceful use of nuclear energy.

One of the main tasks of the scientific and technical support organization is safety review, both using its own resources, and with the assistance of specialists from other organizations.

Regarding scientific and technical support of regulatory authority, the effort are fostered to develop scientific and technical knowledge by means of:

- examination, analysis, adaptation and introduction of the best practices of safety review;
- developments, introductions and tests of modern computer programs and models for simulation of processes inside and outside NPP (for example, in the reactor, on the first and the second circle, in the containment dome, emissions through the barriers);
- examination and analysis of experience in production of the components, systems of NPP and in NPP operation;
- creation of analytical inquiry and communications systems and databases;
- collection, analysis and check of input data for the reactor unit;
- introduction of probabilistic methods of safety analysis;
- definition of problems with safety, analysis of character and actions for its elimination.

SSI JIPNR Sosny constantly increases scientific and technical level of the support provided to the regulatory authority using recent developments, best practices developed in the field of peaceful application of nuclear energy, providing the high quality of the expert services rendered.

Safety review and scientific and technical support of the regulatory authority are conducted considering and based on the state-of-the-art achieved. The examination and the expert support take into consideration the operation experience of the Russian and foreign nuclear facilities; all available data on the events which took place at the Russian and foreign nuclear- and radiation-hazardous facilities; assessment of sufficiency of actions for assurance of nuclear safety and radiation safety when exercising the peaceful use of nuclear energy.

Organizational and legal basis of expert assessment system in the Republic of Belarus continue to improve. As specified in the [Article 8 \(1\)](#) of this National Report, the improvement strategy of technical support of regulatory authority involves transfer from a single technical support organization – SSI JIPNR Sosny – to the system of 16 organisations and Scientific and Technical Institution “Center of Nuclear and Radiation Safety” as a coordinator uniting the scientific and expert potential available in the Republic of Belarus.

Safety assessment and inspection of scientific nuclear facilities

The regulatory authority has reviewed and approved "Justification of nuclear safety of allocation of fissile material in the storage facility of Yavar non-irradiated nuclear material in SSI JIPNR Sosny complying with safety requirements. Currently Yavar storage facility is in operation and is used for storage of non-irradiated nuclear material. The regulatory authority issued a license for construction of a new storage facility for nuclear materials; work on review and assessment of the documents for storage facility commissioning is in progress.

The organizations engaged in operation of storage facilities, transportation equipment, refueling should ensure implementation of necessary organizational and technical actions aimed at observance of the requirements of nuclear safety, and control of their performance [71, 79, 96].

Periodically (not less than once a year) the operating organisation commission should conduct inspection of the conditions during the storage, transport, transshipping of the nuclear fuel. The Commission Act shall be approved by the head of the organization and forwarded to the state supervision authorities and to the institutional control bodies.

Availability of the stand for the physical start shall be established:

department commission for operational acceptance of stand, support facilities and rooms;
operating organization commission for nuclear safety.

Based on the project of the stand and the report (act) according to the results of physical start-up, a stand passport is prepared containing the data on main parameters established in the project of subcritical and critical assembly, content and characteristics of safety systems, as well as on experimentally-confirmed operational limits. The passport is coordinated by the state regulatory authority exercising control (supervision) in the field of nuclear and health physics.

SAR is included in the list of the main documents of subcritical and critical assembly concerning nuclear safety assurance.

Safety assessment and inspection of non-scientific nuclear facilities

Safety assessments are conducted and documented by the operating organization to check the safety requirements at all nuclear facility life cycle stages, as well as to determine the actions to be taken for safety assurance of this nuclear facility. The results obtained are provided to the regulatory authority in the field of nuclear and radiation safety, within the licensing process of the activity in the field of nuclear energy use at all nuclear facility life cycle stages.

Gosatomnadzor has organized expertise of the documents substantiating nuclear and radiation safety at each licensing stage of Belarusian NPP (location, construction). The expertise results were provided in Expert Reports according to the results of expertise of the documents substantiating nuclear and radiation safety assurance in carrying out activities in the field of the use of nuclear energy

regarding location, construction of nuclear facilities (units No. 1, No. 2 of Belarusian NPP) prepared by SSI JIPNR Sosny.

The review purpose is to determine the level of nuclear and radiation safety of Belarusian NPP by comparison of the design decisions made and the results of its implementation with the requirements of regulatory legal acts, including TRLA in the field of nuclear and radiation safety.

SAR is the main of the documents subject to expertise substantiating nuclear and radiation safety assurance in carrying out activities in the field of the use of nuclear energy [92]. SAR development is provided by the operating organization in compliance with SAR project documentation of nuclear facility. Works on preparation, formation and revision of SAR should be performed at all life cycle stages of the Belarusian NPP. The requirements to the information provided to SAR for Belarusian NPP have been established.

At the same time a dedicated commission including the specialists of Gosatomnadzor conducts an assessment of compliance of organizational and technical capabilities of the operating organization with the licensing requirements and conditions. According to the results of the reviews performed, Gosatomnadzor formed the requirements to the operating organization to be met within the scope of the license.

Decree of the President of the Republic of Belarus No. 475 dated November 26, 2015 stipulates the possibility of a periodic safety review and assessment of the compliance of the licensee's capabilities with the licensing requirements and conditions, *which correspond to Principle 2 of the Vienna Declaration on Nuclear Safety of February 9, 2015, according to which: "comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective..."*

Article 14 (2) Verification of safety

To check correctness of technological process performance (compliance with all its requirements) and quality of products and services at any stage of the process of design, development and production of the equipment, construction, installation, commissioning and operation of Belarusian NPP, the operating organization should exercise control by performance of inspections [65].

The operating organization will organize periodic (at least once in two years) inspections of compliance with the requirements of nuclear safety and establish an inspection procedure of nuclear safety condition of Belarusian NPP by the internal commissions. The inspection results are provided to the regulatory authority.

According to the General Contract for the Construction of Belarusian NPP between RUE "Belarusian NPP" and JSC Atomstroyexport:

operating organization undertakes to maintain technical (designer) supervision (control of quality and volumes, the works performed). To implement these functions an Engineering Supervision Department has been created in the operating organization one of the tasks of which is execution of inspections of activity of General Contractor and subcontracting organizations;

the General Contractor undertakes to conduct inspections of compliance of the construction and installation works performed with the working documentation and the requirements of regulatory documents; implementation of quality assurance programs by the subcontracting organizations; to provide designer supervision over meeting the requirements of design and working documentation at all construction stages of Belarusian NPP and its commissioning.

Organization and implementation of actions on target safety re-assessment (stress tests) of the Belarusian NPP

In 2016-2018 the Republic of Belarus voluntarily performed stress-tests of the Belarusian NPP according to the methodology of the European Nuclear Safety Regulators Group (ENSREG) and the

European Commission and passed a partner inspection of its results by the European regulators in the sphere of nuclear safety.

The results of stress tests of the Belarusian NPP determined the sufficiency of existing design measures to ensure the safety of power units, taking into account the accident at the Fukushima Daiichi NPP. For each of the considered extreme impacts, safety margins have been determined, which demonstrates safety of the Belarusian NPP against factors characteristic of the accident at the Fukushima Daiichi NPP.

ENSREG Peer Review Team included the experts from Austria, Belgium, Bulgaria, UK, Hungary, Germany, Greece, Spain, Lithuania, Slovakia, Ukraine, Finland, France, Czech Republic, Sweden.

During the peer review, the European experts applied new reference safety levels to the Belarusian NPP which were developed by the WENRA in 2014.

Peer Review outcomes (Peer Review Report, Summary Conclusions, Joint Press Release of Gosatomnadzor and ENSREG) has in general a positive character. It highlights various good practices and also suggests future potential improvements in the context of continuous safety improvement that were suggested during the review, considering the new WENRA reference safety levels.

In line with the European practice, Gosatomnadzor prepared a National Action Plan according to the results of the stress-tests (determined a set of measures to improve security of NPP and the terms of its implementation) and together with the Belarusian NPP and other parties concerned proceeded to its implementation.

ARTICLE 15. RADIATION PROTECTION

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

Regulatory Requirements

The main principles and requirements to radiation protection assurance are defined in the Laws of the Republic of Belarus "On Radiation protection of the Population" and "On the Use of Atomic Energy" [20, 29].

The radiation safety requirements for situations of planned, accidental and actual exposure, used to ensure human safety in all conditions of exposure to ionizing radiation of artificial or natural origin, are established by the Sanitary norms and guidelines "Requirements for Radiation Safety", approved by the resolution of the Ministry of Health of the Republic of Belarus of 28 December 21, 2012 No. 213, and the Hygienic regulatory standard "Criteria for assessing radiation exposure", approved by the same resolution [102, 103]. The documents have been developed in accordance with the requirements of the IAEA GSR Part. Three classes of regulatory standards are established: basic dose limits and dose constraints (for planned exposure), reference levels (for accidental and actual exposure) and acceptable levels of monofactor exposure. Radiation safety of personnel and population is considered ensured, if the main principles of radiation safety (normalization, substantiation, optimization) and the requirements of the legislation of the Republic of Belarus are observed. The above-mentioned document contains the reference to a representative person (corresponding to Publication 101 of ICRP), defines use of dose constraints and reference levels, introduces the dose quota of public exposure from NPP (100 μ Sv/year), defines the exemption levels and clearance levels from regulatory control, sets general measures of response to nuclear and radiological emergencies, criteria for radiation protection of emergency workers, introduces the reference levels of radionuclide content in drinking water, total alpha and beta activity.

Sanitary regulations, rules and hygienic standards "Hygienic requirements to design and operation of nuclear power plants" approved by the resolution of the Ministry of Health of the Republic of Belarus No. 39 of March 31, 2010 establish the requirements to radiation safety assurance of personnel, population and environment protection (radiation exposure) during location, design, construction, commissioning and operation of NPP with WWER reactors. NPP radiation safety is performed by performance of a special action plan:

- establishment and fulfillment of radiation safety requirements at the industrial site of NPP and adjoining territories;

- control of the state of the NPP protective barrier on the path of the spread of ionizing radiation and radioactive agents;

- confinement of radiation sources and protection of personnel and population during normal operation and in case of accident at the NPP.

The content and the volume of special actions is provided in the project and in operational documentation for the NPP.

The requirements and approaches, recommended by publications of the series of safety standards of IAEA, are also considered in the following documents:

- Sanitary regulations and rules "Requirements to radiation safety assurance of personnel and population when exercising an activity on use of nuclear energy and ionizing radiation sources" approved by the resolution of the Ministry of Health of the Republic of Belarus No. 137 of December 31, 2013;

- Regulations and rules for assurance of nuclear and radiation safety "Safety in radioactive waste management. General provisions" approved by the resolution of the Ministry for Emergency Situations of the Republic of Belarus No. 47 of September 28, 2010. In 2017 the document was

amended and supplemented by the resolution of the Ministry for Emergency Situations of the Republic of Belarus No. 33 of July 24, 2017;

Regulations and rules for assurance of nuclear and radiation safety "Safety rules in radioactive waste management of nuclear power plants" approved by the resolution of the Ministry for Emergency Situations of the Republic of Belarus No. 43 of October 12, 2017. The documents sets the requirements of safety assurance implemented during design and operation of radioactive waste management systems at nuclear power plants. Regulations and rules have been introduced instead of previous TCP 565-2015 "Safety rules in radioactive waste management of nuclear power plants";

The technical code of common practice "Safety assurance of dry storage of spent nuclear fuel" [69] approved by the resolution of the Ministry for Emergency Situations of the Republic of Belarus No. 26 of September 9, 2014. The documents sets the requirements to safety assurance implemented during design, construction, operation and decommissioning of dry storage units of spent nuclear fuel;

Sanitary regulations and rules "Requirements to radiation safety assurance of personnel and population in radioactive waste management" approved by the resolution of the Ministry of Health of the Republic of Belarus No. 142 of December 31, 2015 [106]. The document has been developed in accordance with the requirements of publications of the series of safety standards of IAEA, No. GSG-1 and No. SSR-5; introduced instead of previous Sanitary rules for radioactive waste management "CIIPOPO -2005" and sets the criteria for reference of waste to radioactive, as well as the general classification of radioactive waste based on assurance of its long-term safety upon disposal;

Regulations and rules for assurance of nuclear and radiation safety "Requirements to operational organization in radiation monitoring in sanitary protection area and supervised area of the nuclear power plant" approved by the resolution of Ministry for Emergency Situations No. 29 of June 30, 2016 [83].

Expectations in accordance with the regulating provisions regarding exposure dose optimization processes and implementation of the principle of "as low as reasonably achievable" (ALARA)

The priority of using the ALARA methodology is established by the Law of the Republic of Belarus "On the Radiation Safety of the Population" [20], and sanitary rules and norms. The main regulatory requirements that must be followed during the normal operation of ionizing radiation sources and nuclear facilities are:

- not exceeding the permissible limits of individual doses for citizens from all ionizing radiation sources (the principle of rationing);

- the prohibition of all activities directed at the implementation of ionizing radiation sources, in which the benefits received for a person and society do not exceed the risk of possible harm caused by radiation exceeding the natural radiation background (the principle of justification);

- maintaining at the lowest achievable level the individual radiation doses and the number of exposed persons, taking into account economic and social factors, when using any sources of ionizing radiation (the principle of optimization).

Sanitary Regulations and Standards Requirements for Personnel and the Public Radiation safety When Carrying Out Nuclear and Ionizing Radiation Activities approved by the resolution of the Ministry of Health of the Republic of Belarus as of January 31, 2013 No.137 [104] define the ways for the practical implementation of the optimization principle of ionizing radiation sources. Based on non-exceedance of dose limits, controlled parameter system has been introduced being the derivative standards from the dose constraints. IRS user (operating organization) undertakes to ensure development of control parameters of exposure of radiation factor at the radiation facility and in the supervised area set for operating protection survey to maintain the achieved level of health physics, ensure further decrease in personnel and public exposure, radioactive contamination of environment. When setting the dose constraints, IRS user (operating organization) should adhere to the principle of optimization considering:

ununiform radiation exposure in time;
 practicability of preservation of already achieved level of radiation exposure at this facility lower than acceptable;
 efficiency of actions for improvement of radiation situation.

Radiation protection programme implementation by license owners

Currently Belarusian NPP is at the construction stage, therefore there is no radiation exposure of personnel of operating organization and the population living in the supervised area of Belarusian NPP.

Compliance with the dose limits, main results regarding the doses received by the workers subject to exposure

Currently, at the construction stage, the RUE "Belarusian NPP" is not a IRS user, however at the construction site of Belarusian NPP the personnel of the General Contractor ASE JSC performs the works associated with IRS use for non-destructive testing of the mounted equipment.

On June 21, 2017 the state-owned company Belarusian NPP and ASE JSC has developed and put into force the "Coordination Protocol of Customer and General Contractor in radiation safety assurance at the construction stage of Belarusian NPP". In accordance with the provisions, the General Contractor transfers the information about Contractor's Personnel exposure doses received during the works using IRS (see table 4) to the Belarusian NPP.

Table 4
Exposure doses received by the Contractor's Personnel

Year	Employees, persons	Collective dose, person*mSv	Average individual dose, mSv	Maximum individual dose, mSv
2017	105	63.066	0.601	3.670
2018	173	185.966	1.075	5.510
2019 (for the 1st q. of 2019)	17	10.949	0.644	1.310

Conditions of radioactive matter emission into environment

For the purposes of preventing exceedance of the dose of industrial irradiation of population, the quota for public exposure – 100 μ Sv per annum is set for NPP by the Sanitary regulations and rules "Hygienic requirements to design and operation of nuclear power plants" approved by the resolution of the Ministry of Health of the Republic of Belarus No. 39 of March 31, 2010 [101]. This quota is set for total public exposure from all the sources of radioactive gas-aerosol emission in the atmosphere and liquid effluents in surface waters in general for NPP irrespective of the number of units at the industrial site. The value of the quota is considered as the upper limit of the possible public exposure due to radioactive emissions and discharges from the NPP while optimizing the radiation protection of the population during its normal operation. The values of the corresponding public exposure quotas are used to calculate the maximum permissible emissions of radionuclides from the NPP into the atmosphere and the maximum permissible discharges of radionuclides to surface waters. Maximum permissible emissions and maximum permissible discharges are the upper limits for gas aerosol emissions and liquid discharges of radionuclides into the environment during normal operation of the nuclear power plant.

In addition to the above-mentioned quotas, to optimize the radiation protection of the population during normal operation of the nuclear power plant, a minimum significant dose of 10 μSv per year was adopted as the lower limit of the radiation dose. The values of the corresponding minimum significant public exposure dose are used to calculate the allowable emissions of radionuclides of the nuclear power plant into the air and the allowable discharges of radionuclides into surface waters. The values of permissible emissions and discharges are set below the values of maximum permissible emissions and discharges.

The limits of safe operation of each NPP power unit in terms of emissions and discharges are set at the level of maximum allowable emissions and maximum allowable discharges in technological regulations, and operational limits are set at the level of annual allowable emissions and annual allowable discharges with the restriction that the safe operating limits set for one power unit should not be exceeded during operation of all nuclear power units.

In addition to the above-mentioned limits, in accordance with the statement of work for the Belarusian NPP in the Republic of Belarus for the emissions and discharges into the environment during normal operation and violations of normal operation, taking into account the achieved level of safety in the existing NPPs with WWER reactors, the following target limits are set:

the annual gas-aerosol emission of inert gases into the environment during normal operation and violations of normal operation should not exceed 40 TBq per unit per year;

the annual release of aerosols and iodine into the environment during normal operation and violations of normal operation should not exceed 0.8 GBq per unit per year;

the annual discharge of radionuclides (excluding tritium) during normal operation and violations of normal operation should not exceed 10 GBq per unit per year.

Processes and Measures Implemented to Ensure that Radiation Exposure is Maintained at Reasonably Achievable Low Level in All Operational Stages

The Terms of Reference for the Belarusian NPP set the following target dose criteria:

collective effective dose of personnel — 5 manSv/ year per one GW of installed capacity;

collective effective dose during routine maintenance related to dose costs during dismantling, assembly of the reactor and refueling on average for the entire design life is 0.5 manSv/year per unit.

In accordance with the documents substantiating the safety of the Belarusian NPP, during the main technological operations, the maximum estimated collective doses of the personnel of the Belarusian NPP on average per year are:

dismantling and assembly of the reactor and refueling – 330 manSv/year;

control of the technical condition of reactor equipment – 480 manSv/year;

SG maintenance – 92 manSv/year;

reactor coolant pump set maintenance – 6.1 manSv/year;

main circulation pipeline maintenance – 100 manSv/year;

Pressurizer maintenance – 280 manSv/year.

The maximum value of the annual collective dose per unit is about 1.3 manSv/year, which does not exceed the target limit of 5 manSv/year per 1 GW of the installed capacity set in the Terms of Reference for the Belarusian NPP.

During the Belarusian NPP operation, maintaining a reasonably achievable low level of radioactive substances in the area of technological systems of NPPs, radioactive contamination of equipment and premises of the controlled access area, individual and collective doses of personnel radiation exposure, emissions and discharges of radioactive substances into the environment, volumes of RW generation will be achieved through a number of organizational and technical measures, including:

planning, performance monitoring, analysis of results and improving the system of measures aimed at reducing personnel/public radiation exposure, minimizing emissions and discharges of radioactive substances into the environment;

implementation of organizational and technical measures to ensure radiation safety while planning and executing work;

- use of best operating practices and proven engineering solutions;
- analysis, self-assessment and periodic independent assessment of the achieved level of radiation safety(OSART missions, WANO peer reviews);

- implementation of QA system and maintenance of a high level of quality assurance for ongoing activities.

- compliance with safety culture principles (priority of safety over economic and production goals, selection, training and maintenance of personnel qualifications, strict discipline with a clear distribution of powers and responsibilities, compliance with operational and other guidelines, performance of work only within the framework of documented procedures, creation of an atmosphere of trust and work approaches that promote a positive attitude towards security issues, self-control).

Environmental monitoring

In accordance with the Regulation on the Procedure for Radiation Monitoring and use of its data as part of the National Environmental Monitoring System in the Republic of Belarus approved by the resolution of the Council of Ministers of the Republic of Belarus dated May 17, 2004 No. 576, the Republican Centre for Hydrometeorology, Control of Radioactive Contamination and Environmental Monitoring of the Ministry of Natural Resources and Environmental Protection (Belhydromet) ensures radiation and environmental monitoring both inside (12.9 km) and outside the Belarusian NPP supervised area.

A network of observation points of radiation and environmental monitoring in the area of radiation exposure of the Belarusian NPP was created in order to monitor its work, timely detect changes in the radiation situation, assess and predict the possible radiation effects on public health and environment, as well as (if necessary) promptly take measures to prevent or reduce radiation exposure.

The objects of radiation monitoring are:

- atmospheric air;
- surface waters and objects of hydrographic network (bottom deposits, coastal aquatic and aquatic vegetation, ichthyofauna);
- groundwaters, including underground potable water;
- soil (ground);
- ground vegetation;
- components of agricultural ecosystems and agricultural products.

In 2017-2018, Belhydromet created a network of radiation monitoring points in the area of the Belarusian NPP, organized stationary points of observation for the content of radioactive aerosols in the air with sampling through filter installations at meteorological stations closest to the Belarusian NPP: Lyntupy, Oshmyany, Naroch. Since 2017, observations of the radioactive contamination of surface waters have been carried out at three observation points: Viliya river (Bystritsa village), Lake Svir, Lake Naroch. Soil radiation monitoring was carried out at four observation points.

The monitoring results obtained to date show that the levels of radioactive contamination of environmental components, agroecosystems and agricultural products in the supervised area of the Belarusian NPP mainly correspond to the levels of global fallout of radionuclides due to nuclear weapons tests in the 60s of the last century, observed before the Chernobyl accident, taking into account their natural decay.

Since 2016, in the proximity of the Belarusian NPP, an automated radiation situation monitoring system (ARSMS) has been operating. ARSMS developer is a research institution A. N. Sevchenko Institute of Applied Physical Problems of Belarusian State University, Owner – Ministry of Natural Resources and environment. The system consists of ten automatic measurement points

(AMP). Three of them are located inside the supervised area of the Belarusian NPP, seven — outside the supervised area. AMPs are equipped with gamma radiation dose rate (DR) measurement sensors, spectrometric sensors that allow measuring the gamma radiation spectrum with subsequent identification of radionuclide composition, and, in part, measurement sensors of meteorological parameters. Information on gamma radiation dose rate levels, gamma radiation spectra and meteorological data are continuously transmitted to Belhydromet.

The results are recorded in the radiation monitoring database of the supervised area of the Belarusian NPP. ARSMS data, as well as data resulting from determining the levels of natural and technogenic radionuclides at natural environment locations in the proximity of the Belarusian NPP are collected and accumulated in order to use them further as background ones.

The legislation of the Republic of Belarus [20, 29] establishes the requirements to the operating organization regarding the mandatory implementation of radiation and environmental monitoring of the area around the Belarusian NPP at all stages of its life cycle.

The volumes, terms and procedure for the implementation of radiation and environmental monitoring are regulated by the Program for Integrated Environmental Monitoring of the Belarusian NPP. The Environmental Monitoring Program for the Period of Construction constitutes its integral part. The results of radiation monitoring of the area around the NPP are recorded in the radiation monitoring database of the supervised area of the Belarusian NPP, which is a means of supporting decision-making regarding measures to optimize the radiation safety system of the Belarusian NPP.

At present, the Report on Initial Radiation Condition of the Environment (Report on Zero Radiation Background), has been generated and peer reviewed. It is an integral part of the documents justifying the safety of the Belarusian NPP. In the future, after the NPP has been commissioned, these data will be used to make a comparative assessment of the impact on the population of emissions and discharges during normal operation of the NPP and in case of emergency.

The activities in the field of regulatory consideration and control

State supervision of nuclear and radiation safety is organized and carried out in accordance with the Regulation on State Supervision in the Field of Nuclear and Radiation Safety, approved by Resolution of the Council of Ministers of the Republic of Belarus dated December 31, 2008 No. 2056.

ARTICLE 16. EMERGENCY PREPAREDNESS

1. Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.

For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.

2. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.

3. Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

Article 16 (1) Emergency Plans and Programs

Regulatory Requirements

In the Republic of Belarus, the preparedness system of response to nuclear and radiation accidents is integrated into the National Emergency Response System in accordance with [22, 39]. The requirements are established by the law for the development of measures to ensure emergency preparedness and emergency response in the event of accidents at nuclear facilities. Measures to ensure emergency preparedness and emergency response in case of accidents at nuclear facilities are established by on-site and off-site emergency plans.

There is ongoing work to improve regulatory requirements, taking into account modern international approaches, including those set forth in the IAEA Safety Standards GSR Part 7. The requirements for categorizing emergency planning in the event of a nuclear or radiological emergency have been established [89]. A graded approach to the development of emergency planning measures has been introduced, depending on the hazard category of the facility (practical activity). Requirements have been established for the composition and content of action plans in the event of an accident at the NPP, at a research nuclear installation [86, 91].

Taking into account the IAEA documents, regulatory requirements for establishing the radiation emergency class, the procedure for declaring an emergency situation, the prompt transfer of information in the event of a nuclear and/or radiation emergency at the NPP have been developed and introduced [93]. The document takes into account the approaches of IAEA outlined in the Safety Standards GSR Part 7 "Preparedness and Response for a Nuclear or Radiological Emergency", GSG-2 "Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency", and GS-G-2.1 "Arrangements for Preparedness for a Nuclear or Radiological Emergency." In accordance with the IAEA recommendations, an approach has been taken to classify emergencies based on the analysis of technological and radiation parameters. In order to timely determine, adopt and establish an emergency class, requirements have been introduced to define specific, predetermined and observed criteria – emergency action levels.

By the Resolution of the Ministry for Emergency Situations, some requirements for the operating organization, planning and implementation of radiation monitoring in the event of a nuclear or radiological emergency at the NPP have been set out [84].

Implementation of Measures to Improve Emergency Preparedness

In the Republic of Belarus, the system of response to nuclear and radiation accidents is integrated into the National Emergency Response System. The State Emergency Prevention and Response System (SEPRS) has been created and is currently functioning. The basic requirements for

this system are defined in the Law of the Republic of Belarus "On the Protection of the Population and Territories from Natural and Technogenic Emergency Situations" dated May 5, 1998.

Actions of the State authorities of the republican level, local authorities, governmental and other organizations, as well as citizens to protect the life and health of population, environment and property, in the event of a radiation accident at a nuclear installation and/or in a storage facility located outside the territory of the Republic of Belarus, closer than 100 km from the State border of the Republic of Belarus, are implemented in accordance with the Plan of Protection Against Radiation Accidents, which is one of the sections of the Plan of Protection of the Population and Territories of the Republic of Belarus from Natural and Technogenic Emergency Situations.

In the Republic of Belarus, there is ongoing work to improve the emergency preparedness and response system, taking into account the construction and preparation for commissioning of the first Belarusian NPP.

On-site and off-site emergency plans for the Belarusian NPP have been developed and approved.

The On-Site Emergency Plan was approved by the Director General of the Belarusian NPP in May 2018.

The Off-Site Emergency Plan was approved by the Resolution of the Government of the Republic of Belarus dated March 22, 2018 No. 211 (Plan of Protective Measures in the Event of a Radiation Accident at the Belarusian NPP).

On the initiative of the Republic of Belarus, at the final stage of development, the draft Off-Site Emergency Plan was studied by the IAEA experts and received a positive assessment.

Off-Site Emergency Plan established:

- a list of measures to ensure emergency preparedness and emergency response in the event of nuclear and radiation accidents at the Belarusian NPP on the national level;

- coordination and interaction mechanisms of the State authorities of the republican level, local authorities, governmental and other organizations, as well as citizens when implementing measures to protect the population and territories in the event of nuclear and radiation accidents at the Belarusian NPP;

- measures to protect the population and territories in the event of nuclear and radiation accidents at the Belarusian NPP;

- emergency response areas and actions of the State authorities of the republican level, local authorities, governmental and other organizations, as well as citizens to protect the life and health of population, environment and property in the event of nuclear and radiation accidents at the Belarusian NPP.

In October 18-19, 2017, at the stage of development, the Off-Site Emergency Plan was tested in the Ostrovets District of the Grodno Region as part of the republican command-and-staff drills with the participation of the State authorities and forces of the State System for the Prevention and Liquidation of Emergency Situations (SSPLES) to respond to radiation accidents and incidents.

The drills was attended by international observers from Latvia and Poland, representatives of the CSTO member states, as well as international organizations (IAEA, International Red Cross, CSTO). The experts had the opportunity to see the work of the State authorities and forces of SSPLES, both at the republican and local levels.

In October 2018, following the Belarusian invitation, the IAEA conducted a mission to assess preparedness for a response to nuclear and radiation emergencies (EPREV mission). In the course of its work, the EPREV mission assessed various aspects of preparedness and response to nuclear and radiological emergencies at the NPP, including those provoked by extreme environmental impacts.

Experts of the mission arrived at the conclusion that Belarus had effective and reliable mechanisms in the field of emergency preparedness and response, highlighted good and applicable practices, identified strengths, as well as areas of further improvement.

Based on the results of the mission, experts noted good practices, as well as made suggestions and recommendations with regard to the improvement of the emergency preparedness and response system in accordance with the current international approaches. [The report on the results of the EPREV mission](#) is publicly available.

In order to implement the suggestions and recommendations of the EPREV mission, in March of 2019, the Government of the Republic of Belarus developed and approved the Action Plan for the Implementation of Recommendations and Suggestions of the IAEA EPREV Mission to Belarus.

To implement the suggestions of the EPREV mission, the Organizational and Methodological Instructions for the Preparation of SSPLES Authorities and Forces and Civil Defense Forces for 2019, approved on December 5, 2018 by the Prime Minister of the Republic of Belarus, in October 2019, an exercise is planned with the participation of the governing bodies, forces and means of Grodno Regional Subsystem of SSPLES as training activities in the event of a radiation accident at the NPP (*using on-site and off-site emergency plans*).

The Government of the Republic of Belarus has signed 49 bilateral agreements on assistance and/or exchange of information/notifications, including with the neighboring countries (the Republic of Latvia, the Republic of Lithuania, the Republic of Poland, the Russian Federation, the Ukraine), which is noted as a good practice by the 2018 EPREV mission.

Article 16 (2) Informing the Public and Neighboring States

In accordance with the Law of the Republic of Belarus dated May 5, 1998 No. 141-3 “On the Protection of the Population and Territories from Natural and Technogenic Emergency Situations”, the State authorities for emergency situations of the republican level, other state bodies of the republican level, governmental organizations subordinate to the Council of Ministers the Republic of Belarus, local authorities and other organizations are obliged to promptly and reliably inform the population through mass media and other channels about the current state of protection of the population and territories from emergencies, as well as methods and means of protection of the population.

Concealment, untimely provision or provision of misleading information by officials in the field of protection of the population and territories from emergency situations entail liability in accordance with the legislation of the Republic of Belarus.

The procedure for informing the public about the threat of emergency situations or current emergency situations, including the transmission of information about possible and actual emergencies, their consequences, radiation safety in the respective territories, is established by the Resolution of the Government of the Republic of Belarus dated August 23, 2001 No. 1280 "On the Procedure for Collecting Information in the Field of Protection of the Population and Territories from Natural and Man-Made Emergencies and its Exchange".

The functioning of the information and management system of the State System for the Prevention and Liquidation of Emergency Situations and the provision of information in the field of protecting the population and territories from natural and technogenic emergency situations are regulated by the Resolution of the Ministry for Emergency Situations of the Republic of Belarus dated August 2, 2005 No. 41 "On Approval of Instructions on the Procedure for Provision of Information Regarding the Protection of the Population and Territories From Natural And Technogenic Emergency Situations", as well as the Resolution dated August 17, 2009 No. 42 "On Approval of the Regulation Regarding the Functioning of the Information and Management System of the State System for the Prevention and Liquidation of Emergency Situations".

The Resolution of the Government of the Republic of Belarus dated November 28, 2014 No. 1118 approved the Regulations on the Alerting System for the Population, Governing Authorities and Forces of the State System for the Safety Alert and Emergency Response and Civil Defense. The tasks and the procedure for using and ensuring the availability of the Alerting System for the Population, Governing Authorities and Forces of the State System for the Safety Alert and Emergency Response and Civil Defense at all times have been determined.

The Joint Resolution of the Ministry for Emergency Situations, the Ministry of Communications and Informatization and the Ministry of Information of the Republic of Belarus dated December 7, 2015 No. 42/27/9 established a list of entities of the Alerting System at the national level. The Resolution of the Ministry for Emergency Situations dated 18.12.2015 No. 44 approved

the instruction on implementation and operation of the local alerting systems in the areas of location of the hazardous industrial facilities.

The functionality testing of the automated systems of centralized notification of the population, enterprises and governmental authorities is conducted regularly (in accordance with the approved schedule). During the trainings the issues of promoting public awareness in the case of radiation accidents are worked out.

The decision of promoting public awareness of the radiation accident and the recommended actions is taken by:

- at all levels - the Prime Minister of the Republic of Belarus and his deputies, the Minister for Emergency Situations, in case of his absence - a person in the acting capacity;

- at the territorial and lower levels - the chairman of the Regional Executive committee (Minsk Executive Committee), the head of the regional (Minsk municipal) department of the Ministry for Emergency Situations, in case of their absence - persons in the acting capacity;

- at the local and lower levels - the head of the local executive authority, the head of the municipal (regional) department of emergency services, in case of their absence - persons in the acting capacity;

- at the facility or local levels - heads of the organization operating the facility (hazardous industrial facility), in case of his absence - a person in the acting capacity, the operator of the duty dispatcher service.

The public is warned through the automated centralized alerting system in the following ways:

- activation of the electrical alarm systems and loud speakers;

- voice information transmission using radio transmitting (broadcasting) stations;

- voice information transmission using wireless broadcasting units and local alerting systems of the potentially hazardous and heavily trafficked facilities;

- voice information transmission using the fire rescue technique, automobiles of the Ministry of the Internal Affairs and other technical transport equipped with loud-speakers in the underpopulated areas and horticultural societies outside the insonation area of the electrical alarm systems;

- text information transmission using SMS messages of the mobile operators;

- publication of information on the popular web-sites;

- transmission of text, voice, video information via TV mass communication media.

The automated centralized alerting system is regularly inspected (in accordance with the established schedules). During this tests the public is informed of the radiation accident.

The Republic of Belarus has ratified a number of international conventions, including the Convention on the Early Notification of an Accident. Furthermore, a number of international and bilateral agreements have been concluded.

The Republican Centre for Management and Emergency Response (RCMER) of the Ministry for Emergency Situations is a contact point for notification in the case of accident and provision of support in accordance with the Convention on the Early Notification of an Accident and the Convention on Assistance in the case of Nuclear Accident or Radiological Emergency. Due to around-the-clock work schedule the Republican Centre for Management and Emergency Response is able to receive any notifications and promptly respond or confirm information.

In case of nuclear or radiation accidents, the Republican Centre for Management and Emergency Response informs IAEA by fax, through the official web-site (USIE) and by telephone.

In case of threat or occurrence of radiation accidents, the foreign countries are immediately informed through direct information exchange between the executive officers of the duty shift of the RCMER and the corresponding crisis centres of the foreign countries. Official information is also sent to the foreign countries through the Ministry of Internal Affairs of the Republic of Belarus according to the procedure established by the international agreements.

ARTICLE 17 SITING

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

- i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;*
- ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;*
- iii) for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;*
- iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.*

From the date of the previous National Report, no selection of the sites for location of the new nuclear installations corresponding to the definition of the Chapter 2 of the Convention on nuclear safety was exercised in the Republic of Belarus, the legal framework regulating selection of sites for location of the nuclear installations remained unchanged. For this reason, Article 17 (1, 2, 4) contains summary information already discussed during the meetings of the Contracting Parties to the Convention.

Article 17 (1) Evaluation of site related factors

The decision on the site selection for the Belarusian NPP was taken in accordance with [62-64], defining:

key criteria and requirements regulating location of the NPP in the Republic of Belarus with account for impact of the processes, events and factors of natural and anthropogenic origin and the NPP impact on the population and the environment;

key requirements to the composition and scope of investigations and researches for selection of the site for location of the nuclear power plant in the Republic of Belarus;

requirements for development and contents of the report concerning EIA, justification of the environmental safety of the NPP.

At the stage of siting for NPP construction, the state of the environment, agricultural lands and forests was investigated for obtaining background data on the nuclear and chemical pollution as a basis for subsequent assessment of the impact of the operating nuclear power plant on the population and the environment.

The mentioned key criteria and requirements regulating location of the nuclear power plant in the Republic of Belarus with account for impact of processes, events and factors of natural and anthropogenic origin and impact of the nuclear power plant on the population and the environment and their fulfilment during selection of the site for location of the Belarusian NPP, make it possible to declare adherence to the principle 1 of the Vienna declaration dated February 9, 2015: "new nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions".

The site selection for the Belarusian NPP was made in accordance with the IAEA recommendations. Survey materials were examined with the participation of agency experts during special expert missions in 2008.

At the stage of selecting the site for the future NPP, Belarus carried out a comprehensive assessment of its environmental impact and all the necessary risk and safety assessments in accordance with its international obligations and the national legislation. Based on the assessment

report of the environmental impact of the NPP project, Belarus conducted cross-border consultations with Austria, Latvia, Lithuania, Poland and the Ukraine as well as discussions with the interested public in 2009-2013.

In November 2013, after the consultations have been completed, the President of the Republic of Belarus took a decision to build the Belarusian NPP on the Ostrovets site. This decision was made based on the results of the environmental impact assessment, including the results of transboundary consultations, the approved project documentation, as well as approvals and conclusions provided for by the national legislation. The materials and conclusions of the environmental impact assessment showed the absence of significant harmful transboundary impact of the Belarusian NPP project. None of the countries participating in the transboundary consultations provided any evidence of possible significant harmful impact on the environment as a result of project implementation.

In 2017, the IAEA SEED mission confirmed that Belarus had taken the necessary steps to ensure the safety of the Belarusian NPP in the event of the worst possible external event and that external threats typical of the site (earthquakes, floods and extreme weather conditions as well as human-caused events) had been properly addressed in the NPP design and measures had been taken in the light of the lessons of the accident at the Fukushima-Daiichi NPP.

At the stage of selection of the site for location of the Belarusian NPP, the Gosatomnadzor performed continuous monitoring of compliance of the work executed by all organizations of the Republic of Belarus taking part in the selection of the site. Fulfilment of the requirements of technical regulatory legal acts by them was inspected. Based on the inspection results, the guidelines were issued for the organizations setting the terms for elimination of violations. All violations were eliminated.

Article 17(2) Impact of the installation on individuals, society and environment

On the basis of the results of studies of the NPP environmental impact, the following was established.

The NPP produces no significant impact on the geological environment, and the engineering solutions including foundation of the nuclear building and other 24 important buildings and facilities ensure their stability under any influences stipulated by the regulatory requirements (seismic activity, shock wave, etc.).

The costs associated with withdrawal of the land parcel for the construction of the nuclear power plant are fully accounted for in the project.

The nuclear power plant will be supplied with process water through the recycling system using cooling towers and spray ponds. No changes in the microclimate parameters and atmospheric processes in the area of the nuclear power plant location related to emissions of heat and moisture from these facilities will be observed.

The process water supply system will be fed from the Viliya river. The water supply deficit of the Viliya river is not expected.

Under normal operating conditions:

main radiative environmental load of gas and aerosol emissions during operation of the NPP unit is caused by inert gases through external exposure. During operation of the nuclear power plant the background radiation level will not increase. The radiation dose rate in the NPP area at the height of 1 m from the soil surface is within 0.10-0.17 mSv/h;

chemical agents emitted by the auxiliary structures produce no harmful impact on the population as their maximum ground level concentration with account for background pollution is lower than MAC even in the sanitary buffer area;

process emissions of the NPP will produce no negative impact on the soil, surface and ground waters, flora and fauna.

The NPP operation will not affect the state of the groundwaters within 30 km; the water quality (chemical, bacteriological characteristics) of the artesian water intakes does not depend on the NPP operation.

Article 17(3) Re-evaluation of site related factors

During construction of the Belarusian NPP, surveillance over the state of the environment in the region of the NPP is continued.

For the purposes of control of the state of the environment, the operating organization implements the Integrated Ecological Monitoring Program of the region and the site of the Belarusian NPP for investigation of the change dynamics of the parameters and characteristics of the natural processes and events in this region. The following types of surveillance over the environmental status are performed: radiation monitoring; seismological monitoring; geodetic monitoring of the present-day crustal motion; monitoring of meteorological processes, events and factors; climate monitoring; aerological monitoring; groundwater monitoring; hydrological monitoring (monitoring of the surface water regime); geotechnical control (surveillance over the yield of foundation of the buildings and facilities).

The results of the investigations demonstrate no deviations from the design target values of the NPP environmental load.

Article 17(4) Consultation with other Contracting Parties likely to be affected by the installation

Belarus conducted cross-border consultations with Austria, Latvia, Lithuania, Poland and the Ukraine as part of the procedure for assessment of the environmental impact of the Belarusian NPP in 2009-2013.

None of the countries participating in the transboundary consultations provided any evidence of possible significant harmful impact on the environment as a result of project implementation.

Belarus invited these countries to take part in the subsequent post-project analysis and consultations concerning its program.

Information on assessment of the Belarusian NPP environmental load is published on the websites of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus <http://www.minpriroda.by/> and RUE "Belarusian NPP" <http://www.belaes.by/>, and the EIA report of the Belarusian NPP is published in the section "[NPP ecology](#)" of the website of the RUE "Belarusian NPP" .

As a part of their remit, the regulatory authority, other State authorities and organizations of the Republic of Belarus continuously inform the public concerned and the community of professionals of the activities on provision of nuclear and radiation safety within implementation of the first nuclear energy program in the Republic of Belarus, including the actions within the frames of bilateral and multilateral cooperation, including activities of IAEA, Regulatory Cooperation Forum (RCF), WENRA, WWER Forum.

ARTICLE 18. DESIGN AND CONSTRUCTION

Each Contracting Party shall take the appropriate steps to ensure that

i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

At the stage of preparatory work for construction of the NPP in the Republic of Belarus, one of the most important tasks was selection of the reliable, safe and cost-efficient NPP project, and correspondingly, of the company to implement this project with supply of equipment for the NPP. With account for the conducted comprehensive analysis, the Russian project "AES-2006" was chosen and being currently implemented. The development of the design of the Belarusian NPP is performed in accordance with the requirements of the legal regulatory acts, including technical regulatory legal acts of the Republic of Belarus, the Russian Federation and the recommendations of IAEA. The fundamental characteristics of the Belarusian NPP are presented in the [Article 6](#) of the National Report.

In November 2013, Belarusian NPP construction were started under the General Contract.

Construction of the NPP according to the "AES-2006" design project enables:

creation of a 3+ generation nuclear power plant, characterized by a new reactor facility with additional safety systems: passive heat rejection system; passive system of leakage filtration into the annulus;

double protective containment; melt trap upon off-design accidents;

maximal implementation of the defense-in-depth principle - formation of the distribution barriers for the ionizing radiation and radioactive substances and the system of technical and organizational measures for barrier protection and maintenance of their effectiveness when protecting the population;

compliance of the NPP with the criteria of nuclear safety contained both in the national legislation and in the international practice of the nuclear plant engineering (European utility requirements for LWR nuclear power plants. Revision C).

To perform safety functions during the design of the NPP, the use of safety systems based on the principles of redundancy, spatial and functional independence, and single failure is provided.

Article 18 (1) Implementation of the defense-in-depth

The defense-in-depth concept is a system of physical distribution barriers for the radioactive substances and emissions as well as a system of organizational and technical measures directed at maintenance of the barriers and mitigation of the damage consequences of physical barriers.

The defense-in-depth is ensured primarily through combination of progressive and independent defense levels. Only after the failure of all defense levels, the population and the environment may be exposed to the harmful effects. In case of the failure of one defense level or penetration through one barrier, there is the next level or barrier.

The technical design project of the Belarusian NPP includes five physical barriers preventing output of radioactive substances and ionizing emission. It includes a fuel matrix, fuel-element cladding, primary coolant equipment, leak tight confinement of the reactor installation and a biological shield.

The system of technical and organizational measures includes the following levels of defense-in-depth:

level 1 - conditions for the NPP location and prevention of field troubles;

- level 2 - prevention of the design basis accidents by the normal operating systems;
- level 3 - prevention of the off-design accidents by the safety systems;
- level 4 - management of the off-design accidents;
- level 5 - emergency planning.

The NPP safety concept is based on the active safety systems having both normal power supply and emergency power supply from oil-electrical engines.

For prevention of severe accidents and mitigation of their consequences, the passive systems are available capable of operating without intervention of the in-plant personnel and power supply.

To achieve the level of safety required by the regulatory documents of the Republic of Belarus, the Russian Federation and the IAEA recommendations, the design project defines a group of safety systems and additional facilities for management of the off-design accidents.

The main tasks of management of the off-design accidents are: prevention of damages of the reactor core; prevention of the reactor vessel rupture; prevention of the containment failure; decrease of the environmental nuclear emission.

The human error check is a necessary element of both deterministic and probability safety analysis of the systems important for the NPP safety.

The deterministic safety analysis demonstrated effectiveness of operation of the safety systems and the systems important for safety of the nuclear power-generating unit within the frames of the design basics for provision of safe operation of the NPP in the design conditions. The project of the power unit of NPP ensures fulfilment of the requirements for limits of the radiation dose limits and emissions established by the regulatory documents for the design conditions of the NPP.

The results of the analysis of the off-design accident conditions presented in the Preliminary SAR for the Belarusian NPP demonstrated possibility of management of the off-design accidents ensuring effective mitigation of the consequences.

The results of the performed probabilistic analysis of safety of the levels 1 and 2 confirmed the probabilistic NPP safety criteria established by the regulatory documents. The average summary damage rate of the reactor core (nuclear fuel) does not exceed 10^{-5} 1/year (1.77×10^{-6} (1/year)), and the average summary rate of exceeding of the large accidental emission does not exceed 10^{-7} 1/year (9.7×10^{-8} (1/year)).

Article 18 (2) Incorporation of proven technologies

The NPP-2006 concept is based on the use of developed technology and equipment, the availability of prototypes, and the experience in the construction and operation of power units. The major technological equipment used in the project has many years of positive experience in the operation at Russian NPPs and NPPs of other countries built according to Russian projects.

The advantage of NPP-2006 project is the unique combination of active and passive safety systems (double reactor doom, passive systems heat removal from reactor core in emergency, core catcher) ensuring the highest level of security and complying with current and future requirements.

These systems will protect NPP from natural and man-made impact, as well as from false staff operation in emergency.

Reference power units of the Belarusian NPP are the commissioned power units of Novovoronezhskaya NPP-2 and Leningradskaya NPP-2 constructed under AES-2006 design.

Article 18 (3) Design for reliable, stable and manageable operation

AES-2006 design for the Belarusian NPP was selected based on the preliminary comprehensive analysis during preparation stage to ensure maximum reliability, safety, sustainable and manageable operation, taking into account the relevance of technologies used and with special attention to human factor.

The project provides technical measures to prevent and limit the consequences of false staff operation which violates safety functions. Accounting of human factor during nuclear facility design,

operation and technical maintenance, licensee measures (administrative, organizational, etc.) taken to account for human factor impact are stipulated in [Article 12](#) of this National Report.

Regulatory actions with regard of the works related to the Belarusian NPP construction, principles and legal grounds of their implementation are described in [Article 7 \(2\) \(ii\)](#), [Article 7 \(2\) \(iii\)](#) and [Article \(2\) \(iv\)](#) of this National Report.

Design and construction of the Belarusian NPP comply with principle 1 of the Vienna Declaration on Nuclear Safety of 9 February 2015 "new nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions".

ARTICLE 19. OPERATION

Each Contracting Party shall take the appropriate steps to ensure that

i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;

ii) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;

iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;

iv) procedures are established for responding to anticipated operational occurrences and to accidents;

v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;

vi) incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;

vii) programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;

viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

Article 19 (1) Initial authorization

RUE "Belarusian NPP" is determined as the operating organization of the NPP under construction in the Republic of Belarus [37]. Operating organization performs commissioning, operation, limitation of operating characteristics, extension of operation time and decommissioning of the Belarusian NPP and is responsible, under the legislation of the Republic of Belarus, for the failure to comply with the requirements for plant safety.

The operating organization must obtain a special permit (license) to carry out activities in the field of atomic energy use with regard to the operation of the Belarusian NPP [33].

The process of nuclear facility commissioning is regulated in the following way:

development of the nuclear facility commissioning program by the operating organization, its approval by the Regulatory Authority;

acceptance of the nuclear facility in accordance with the legislation in the field of construction, architecture and urban development;

implementation of the commissioning program controlled by the Regulatory Authority in accordance with the Procedure for the implementation by Gosatomnadzor of monitoring (supervision) of the commissioning of nuclear power plant units with WWER reactors" approved by order No.14 of the head of Gosatomnadzor of March 31, 2016.

Commissioning of the start-up complex of NPP unit includes two consecutive stages: preparatory stage of start-up works and unit commissioning stage. The latter includes the following main stages and is carried out in accordance with the milestone programs subject to safety review as part of the documents substantiating nuclear and radiation safety [92]:

Stage A – "Pre-Commissioning Activities".

Stage A includes the following substages:

substage A-1: tests and equipment try-out;

substage A-2: tests of leak-tight enclosure system;

substage A-3: hot-cold functional test of reactor installation consisting of:

phase A-3.1 (cold phase) — hydraulic tests and circulation flushing of the first circuit;
 phase A-3.2 (hot phase) — hot functional test of reactor installation equipment;
 substage A-4 — revision of basic equipment of reactor installation.

Tests in the unit not stipulated by technological rules and operation instructions shall be performed under programs and methods containing measures to ensure safety of these tests. These programs and methods shall contain measures to ensure nuclear safety of the tests performed, be approved by the manager of the start-up, chief designer of the reactor installation and General Designer, as well as be approved by operating organization. These tests shall be performed after the inspection by the regulatory authority, in accordance with the conditions of transfer from one stage of works to another and under the permission of the operating organization.

Stage Б – "Physical Start-Up".

Before the reactor is loaded with nuclear fuel and the beginning of stage Б, the operating organization shall get a license for unit operation from the regulatory authority in accordance with the established procedure.

Stage Б starts with transportation of fuel clusters from storage location to the NPP for their installation into the reactor under the program and methods of first loading of intended core.

Stage Б includes the following substages:

substage Б-1 — "Loading of reactor with nuclear fuel and tests in nuclear installation subcritical state";

substage Б-2 — "Building up critical reactor state and implementing physical tests on minimum controlled power level".

Permit for stage Б — "Physical reactor start-up" — is given by the start-up management group after the inspection of actual unit readiness based on the working commission act, decision of the main acceptance commission on the unit readiness for stage Б works and after inspection of the readiness by the regulatory authority.

Stage В – "Power Start-Up". Works at this stage shall be performed under the milestone program "Power start-up" revised (if necessary) under the results of physical start-up.

Stage В starts with reactor power increase to the level higher than the limit power of reactor physical start-up stage (stage Б) (more than 1 % of nominal power).

Under the results of physical and power start-up the operating organization shall issue a report with their results and revise NPP safety case report (if necessary).

Decision on transfer to stage В "Power start-up" is made by start-up management group after inspection of readiness by the regulatory authority.

The decision on the increase of unit power during the implementation of works at the previous stage is made by the start-up management group after its notification of the regulatory authority under the established procedure, the inspection of documents by the supervisory authority and in accordance with the terms and conditions of the operation license.

Programs and methods of testing safety-relevant systems stipulated at stage В shall be approved by the regulatory authority under the established procedure and terms.

Before works start, commission of the regulatory authority inspects readiness of the unit for stage В filing acts on unit readiness for works of stage В "Power start-up".

Stage Г – "Extended Well Test". Stage Г includes the following substages:

substage Г-1: low power testing, including nominal power;

substage Г-2: comprehensive unit tests.

Stage Г starts after low power testing of reactor installation at 50 % nominal power. Stage Г finishes after the end of tests on all reactor installation power levels tested at stage Г, including nominal power, and implementation of comprehensive unit tests.

Decision on the increase of unit power during the implementation of works at the previous stage is made by the start-up management group after the inspection of documents (including

operation logs, protocols and other documentation required) by the regulatory authority and in accordance with the terms and conditions of the operation license.

Readiness of equipment (system) for stage (substage) of NPP commissioning shall be supported by the acts of working subcommission and start-up management group.

Technical management of power unit commissioning is performed by OAO Atomtechenergo (Russian Federation) — specialized engineering enterprise performing start-up works and tests during the commissioning of new NPP power units, ensuring support of operation of the existing NPP power units and training of operational staff for existing power units and units under construction.

At the moment of the publication of this National Report, the first power unit of the Belarusian NPP is at substage A-1.

Decision on the extension of nuclear facility operation time after expiration of normative time stipulated by the design is made by a authority or a responsible officer that made a decision on the construction of these facilities.

Within five years before the expiration of the normative operation time stipulated by the design for the nuclear facility, operating organization RUE "Belarusian NPP" develops a program of nuclear facility decommissioning which shall contain measures on disassembly of the facilities specified, management of nuclear materials, spent nuclear materials and (or) operational radioactive waste, as well as measures of further monitoring and state supervision of the facilities specified.

Article 19 (2) Operational limits and conditions

Limits of safe operation are values of parameters of technological process deviations from which could result in an accident. There are safe operation limits for radiation parameters and safe operation limits for other technological parameters. *Conditions* of safe operation are minimum conditions for number, characteristics, working state and maintenance conditions for safety-relevant systems (elements) which ensure compliance with the limits of safe operation and (or) safety criteria.

The NPP project justifies the limits and conditions of safe operation, as well as provides technical means and organizational measures aimed at the prevention of violation of limits and conditions of safe operation.

In the NPP SAR there shall be operational limits and conditions, limits and conditions of safe operation for all operational states of the NPP, including reactor operation at power, outage state and refueling.

The basic document to determine safe operation of NPP unit is technological rules of NPP unit operation which contains rules and basic methods of operation, basic procedure of performing safety-related operations, as well as limits and conditions of safe operation. NPP unit operation is forbidden in case of violation of the requirements of technological rules of NPP unit operation.

Before power unit develops to minimum controlled level, all channels of safety systems shall be operating with equipment characteristics established by the project. Fitting, instrumentation, measuring devices, automation, technological protection and interlocks, as well as parameter alarm systems shall be fully operational and commissioned.

NPP units shall be stopped and put into safe state stipulated by the NPP design if during the operation of reactor installation established limits and (or) conditions of safe operation are not complied with.

During the operation of the unit at power there shall be regular check of working efficiency of safety system channels in accordance with the maintenance rules and repairs of safety systems.

Violation of limits and conditions of safe operation of the Belarusian NPP shall be investigated. Operating organization shall develop and implement measures to prevent recurrent violations of limits and conditions of safe operation for the same reasons.

Account and investigation of violations in the NPP operation, and informing of the regulatory authority about them shall be performed in accordance with the requirements of norms and rules for ensuring nuclear and radiation safety "Procedure of investigation and account of violations in the operation of nuclear power plants" approved by the resolution No.52 of the Ministry for Emergency Situations of the Republic of Belarus of October 2, 2018.

Article 19 (3) Procedures for operation, maintenance, inspection and testing

First delivery of nuclear fuel to the site, physical and power start-ups of the NPP unit and pilot operation are permitted by the regulatory authority under the following conditions:

- compliance with the conditions of transfer from one stage of works to another established in the operation license;

- verification of the readiness of the NPP for commissioning stages;

- availability of staff and population protection plans in case of accident at NPP.

To support working efficiency of safety systems and prevent failures in safety-relevant systems their maintenance, repairs, tests and inspections shall be performed.

The operating organization ensures the development of rules of maintenance, repairs, tests and inspections with the involvement of the developers of the NPP design and reactor unit in accordance with the NPP project and NPP SAR.

When safety systems are put down for maintenance, repairs, tests and inspections, the conditions of safe operation established in the technological regulations of the NPP unit operation shall be complied with.

Upon request of the regulatory authority, during use of atomic energy the operating organization shall perform extra inspections of working efficiency of safety systems, special technical means for non-design basis accident response, as well as extra control of the state of base metal and welding joints of NPP safety-relevant elements and systems.

The requirements for order and volume of pre-commissioning start-up works, works at the stages of physical and power start-ups, low power testing and acceptance criteria for NPP systems (elements) and unit during commissioning are established with regard of:

- project documentation;

- project documentation of the suppliers of NPP systems and elements;

- programs of NPP unit commissioning;

- technological regulation of NPP unit safe operation;

- regulations of maintenance, inspection and tests of NPP unit systems (elements);

- programs for the implementation of specific stages (substages) of NPP unit commissioning;

- programs of tests of NPP systems (elements) and unit.

To implement monitoring (supervision) during the commissioning of the Belarusian NPP unit, the operating organization shall, within the time frames established by license requirements and conditions, inform the regulatory authority about the following:

- transfer from one stage (substage) to another during NPP units commissioning;

- tests of systems and equipment (items) important for safety under programs and procedures for the commissioning of NPP unit, equipment and piping to be registered in Gosatomnadzor;

- tests of systems and equipment (items) important for safety not stipulated in programs of commissioning, technological regulation and instructions;

- readiness of systems and equipment to perform start-up works and organizational and assembly readiness of system or equipment for acceptance to perform start-up works;

- reconstruction (modernization) of systems and equipment (items) important to safety;

- delivery and movements of nuclear fuel at the NPP site;

- other events during the NPP unit commissioning referred to works at safety-relevant systems.

Tests at NPP unit not stipulated by technological regulation and operation instructions shall be performed under the programs and methods containing measures to ensure safety of these tests. These methods and programs shall be approved by the regulatory authorities under the established procedure. These tests are performed after the compliance with comments (if any) in the inspection log of the regulatory authority.

Programs of tests and other documentation regulating actions of the staff during tests shall contain instructions for the staff actions in situations when parameters of systems and elements violate the limits established.

Operating organization ensures permanent control of all activities relevant for the safety of the Belarusian NPP. Results of the inspections of NPP safety monitoring and regular reports on power plant safety are provided by the operating organization to the regulatory authority.

Based on the technological regulation of NPP unit operation and NPP SAR, the NPP administration shall arrange the development and issuance of and compliance with the instructions and guidelines determining staff actions to ensure safety in case of failures in normal operation, including the instruction on design basis accident liquidation and guidelines on the management of non-design basis accidents, including severe ones.

RUE "Belarusian NPP" has developed and introduced instructions specifying staff actions to ensure safety in case of failures in normal operation, instruction on the design basis accident liquidation and guidelines on the non-design basis accident management; guidelines on severe accident management is now under development.

Before the delivery of nuclear fuel, the NPP shall have recruited staff with necessary qualifications admitted to independent work under the procedure established by the operating organization.

During the NPP operation, there shall be staff available at their workplaces according to their respective posts admitted to independent work; minimum requirements to the number and composition of the staff are specified in the NPP project, NPP safety report and technological regulation on the NPP unit operation.

Persons from the NPP staff perform specific kinds of activities in the field of atomic energy use if they have permits issued by the regulatory authority.

Article 19 (4) Procedures for responding to operational occurrences and accidents

Requirements for the procedures to respond to the anticipated commissioning and operational occurrences and accidents are regulated by the legislation in the field of nuclear and radiation safety. Operating organization is responsible for their full implementation.

In accordance with the regulatory requirements based on the technological regulation on safe operation of NPP power unit and SAR, as well as in full compliance with the design documentation, the operating organization ensures development and issuance "Instruction on normal operation failure liquidation", "Instruction on design basis accident liquidation" and "Guidelines on non-design basis accident management".

Before the start of each stage (substage) of the NPP unit commissioning operating organization shall ensure preparation of all measures and safety means under SARR, NPP unit commissioning program, NPP unit commissioning stage (substage) implementation programs, as well as programs on start-up works and tests of safety-relevant systems (elements).

Before the delivery of nuclear fuel to the NPP, plans of measures on staff and population protection in the event of an accident at the NPP with regard of radiation consequences of non-design basis accidents shall be developed and ready.

By the moment of nuclear fuel delivery to the NPP there shall be internal and external emergency response plan approved under the established procedure, in accordance with the Regulations on the conditions and procedure of emergency plan development [49].

At the moment the following emergency plans for the Belarusian NPP have been developed and approved:

Plan of emergency measures in case of radiation accident at the Belarusian nuclear power plant (external emergency plan) approved by the resolution No.211 of the Government of the Republic of Belarus of March 22, 2018;

Plan of measures on staff protection in case of an accident at the Belarusian NPP (internal emergency plan) approved by the General Director of state enterprise "Belarusian NPP" of May 30, 2018.

During the NPP unit commissioning, the operating organization ensures and supports emergency preparedness level for response to accidents and emergencies by various kinds of staff trainings on response and emergency action.

Before fuel delivery, operating organization shall launch crisis centre, as well as basic and alternative means of communication with MES, republican authorities in the field of atomic energy use and regulation of activities to ensure safety during atomic energy use, local emergency management authorities and local authorities of settlements within the NPP supervised area.

For staff emergency drill, operating organization develops methods and programs of preparation and holding of emergency response training, organizes and regularly holds emergency response trainings in accordance with the established schedule.

During the professional training of the NPP staff, to drill practical skills of NPP operation technical means shall be used, including simulators of different kinds, which are admitted to use for NPP staff training. Special attention shall be paid to the drill of actions in case of possible failures, including accidents, in the NPP operation and feedback of the operation experience. At the moment, training centre of the Belarusian NPP with full-scale simulator is open.

At the stage of final NPP SAR version, there shall be schedules of trainings and emergency response drill developed and presented to the regulatory authority specifying the categories of administrative and operational staff taking part in drill of respective actions in accident conditions and during accident liquidation, as well as technical means (including simulators) used for classes.

Article 19 (5) Engineering and technical support

Engineering and technical support during the commissioning and operation of the NPP shall be provided by the Russian organization implementing AES-2006 project in the Republic of Belarus via:

- tests, start-up works, commissioning, and support during the warranty period of the NPP operation;

- provision of maintenance services for the delivered equipment, including consultations, delivery of spare parts, provision of equipment storage and conservation technology, support in organization of repair maintenance and repairs;

- development of quality assurance programs and their coordination with the owner ordering works on the construction of the Belarusian NPP;

- provision of engineering and consultation services to the Belarusian organization during the development of programs and measures for physical protection of the NPP;

- training of Belarusian specialists.

The Regulatory Authority receives the necessary support from both the technical support organizations of the Republic of Belarus and the relevant technical support organizations of the vendor country Regulatory Authority, i.e. the technology supplier of the Russian Federation (on a contractual basis), FSUE VO "Safety" (Russian Federation) and a number of other organizations.

Article 19 (6) Reporting of incidents significant to safety

In 2013-2018 operation of nuclear installations corresponding to definitions of Article 2 of the Convention on Nuclear Safety was not performed in Belarus.

Article 19 (7) Operational experience feedback

During operation of a nuclear facility, operating organization shall ensure collection, processing, analysis, systematization and storage of information about failures of elements of safety-relevant systems and false staff actions, as well as its quick transfer to all organizations involved.

Operating organization shall act to improve NPP safety in accordance with the plans made with regard of the results of safety analysis and operation experience to achieve new target safety key points.

Due to the lack of its own experience of NPP power unit operation, the Republic of Belarus made some steps to get an opportunity to study operational experience of other countries and

mechanisms of its accounting and use by regulatory authorities and operating organizations. Exchange of relevant regulating and operational experience is performed:

on multilateral basis — at sites of the international associations of regulatory authorities of nuclear safety (RCF — Belarus accedes in 2012 as recipient, WENRA — Belarus accedes in 2015 as observer, WNER Regulators Forum — Belarus accedes in 2015 as observer), Global Nuclear Safety and Security Network (GNSSN), World Association of Nuclear Operators (WANO — RUE "Belarusian NPP" accedes in 2015);

on bilateral basis — in terms of the cooperation agreements concluded with Austria, Armenia, Germany, Poland, Russia, France and Ukraine.

Article 19 (8) Management of spent fuel and radioactive waste on site

Spent nuclear fuel management

Activities on spent nuclear fuel management in the Republic of Belarus are regulated by the Law of the Republic of Belarus "On the Use of Atomic Energy" and other legal documents.

Range of measures to ensure safety during spent nuclear fuel management at the Belarusian NPP is stipulated by design solutions.

After its unloading from the reactor, spent nuclear fuel (SNF) will be delivered to the system of reactor spent nuclear fuel storage. This system is a cooling pool equipped with necessary equipment and systems.

The system of reactor spent nuclear fuel storage is provided for storage of spent nuclear fuel unloaded from the reactor to decrease activity and after power of spent fuel assemblies to admissible values allowing their transportation.

Reactor spent nuclear fuel storage system ensures its storage and hold-up in the building of reactor power unit for 10 years accounting for planned refueling and unloading of the whole core at any moment of NPP operation.

After its hold-up in reactor storage system to get to the parameters allowing for transportation, spent nuclear fuel is transported from the reactor building to the plant transfer unit in TK-13 container for further delivery by special railway train from the NPP territory.

Under the intergovernmental agreement between the Republic of Belarus and the Russian Federation of March 15, 2011, spent nuclear fuel will be sent to the Russian Federation for processing.

At the moment, the Ministry of Energy together with the National Academy of Sciences of Belarus has developed project of Strategy of Spent Nuclear Fuel Management by the Belarusian nuclear power plant and submitted it to the Council of Ministers of the Republic of Belarus for approval.

The Strategy project reflects key organizational issues for the implementation of the national policy in the field of spent nuclear fuel treatment at the Belarusian NPP. The document is developed with account for the international experience in spent nuclear fuel treatment.

Radioactive waste management (RWM)

The main legislation establishing the requirements for the provision of radiation safety during the radioactive waste management is the Law of the Republic of Belarus "On Radiation safety of the population" [20].

There is a range of regulatory documents in place in the Republic of Belarus regulating the safety issues of RWM.

Decree of the Council of Ministers of the Republic of Belarus No. 460 of 02/06/2015 [57] brought into force the Strategy of Radioactive Waste Management at the Belarusian NPP. The Strategy shall determine the ways of development of the RWM system at the Belarusian NPP; it describes the manner of managing various types of RW at the Belarusian NPP at all stages of the waste life cycle; and establishes the term for the construction of the disposal facility. The Strategy shall define the resources required to achieve the established goals.

In line with the project of the Belarusian NPP low-level RW (LLW) and medium-level RW (MLW) will be stored conditioned at the NP storage for 10 years followed by removal to the RW disposal facility (RWDF). High-level RW (HLW) will be stored in NPP storage facilities for the entire life of the NPP and will be removed to the RWDF for final disposal when decommissioning the NPP.

In accordance with the Strategy for the disposal of LLW and MLW, it is planned to construct a near-surface RWDF; and it is planned to construct a RWDF in deep geological formations for the disposal of HLW.

For the construction of the near-surface DFRW, developments for the determination of the principal structural, technological solutions and spatial designs, of the facility location, of the assessment of its potential environmental impact and of the possibility of achieving the planned technical and economic indicators are currently being conducted within the state scientific research programmes.

Commissioning of the 1st stage of the DFRW is scheduled not later than 2028 which shall ensure the receipt and disposal of the RW of the LLW, MLW categories accumulated after 10 years of the NPP operation.

The NPP radioactive waste management system is intended for the collection, cleanup, processing, conditioning, transportation and storage of the RW produced during the operation of the nuclear power plant.

It is expected that gaseous, liquid and solid radioactive waste will be produced during the NPP operation.

Solid waste is categorised as low-level and medium-level RW. The amount of the high-level operational RW will constitute approximately 1% of the total amount of the waste.

Main tasks solved by the NPP RW management:

for the gaseous waste, cleanup before emission to the atmosphere to the state meeting the sanitary standards;

for liquid RW, cleanup of the liquid RW from radionuclides, radionuclide concentration at minimum volume with subsequent conditioning in order to transfer the concentrated liquid RW into forms convenient for storage;

for solid RW, minimising its amount and its safe, robust storage during the projected term.

Low-level and medium-level solid radioactive waste shall be packaged in 200 L metal containers. High-level solid RW produced during replacement of the inter-reactor detectors and cutting the surveillance specimen shall be collected in specialised metal capsules, loaded into shielded casks and transported to the solid RW storage area for its storage during the whole nuclear power plant operational period. Liquid radioactive waste shall be placed in concrete non-returnable shielded casks, NSC, after solidification.

The expected average annual amount of the solid RW produced per one generator unit with consideration of its processing shall be:

- 8 m³ (40 barrels) of low-level RW (17.6 %);
- 32 m³ (160 barrels) of low-level RW (70.4 %);
- 5 m³ (50 barrels) of medium-level RW (11 %);
- 0.5 m³ of high-level RW (1 %).

The expected amount of processed (solidified) liquid RW in non-returnable reinforced concrete shielded casks (NSCs) per one generator unit per year shall be approximately 33 m³/year (22 NSCs)

It is provided that storage of the barrels with solid RW and NSCs with solidified liquid RW will take place at the nuclear power plant, in specially equipped permanent surface mounted storages, one per each generator unit.

The planned amount of the solid RW subject to disposal after 60 years of operation of two generator units of the nuclear power plant shall be:

- 960 m³ of low-level RW;
- 3,840 m³ of low-level RW;
- 600 m³ of medium-level RW;

60 m³ of high-level RW.

The planned production of the solidified liquid RW in the non-returnable shielded casks after the nuclear power plant service life shall be 3,960 m³ (2640 NSCs).

Thus, it is planned that 9,360 m³ of the solid RW of various categories and 60 m³ of the high-level RW will be produced during the operation time of the nuclear power plant (60 years).

The RW management system provides reliable protection of the employees (personnel) and of the population from the RW radioactive impact exceeding the limits established by the legal acts, as well as prevention of the RW environmental discharge during its management in the amounts exceeding the threshold limit values.

CONCLUSION

The system of nuclear safety and radiation safety which has formed in the Republic of Belarus keeps improving taking into account the implementation of the first nuclear power programme, recommendations of the International Atomic Energy Agency, advanced global experience and achievements. The Government of the Republic of Belarus, the regulating authority in the field of nuclear and radiation safety, other concerned parties have planned and realise consequent actions and efforts, financial and other means of its development.

Within the upcoming three-year cycle of the preparation of national reports on the performance of obligations under the Convention on Nuclear Safety, the most important event in the Republic of Belarus is to be the commissioning of the first (in 2019) and of the second (in 2020) units of the Belarusian NPP, which would demand availability of all the governmental authorities and organisations involved in the implementation of the first country nuclear power programme, including:

- licensing procedures for Belarusian NPP units operation (finalising the procedure for the unit No. 1 and performance of the procedure for the unit No. 2) including the relevant safety review and assessment of the licensee's compliance with the license requirements and conditions;

- supervision over the NPP operation;

- practical use of NPP operational experience system;

- implementation of recommendations and suggestions from the international missions and peer reviews;

- provision of work of the national emergency preparedness and response systems, accounting and control of the nuclear materials, radiation and ecological monitoring, and their improvement with new IAEA safety standards, etc.

The Republic of Belarus maintains consistent adherence to the evolutionary principle of safety provision which is in constant search of the ways for safety improvement regardless of how high the level achieved is. The most important condition for its implementation is the international exchange of experience which has been established as well within the Convention on Nuclear Safety and promotes common desire to maintain the nuclear safety at a high level both in each country and on the regional and international level.

LIST OF THE REGULATORY LEGAL ACTS OF THE REPUBLIC OF BELARUS IN THE FIELD OF NUCLEAR AND RADIATION SAFETY

International treaties and agreements to which the Republic of Belarus is a party.

1. Convention on Early Notification of a Nuclear Accident (since 1987).
2. Convention on Assistance in the case of Nuclear Accident or Radiation Emergency (since 1987).
3. Agreement on the Main Principles of Cooperation for the Peaceful Uses of Atomic energy between the member states of the Commonwealth of Independent States (1992).
4. Convention on the Physical Protection of Nuclear Material (since 1993).
5. Agreement on Nuclear Accident Prompt Notification and Cooperation in the Field of Nuclear Safety between the Government of the Republic of Belarus and the Government of the Republic of Poland (since 1994).
6. Convention on Civil Liability for Nuclear Damage (Vienna Convention) (since 1998).
7. Convention on Nuclear Safety (since 1999).
8. Agreement for Information Exchange and Cooperation in Protection against Ionizing Radiation between the Government of the Republic of Belarus and the Government of the Republic of Austria (2000).
9. Agreement on Nuclear Accident Prompt Notification and Cooperation in the Field of Nuclear Safety between the Government of the Republic of Belarus and the Cabinet of Ministers of Ukraine (2001).
10. Protocol to amend the Vienna Convention on Civil Liability for Nuclear Damage (since 2003).
11. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (since 2003).
12. Agreement on Cooperation for the Peaceful Uses of Atomic Energy between the Government of the Republic of Belarus and the Government of the People's Republic of China (2008).
13. Agreement on Cooperation for the Peaceful Uses of Atomic Energy between the Government of the Republic of Belarus and the Government of the Russian Federation (2009).
14. Agreement for Cooperation in the Nuclear Power Plant Construction on the Territory of the Republic of Belarus between the Government of the Republic of Belarus and the Government of the Russian Federation (2011).
15. Agreement for Nuclear Safety Cooperation between the Government of the Republic of Belarus and the Government of the Russian Federation (2013).
16. Agreement for Information Exchange and Cooperation in Nuclear Safety and Radiation Protection between the Government of the Republic of Belarus and the Government of the Republic of Armenia (2013).
17. Agreement for Nuclear and Radiation safety Cooperation between the Ministry for Emergency Situations of the Republic of Belarus and the Nuclear Regulatory Agency of Ukraine (2013).
18. Agreement for Nuclear Accident Prompt Notification and Nuclear and Radiation safety Information Exchange between the Government of the Republic of Belarus and the Government of the Russian Federation (2013).
19. Agreement for Cooperation in Nuclear and Radiation safety Regulation When Using Nuclear Power between the Ministry for Emergency Situations of the Republic of Belarus and the Federal Environmental, Industrial, and Nuclear Supervision Service of Russia (2013).

Laws of the Republic of Belarus, decrees of the President of the Republic of Belarus.

20. Radiation Safety of Population Law of the Republic of Belarus as of 5 January 1998 No.122-3.
21. Radiation Safety Law of the Republic of Belarus as of 18 June 2019 No.198-3.

22. Law on the Civil and Territory Protection Against Natural and Man-Made Emergencies of the Republic of Belarus as of 5 May 1998 No.141-3.
23. The Criminal Code of the Republic of Belarus as of 9 July 1999.
24. Law on Major Hazard Facility Safety of the Republic of Belarus as of 5 January 2016 No.354-3.
25. The Code of Administrative Offenses of the Republic of Belarus as of 21 April 2003.
26. Decree on Several Issues of the Ministry for Emergency Situations issued by the President of the Republic of Belarus on 29 December 2006 No.756.
27. Decree on Several Measures Aimed at the Nuclear Power Plant Construction issued by the President of the Republic of Belarus on 12 November 2007 No.565.
28. Resolution on the Nuclear-Power Engineering Development in the Republic of Belarus issued by the Security Council of the Republic of Belarus on 31 January 2008 No.1.
29. Law of the Republic of Belarus as of 30 July 2008 No.426-3 "On the Use of Atomic Energy".
30. Decree on licensing of certain types of activities issued by the President of the Republic of Belarus on 1 September 2010 No.450.
31. Law on State Environmental Appraisal of the Republic of Belarus as of 9 November 2009 No.399-3.
32. Law on the State-Owned Property and Activities Subject to the State's Exclusive Right of the Republic of Belarus as of 15 July 2010 No.169-3.
33. Decree on licensing of certain types of activities issued by the President of the Republic of Belarus on 1 September 2010 No.450.
34. Decree on Measures Aimed at Implementation of International Instruments on Civil Liability for Nuclear Damage issued by the President of the Republic of Belarus on 29 March 2011 No.124.
35. Decree on the Location and Design of the Nuclear Power Plant in the Republic of Belarus issued by the President of the Republic of Belarus on 15 September 2011 No.418.
36. Decree on the Adoption of an Amendment to the Convention on Environmental Load Assessment in a Transboundary Context issued by the President of the Republic of Belarus on 28 February 2011 No.81.
37. Decree on the Construction of the Belarusian Nuclear Power Plant issued by the President of the Republic of Belarus on 2 November 2013 No.499.
38. Decree on Ensuring Safety During the Construction and Operation of the Belarusian Nuclear Power Plant issued by the President of the Republic of Belarus on 16 February 2015 No.62.

Laws and regulations of the Government of the Republic of Belarus.

39. Resolution on Approving the Regulations on the State Safety Alert and Emergency Response System adopted by the Council of Ministers of the Republic of Belarus on 10 April 2001 No.495.
40. Resolution on the Procedure for Collecting and Sharing Information on the Civil and Territory Protection Against Natural and Man-Made Emergencies adopted by the Council of Ministers of the Republic of Belarus on 23 August 2001 No.1280.
41. Resolution on Approving the Regulations on the Procedure for Wildlife and Radiation Monitoring as part of the National Environmental Monitoring System in the Republic of Belarus and the use of these monitoring data adopted by the Council of Ministers of the Republic of Belarus on 17 May 2004 No.576.
42. Resolution on the Issues of the Ministry of Foreign Affairs of the Republic of Belarus adopted by the Council of Ministers of the Republic of Belarus on 31 July 2006 No.978.
43. Resolution on Approving the Regulations on the Monitoring and Forecasting System for Natural and Man-Made Emergencies adopted by the Council of Ministers of the Republic of Belarus on 19 November 2004 No.1466.

44. Resolution on Several Issues of the State Nuclear and Radiation safety Oversight adopted by the Council of Ministers of the Republic of Belarus on 31 December 2008 No.2056.
45. Resolution on the National Belarusian Radiation Protection Commission of the Council of Ministers of the Republic of Belarus adopted by the Council of Ministers of the Republic of Belarus on 30 April 2009 No.561.
46. Resolution on Several Issues of the Fulfilment of Nuclear Work adopted by the Council of Ministers of the Republic of Belarus on 4 May 2009 No.574.
47. Resolution on Approving the Regulations on the Procedure for Coordination, Establishment and Designation of the Boundaries of the Health Protection Area, Radiation-Control Area and (or) Storage Facility of the Nuclear Power Unit and Requirements for the Protection and Use Thereof adopted by the Council of Ministers of the Republic of Belarus on 2 April 2009 No.411.
48. Resolution on Several Issues of Attracting Foreign Specialists to Teaching in Higher Educational Institutions for Training of Nuclear Experts adopted by the Council of Ministers of the Republic of Belarus on 21 January 2010 No.54.
49. Resolution on Approving the Regulations on the Conditions and Procedure for Emergency Plan Formation adopted by the Council of Ministers of the Republic of Belarus on 27 August 2010 No.1242.
50. Resolution on Approving the Regulations on the Expert Review of Justifications for Nuclear and Radiation safety When Carrying Out Nuclear and Ionizing Radiation Activities adopted by the Council of Ministers of the Republic of Belarus on 7 December 2010 No.1781.
51. Resolution on the Creation of a Working Group to Coordinate the Implementation of State Control (Supervision) over the Construction of a Nuclear Power Plant adopted by the Council of Ministers of the Republic of Belarus on 30 December 2011 No.1791.
52. The consolidated list of administrative procedures carried out by public authorities and other organisations in relation to legal entities and individual entrepreneurs approved by the Resolution of the Council of Ministers of the Republic of Belarus as of 17 February 2012 No.156.
53. Resolution on the Major Administrative Procedure Plan for the Construction of the Nuclear Power Plant in the Republic of Belarus (with the Regulations on the Interdepartmental Commission for the Coordination of the Major Administrative Procedure Plan for the Construction of the Nuclear Power Plant in the Republic of Belarus and Control Over Implementation Thereof) adopted by the Council of Ministers of the Republic of Belarus on 5 November 2012 No.1010.
54. Resolution on Approving the Regulations on the Alerting System for the Population, Governing Authorities and Forces of the State System for the Safety Alert and Emergency Response and Civil Defense adopted by the Council of Ministers of the Republic of Belarus on 28 November 2014 No.1118.
55. Resolution on Approving the Regulations on the Arrangement and Implementation of Control (Supervision) over Ensuring Safety During the Construction and Commissioning of the Belarusian Nuclear Power Plant adopted by the Council of Ministers of the Republic of Belarus on 25 February 2015 No.133.
56. Resolution on Approving the Regulations on the Radioactive Contamination Control System adopted by the Council of Ministers of the Republic of Belarus on 4 May 2015 No.372.
57. Resolution on Approving the Radioactive-Waste Handling Strategy for the Belarusian Nuclear Power Plant adopted by the Council of Ministers of the Republic of Belarus on 2 June 2015 No.460.
58. Resolution on the Issuance of Nuclear Work Permits adopted by the Council of Ministers of the Republic of Belarus on 14 October 2015 No.854.
59. Resolution on Approving the Concept of Creating the System of Situational Crisis Centres in the Republic of Belarus adopted by the Council of Ministers of the Republic of Belarus on 21 June 2016 No.479.
60. Resolution on Public Hearings on Safety Regulation of the Belarusian Nuclear Power Plant adopted by the Council of Ministers of the Republic of Belarus on 24 April 2019 No.258.

61. Resolution on the Physical Protection of Nuclear Facilities adopted by the Council of Ministers of the Republic of Belarus on 14 June 2019 No.385.

Technical laws and regulations, including:

Technical cost engineering and standardisation systems

62. TCP (Technical Code of Common Practice) 099-2007 Location of Nuclear Power Plants. Guidance on the Development and Contents of Justifications for the Environmental Safety of Nuclear Power Plants.

63. TCP (Technical Code of Common Practice) 101-2007 Location of Nuclear Power Plants. Procedure for Developing a General Quality Assurance Programme for a Nuclear Power Plant.

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The Ministry for Emergency Situations

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71. Resolution on Approving Nuclear Safety Laws and Regulations (the Safety Rules for Research Reactor Units; the Safety Rules for the Storage and Transportation of Nuclear Fuel at Discharged Fuel Storage and Handling System Complexes; the Rules for the Design and Safe Operation of Reactivity Member Actuators; the Safety Rules for the Storage and Transportation of Nuclear Fuel at Nuclear Facilities; the Nuclear Safety Rules for Subcritical Stands, the Nuclear Safety Rules for Critical Stands) adopted by the Ministry for Emergency Situations of the Republic of Belarus on 30 December 2006 No.72.

72. Resolution on Approving the Instructions on the Development, Coordination and Approval of the Radioactive-Waste Handling Programme adopted by the Ministry for Emergency Situations of the Republic of Belarus on 30 April 2009 No.21.

73. Resolution on Approving the Regulations on the Information Management System Operation of the State System for the Safety Alert and Emergency Response adopted by the Ministry for Emergency Situations of the Republic of Belarus on 17 August 2009 No.42.

74. Resolution on Approving the Regulations and Standards for Nuclear and Radiation safety(the Rules for the Design and Operation of Ventilation Systems Safety-Critical for Nuclear Power Plants; the Rules for Hydrogen Explosion Protection at nuclear power plants operating VVER nuclear reactors; the General Provisions for the Design and Operation of Emergency Power Systems for Nuclear Power Plants; the Rules for the Design of Emergency Power Systems for Nuclear Power Plants) adopted by the Ministry for Emergency Situations of the Republic of Belarus on 11 May 2010 No.19.

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84. Resolution on Approving the Regulations and Standards for Nuclear and Radiation safety(the Requirements for Operating Entities for the Planning and Implementation of Radiation Monitoring in Nuclear or Radiological Emergency Situations at Nuclear Power Plants) adopted by the Ministry for Emergency Situations of the Republic of Belarus on 12 April 2017 No.11.

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87. Resolution on Approving the Regulations and Standards for Nuclear and Radiation safety(the Regulations and Standards for Nuclear and Health Physics: Arrangement and Implementation of Welding Work at Nuclear Facilities; the Rules for the Control of Welded Joints of Localising Safety System Elements of Nuclear Power Plants, Equipment and Pipelines of Nuclear Power Units. Welded joints and build-up weldings. Control Rules; Equipment and Pipelines of Nuclear Power Units. Welding and building-up. General Regulations; General Regulations for Welding Elements of Localising Safety Systems of Nuclear Power Plants) adopted by the Emergency Ministry of the Republic of Belarus on 12 June 2017 No.26.

88. Resolution on Approving the Regulations and Standards for Nuclear and Radiation safety(The Procedure for Implementation of Modifications at Nuclear Power Plants and Modifications Safety Assessment; the Requirements for the Operation of Recording and Analysing Systems for Nuclear Power Plant Operational Experience) adopted by the Ministry for Emergency Situations of the Republic of Belarus on 27 July 2017 No.34.

89. Resolution on Approving the Regulations and Standards for Nuclear and Radiation safety(the Requirements for the Classification of Nuclear or Radiological Emergency Planning) adopted by the Ministry for Emergency Situations of the Republic of Belarus on 21 August 2017 No.38.

90. Resolution on Several Issues of Radioactive Waste Management at Nuclear Power Plants adopted by the Ministry for Emergency Situations of the Republic of Belarus on 12 October 2017 No.43.

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95. Resolution on Approving the Regulations and Standards for Nuclear and Radiation safety(Safety Requirements for the Decommissioning of Radioactive Waste Storage Facilities) adopted by the Ministry for Emergency Situations of the Republic of Belarus on 22 February 2019 No.25.

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National State Administrative Authorities

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