

**BULGARIAN NUCLEAR REGULATORY AGENCY**



**ANNUAL REPORT**  
**2023**

With this annual report, I present to the attention of all interested parties information on the state of nuclear safety and radiation protection in nuclear facilities and sites with sources of ionizing radiation in the Republic of Bulgaria for 2023.

Pursuant to our top priority of ensuring nuclear safety and radiation protection in the use of nuclear energy and ionizing radiation and in the management of radioactive waste and spent fuel, the Bulgarian Nuclear Regulatory Agency successfully implemented its regulatory program.

In implementation of the inspection plan of the BNRA, 37 inspections were carried out in nuclear facilities, 119 inspections in sites with sources of ionizing radiation, as well as 6 inspections of activities with materials with an increased content of natural radionuclides to control compliance with the regulatory requirements for radiation protection.

As a result of the preventive control of the BNRA, 48 permits for carrying out activities in nuclear facilities and 338 permits for activities with sources of ionizing radiation were issued. 155 new licences were issued, 164 were amended, and 26 licences for activities with sources of ionizing radiation were terminated.

As a result of the regulatory control carried out by the BNRA inspectors, I can confidently state that the operation of the nuclear facilities and the activities with sources of ionizing radiation is carried out in compliance with the terms and conditions of the issued licences and permits.

The independent regulatory control of radioactive emissions at the Kozloduy NPP site, carried out by the BNRA, indicates that the radiation situation and the radioecological status of the environment correspond to the radiation protection requirements.

At the end of March 2023, the Eighth and Ninth reviews of the National Reports of the contracting parties on the implementation of the obligations under the Convention on Nuclear Safety were held. The report on Bulgaria, approved as part of the review, acknowledged our country's progress in the field of nuclear safety, noting that Bulgaria had successfully addressed three challenges and one recommendation from the last review, and no new recommendations were made. These facts once again emphasize that ensuring the safety of nuclear facilities in the Republic of Bulgaria has priority over all other activities related to the use of nuclear energy.

During the review, two challenges for our country were identified. The first is related to the implementation of the first 3-year plan under the Strategy for the Development of Human Resources in the Nuclear Sector, and the second is related to ensuring the supply of goods and services, including during military conflict.

The provision of human resources for the nuclear sector is particularly relevant after the decisions taken by the National Assembly and the Government of the Republic of Bulgaria to build new nuclear facilities at the Kozloduy NPP site. In this regard, BNRA will continue to actively participate in a number of initiatives outlined in the 3-year plan under the Strategy for the Development of Human Resources in the Nuclear Sector.

On July 20, 2023, the Bulgarian Nuclear Regulatory Agency received an application requesting the issuance of a permit under the Safe Use of Nuclear Energy Act for a phased transition of unit 5 of the Kozloduy NPP to operation with RWFA nuclear fuel produced by Westinghouse. Thanks to the good organization and experience of the BNRA team, the regulatory review of the submitted documents is carried out without significant deviations from the deadlines set in the program developed for the purpose. The regulatory review and independent evaluation activities of the documents submitted with the application are expected to be completed in the first quarter of 2024.

BNRA strives to keep up with the latest trends in the field of public communications by applying the best international practices in the field. In 2023, Bulgaria joined the newly formed Expert Group on Public Communications for Nuclear Regulatory Organizations at the OECD Nuclear Energy Agency. It is our belief that free public access to safety-related information strengthens public trust in nuclear power and in the regulatory body, and we will seek to actively implement this policy.



**Mr. Tsanko Bachiyski**  
Chairman of BNRA





## TABLE OF CONTENTS

### I. NUCLEAR FACILITIES

<b>KOZLODUY NPP POWER UNITS .....</b>	<b>4</b>
1. Operation of the units – compliance with licence requirements. Implementation of integrated programme measures .....	4
1.1. Maintenance and Repair – Main Conclusions Resulting from the Oversight, Including the Inspections Made after the Units' Planned Annual Outages .....	5
1.2. Surveillance and Testing Programmes – Performance Assessment .....	5
1.3. Water Chemistry .....	6
1.4. Ageing Management .....	7
1.5. Operational Events and Implementation of Corrective Measures .....	7
2. Operating Procedures Efficiency. Performance Indicators .....	8
3. Status of the Safety Systems .....	9
4. Status of the Containment, Filtered Venting System, Hydrogen Combustion System - Tests, Surveillance and Maintenance Programmes .....	10
5. Emergency Preparedness – Emergency Drills and Exercises .....	10
6. Radiation Protection .....	11
7. Physical Protection .....	12
<b>SPENT FUEL STORAGE FACILITIES .....</b>	<b>13</b>
1. Operation of the Storage Facilities – Compliance with Licence Requirements .....	13
2. Spent Nuclear Fuel Management. Implementation of the Strategy for Managing the Spent Nuclear Fuel and Radioactive Waste .....	14
3. Radiation Protection .....	14
4. Physical Protection .....	14
<b>STATE ENTERPRISE RADIOACTIVE WASTE .....</b>	<b>15</b>
1. Safety in Managing Radioactive Waste from Kozloduy NPP .....	15
2. Fulfilment of the Terms and Conditions of the Issued Licences and Permits .....	15
3. Plasma Melting Facility .....	16
4. Radiation Protection .....	17
5. Physical Protection .....	18
<b>NEW NUCLEAR FACILITIES PROJECTS .....</b>	<b>18</b>
1. Kozloduy NPP Units 7 and 8 – Licensing Procedure Stage .....	18
2. National Repository for Low- and Intermediate Level Radioactive Wastes – Licensing Procedure Stage .....	18

<b>RESEARCH REACTOR .....</b>	<b>19</b>
<b>SUMMARY .....</b>	<b>19</b>
<b>II. ACTIVITIES INVOLVING SOURCES OF IONISING RADIATION .....</b>	<b>20</b>
<b>III. ADMINISTRATIVE CAPACITY .....</b>	<b>21</b>
<b>1. HUMAN RESOURCES .....</b>	<b>21</b>
1.1. Human Resource Development .....	23
1.2 Training and Qualification .....	24
1.3. Knowledge Management.....	24
1.4 Knowledge Exchange Networks.....	25
<b>2. FINANCIAL RESOURCES .....</b>	<b>26</b>
2.1. Revenues .....	26
2.2. Expenditures .....	26
<b>3. PUBLIC RELATIONS AND ACCESS TO PUBLIC INFORMATION .....</b>	<b>27</b>
<b>IV. BNRA ACTIVITIES .....</b>	<b>28</b>
1. Regulatory Framework Development .....	28
2. Inspections of Nuclear Facilities .....	29
3. Inspections at Sites with Sources of Ionising Radiation .....	30
4. Licences and Permits for Performing Activities at Nuclear Facilities .....	31
5. Licences and Permits for Performing Activities Involving Sources of Ionising Radiation .....	34
6. Nuclear Material Accounting and Control .....	36
7. Emergency Preparedness .....	37
8. Nuclear Harmonisation and Standardisation Initiative .....	38
9. Second Topical Peer Review Organised by the EC on Fire Safety .....	38
10 Interaction and Coordination with other State Bodies for Specialised Control .....	39
11. International Cooperation .....	39

## I. NUCLEAR FACILITIES

### KOZLODUY NPP POWER UNITS

#### 1. Unit Operation – Compliance with Licence Requirements. Implementation of Integrated Programme Measures.

Units 5 and 6 of Kozloduy NPP are operated within their designated design modes and in compliance with the operating licences issued by the Bulgarian Nuclear Regulatory Agency (BNRA). After their planned annual outages, both units have been operating in the 30th and 29th fuel cycles respectively.

BNRA regulatory oversight of Units 5 and 6 encompasses activities pertaining to modifications in safety-related structures, systems and components (SSCs), amendments to the documents used as a basis for the issued operating licences, and monitoring performed through inspections and verifications of the licence and permit conditions. Regulatory oversight aims to establish the state of nuclear safety and radiation protection at Units 5 and 6 of Kozloduy NPP and their compliance with regulatory requirements. The necessary permits have been issued to increase the units' safety and resistance to deviations from normal operation that may evolve into accidents. The efficiency of the measures that have been undertaken is demonstrated by the steady trend in the number of events that occurred and were reported to the BNRA.

The results of the performed reviews and assessments and the information submitted in accordance with the terms and conditions of the issued licences and permits indicate that the units are operated in compliance with existing requirements.



*Photo Kozloduy NPP*

The implementation of the integrated programme measures aimed to improve the level of safety at Units 5 and 6 continued in 2023. The programmes include measures arising from the periodic safety reviews, the lifetime extension projects, and the recommendations made based on the conducted “stress tests.” As at end of the year, 57 out of 66 measures for Unit 5, and 29 out of 48 measures for Unit 6 have been implemented from the integrated programmes.



### *Compliance with Licence Requirements*

To confirm that the terms and conditions of the issued licences and permits and the recommendations and instructions made by the BNRA inspectors are met, the Regulator carries out a review and assessment of the documents certifying their fulfilment. The reviews and assessments performed in 2023 were mainly related to:

- *reporting on the implementation of the integrated programmes aimed to improve the level of safety at Units 5 and 6;*
- *update of the units' safety analysis reports;*
- *periodic updates on the state of nuclear safety and radiation protection, indicators for safe operation, radioactive discharges, etc.*

The results of the performed reviews and assessments reaffirm that Unit 5 and Unit 6 are operated in line with the licence terms and conditions and safety operation requirements.

#### **1.1. Maintenance and Repair – Main Conclusions Resulting from the Oversight, Including the Inspections Conducted after the Units' Planned Annual Outages.**

The maintenance and repair of Unit 5 and Unit 6's SSCs and the auxiliary plant equipment were performed in line with pre-designed time-schedules and in accordance with established procedures and programmes. All planned activities were carried out in full scope, meeting the expected quality requirements. The activities performed during the annual outages relating to the technical inspection and maintenance have restored the design characteristics of the SSCs to the required extent, thus ensuring their reliable operation. The results of the non-destructive examination of the equipment, the performance tests and hydraulic tests confirm the absence of any imperfections or changes in the characteristics of the SSCs' structural materials.

The regulatory oversight covering design modifications as well as on-site inspections reaffirmed the successful implementation of the equipment maintenance and repair activities.

#### **1.2. Surveillance and Testing Programmes – Performance Assessment.**



The equipment surveillance programme in place at Kozloduy NPP Units 5 and 6 monitors the units' performance under long-term operation conditions, regulates the activities aimed to ensure the reliability of SSCs, and verifies the compliance of the equipment condition with the design criteria, limits and conditions. The implementation of these activities leads to the timely detection of signs of SSCs degradation, which may result in deviations in the equipment performance in terms of its intended functions.

In relation with the identified defects in the peripheral guide tubes of the Unit 6 Protective Tube Unit (PTU) and pursuant to BNRA's recommendations, an additional inspection of the facility was performed, which found that the defects were not progressing. All necessary preparatory actions to meet the recommendations to limit any possible consequences in case the defects progress have been taken.

In 2023, five heat exchanger tubes in Unit 6 third steam generator were found leaking, and were subsequently plugged. Based on the facility's design margins, the steam generator can operate without restrictions with 110 plugged heat exchange tubes. Therefore, and pursuant to the recommendations made by the BNRA, actions have been undertaken to enhance the efficiency of preventive control. The scope and means used to exercise preventive control of the steam generators heat exchange tubes have been changed, thereby increasing the effectiveness of the control to prevent the occurrence of leaks during the unit operation at power.

BNRA's daily operational oversight duties at Kozloduy NPP site include the implementation of the surveillance and testing programmes. The daily operational oversight performed by the inspectors permanently working at the site includes daily walkdowns, conversations with the employees, monitoring the test results of SSC's compliance with the adopted success criteria, etc.

### **1.3. Water Chemistry.**

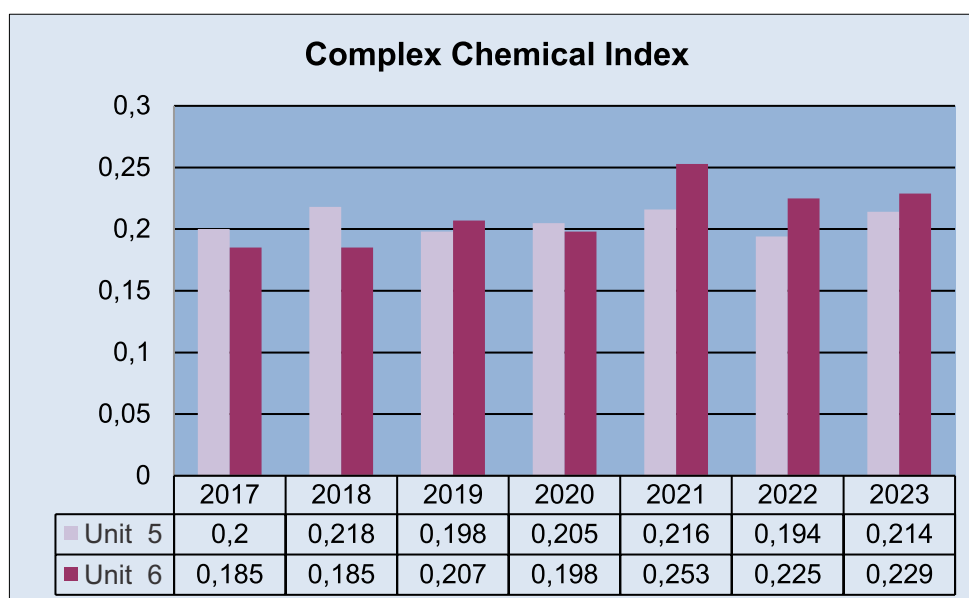
The main purpose of maintaining optimal water chemistry of the coolant in the primary and secondary circuit is to limit structural material corrosion processes and reduce deposits on heat-exchanging surfaces.

The optimal water chemistry of the primary coolant ensures suppression of the formation of oxidation products, provision of corrosion resistance of the nuclear fuel and the equipment, and minimisation of the amount of deposits on the heat-exchanging surfaces of the reactor and steam generators. The water chemistry maintained in the secondary coolant prevents corrosion and corrosion-erosion damage to the steam generators, pipelines and equipment, which are part of the circuit, and minimises the amount of deposits on the heat-exchanging surfaces in the steam generators and turbine.

The condition of the maintained water chemistry parameters is subject to continuous monitoring using a set of chemical indicators, whose values must meet certain standards. The quality of the water chemistry is evaluated based on two indicators: the chemical index (ChI) and the complex chemical index (CChI).

The activities related to maintaining optimal water chemistry levels are evaluated taking into accounts the ChI and CChI fluctuation trends. In 2023, the calculated value of the average annual ChI of the primary and secondary coolant for both units was 1, which corresponds to the optimal value of this indicator. The CChI is determined by comparing the measured values of the chemical indicators and their threshold values. The indicator is determined on a monthly, quarterly, and annual basis, with a maximum value of 1. In 2023, the indicator's average annual value for Unit 5 was 0.214, and for Unit 6 it was 0.229.

The stable trend in the CChI values demonstrates that the primary and secondary circuit water chemistry is maintained at optimal levels.



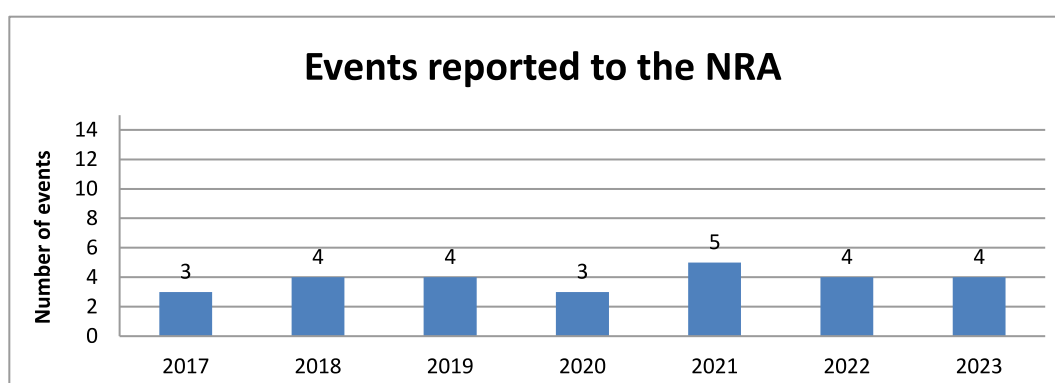
#### 1.4. Ageing Management.

To keep SSC degradation within the permissible limits, a methodology has been implemented at Kozloduy NPP to define the SSC scope subject to ageing management taking into account the regulatory requirements and applicable IAEA standards. Documents have been developed regulating the operation, maintenance, repair, testing, surveillance, and inspections of all SSCs covered by the ageing management process. In 2023, Kozloduy NPP continued to implement measures under the Management Plan for the Activities Implemented in the Long-term Operation Period of the Kozloduy NPP Units 5 and 6. As a result of the regulatory review of the reports on performed activities and requests for the issuance of permits for modifications to SSCs received at the BNRA, no departures from regulatory requirements and applicable safety standards were identified. The IAEA SALTO Follow-up Peer Review in 2023 made a similar conclusion in terms of the ageing management activities carried out under the long-term operation conditions.

#### 1.5. Operational Events and Implementation of Corrective Measures.

In 2023, four operational events were reported to the BNRA. All of them occurred at Kozloduy NPP Unit 6 and were within the scope of the reporting criteria. All events were reported in a timely manner in accordance with the regulatory requirements. The events were related to the following: A diesel generator from a safety system train was off stand-by mode; a pump from the emergency boron injection system in the primary circuit failed to switch off from the control switch, and two inadvertent actuations of safety system trains; in one of these actuations coolant was accidentally released into the Unit 6 containment during annual outage. The information about the events reported to the BNRA can be found on the Agency's website. A list of the events is available in Appendix No.1.

The analyses of the events submitted to the BNRA were reviewed by a special analysis working group. As a result, the events were ultimately classified under the INES scale. Taking into account the significance of the events in terms of nuclear safety, they were defined as "level 0/below scale". The events that occurred over the past year did not lead to any breaches of the limits and conditions for safe operation of the units. Radiation background at the plant remained unchanged. The permissible staff and public radiation exposure levels were not exceeded.





Over the review period, a total of 18 operational events were analysed at Kozloduy NPP, which do not fall within the criteria for reporting to the BNRA. Corrective measures were identified for all analysed events aimed to prevent their recurrence. The implementation of these measures is within the scope of the regulatory oversight in place, as a result of which it was found that they are being implemented within their time frames. The negative trend in the share of deficiencies due to human factors has been maintained over the past year.

## 2. Operating Procedures Efficiency. Performance Indicators.

Operating procedures efficiency is evaluated using Kozloduy NPP self-assessment performance indicator system. Through the application of this system, the necessary information on the overall status of the management process is obtained, taking into account the detailed assessment of the achievement of objectives, principles and implemented tasks and processes.



In accordance with the terms of the licenses for units operation, information on the current values of the indicators and actions taken in the event of a negative trend of some of them is periodically submitted to the BNRA. The information is subject to an assessment by the BNRA, and is taken into account when planning and performing the ongoing and follow-up regulatory oversight. In relation to a negative trend identified by the BNRA for part of the indicators relating to the human factor, a recommendation was made to review the approach used to define the corrective actions in order to eliminate this negative trend.

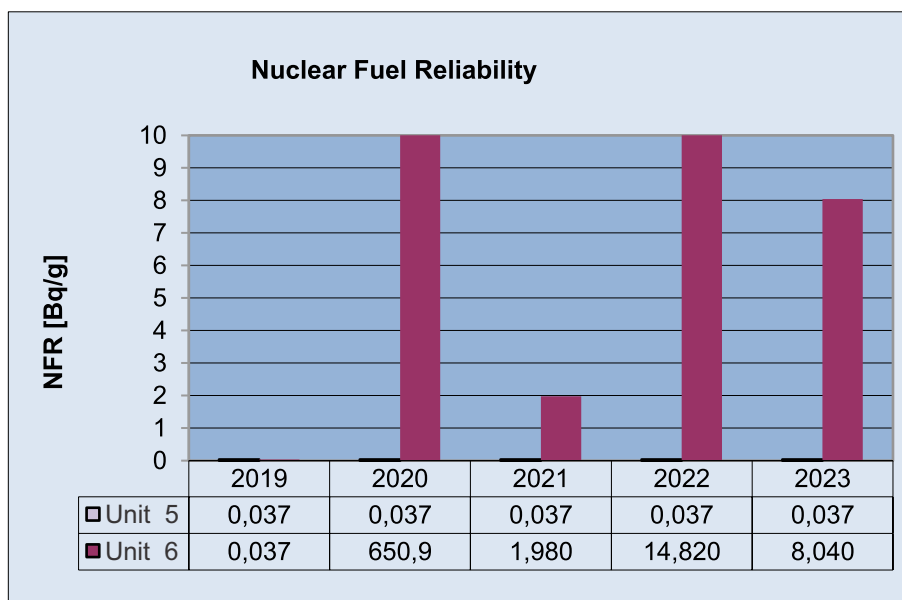
As a result of the collaboration between Kozloduy NPP and WANO, 15 new indicators related to enhanced performance monitoring have been introduced.

Data on indicators related to the operability of safety systems, the reliability of physical barriers, and the effectiveness of equipment maintenance demonstrate a stable trend of remaining below the permissible levels.

In terms of the reliability of physical barriers, it should be noted that in the period from 08 February 2023 to 16 April 2023, a leak from the primary to the secondary circuit in Unit 6 third steam generator was registered. As at 07 April 2023, a calculated leak rate of 1.662 l/h was reached, while according to the technical specifications the permissible value is 4 l/h. As a result, the unit was shut down as a preventive measure and the leak was removed. Two

months prior to the unit's annual outage, a repeated leak in the same steam generator was registered. The value of leak rate was between 0.043 and 3.399 l/h, with the maximum value reached in the process of shutting down the unit for its outage. The leak was removed and no other leaks were registered until the end of the year. In 2023, the implementation of the identified measures aimed at the preventive detection and removal of defects in the tube bundles, which may result in leaks, continued.

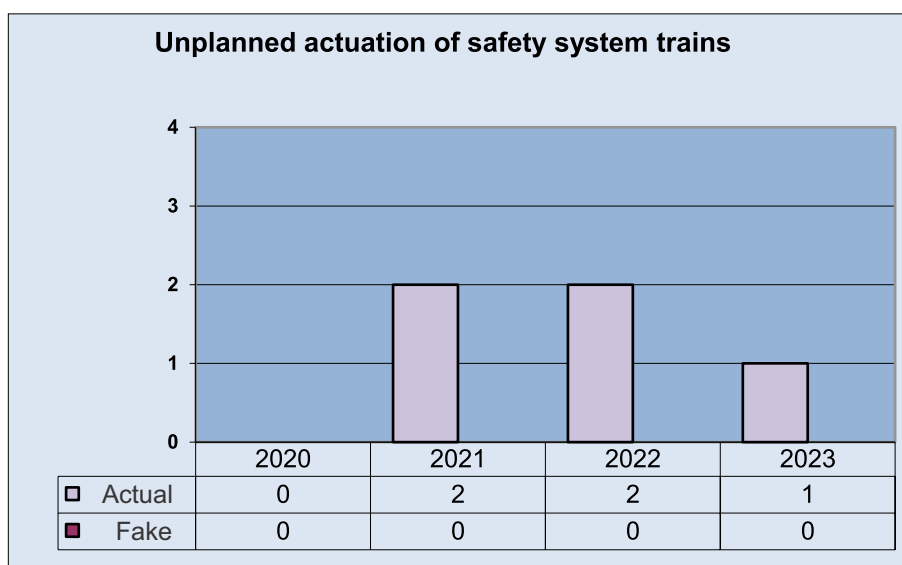
Over the review period, a leak (gas leak type) was detected in the cladding of the fuel elements of three fuel assemblies in Unit 6. This aggravated the value of the indicator related to the reliability of nuclear fuel. The leaking fuel assemblies were removed from the core and are currently stored in the spent fuel pool. The leaks did not cause any exceeding of the normal operation limits prescribed in the unit's Technical Specifications for Safe Operation.



### 3. Status of the Safety Systems.

The units' safety systems are tested in accordance with the existing requirements. The results show that the main parameters characterising the safety systems availability to perform their design functions are within the permissible limits. No deviations resulting in inoperability of these systems were found.

The risk related to the impact on the safety systems during operation is determined by the number of unplanned actuations of the systems triggered by an actual parameter. When safety systems are actuated, it is taken into account whether the triggering signal is an actual change in a certain parameter or it is a spurious signal. In 2023, one event involving unplanned actuation of a safety system train was registered. The indicator's steady trend of low levels demonstrates that the units' SSCs are kept in good condition and the necessary level of safety is maintained. The figure below shows the distribution of the indicator over the last few years.



Over the review period, no events involving a reactor scram were registered.

The regulatory oversight did not find any deviations resulting in the systems' inoperability. Safety systems were found to be well resilient in preventing deviations from normal operation and their evolving into accidents.

#### **4. Status of the Containment, Filtered Venting System, Hydrogen Combustion System - Tests, Surveillance and Maintenance Programmes.**

The current status, residual lifetime and ageing of containment materials are assessed in accordance with the approved ageing monitoring and management programmes in place for the containment and civil structures at Kozloduy NPP. Periodic inspections are performed regularly to verify the operating condition of the units' containments and the implementation of testing, surveillance, and maintenance programmes. The control of the prestressed and deformed condition of the containments is performed in accordance with the monitoring and ageing management programmes, and the results are regularly reported to the BNRA.

The operability of the containment filtered venting pressure reduction system is maintained through the performance of various activities, including annual visual inspection of the scrubber, technical qualification including the results of the welding joints' non-destructive testing, and hydraulic tests to confirm the scrubber's strength. Prior to the start-up of each unit following their annual outage, system performance tests are conducted.

The system monitoring the concentration of hydrogen, oxygen, carbon oxide and steam, as well as the systems used to measure hydrogen content and the passive autocatalytic recombiners are maintained and operated in accordance with established procedures. As a result of the regulatory oversight carried out, no deviations from the requirements regarding the implementation of these procedures were identified.

#### **5. Emergency Preparedness – Emergency Drills and Exercises.**

Over the review period, emergency response team members took part in a series of drills and exercises aimed to maintain their skills and improve the team member actions in various emergency situations related to the occurrence of severe accidents, terrorist attacks and eliminating the consequences of external events, e.g. floods. Four of the drills were conducted jointly with Kozloduy NPP. One of their main goals was to exercise interaction between emergency teams of the BNRA and Kozloduy NPP. The results of the drills and exercises that were conducted show that the success criteria have been met and the set objectives have been achieved. With a view of maintaining the necessary level of emergency preparedness, the personnel and emergency response team members underwent special training on various topics related to preparedness and response.





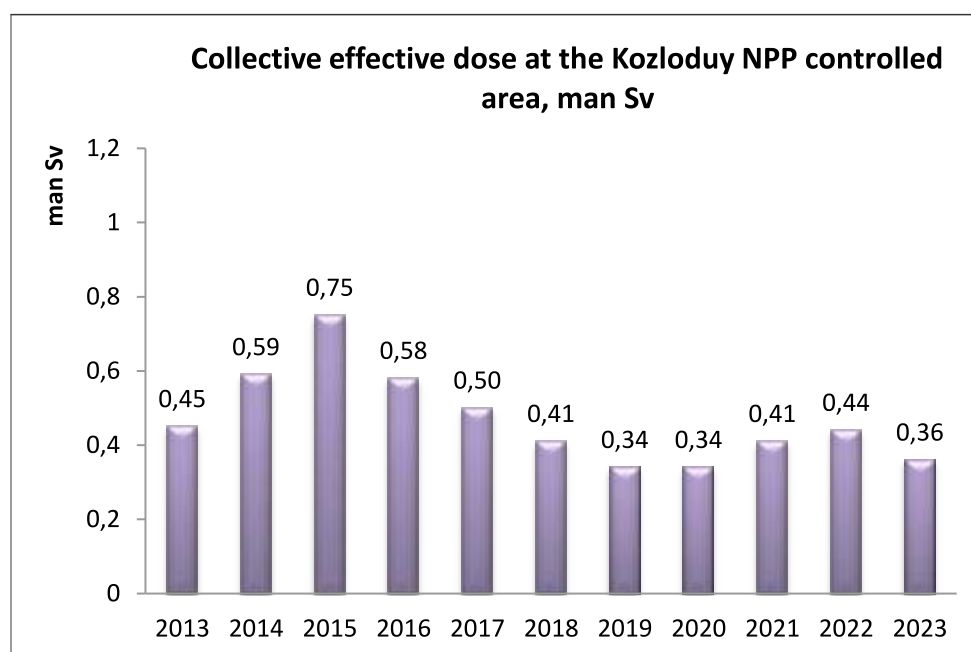
The results of the regulatory oversight in the field over the review period demonstrate that emergency preparedness is maintained at the required level and complies with the approved plans and the current regulatory requirements. The staff performing functions under the on-site emergency plan has the necessary knowledge and skills.

## 6. Radiation Protection.

Radiation protection in the operation of Kozloduy NPP Units 5 and 6 is ensured in accordance with the principles, standards, and requirements for radiation protection set out in the Safe Use of Nuclear Energy Act (SUNEA), the Regulation on Radiation Protection, and the Regulation on Ensuring the Safety of Nuclear Facilities.

### *Occupational Exposure*

The individual dosimetry control of occupationally exposed individuals in the operation of the Kozloduy NPP Units 5 and 6 is performed in compliance with the stipulations of the Regulation on Radiation Protection and Regulation No. 32 on the Conditions and Order for Performing Individual Dosimetry Control of Persons Working with Sources of Ionising Radiation. In 2023, the average annual individual effective dose was 0.14 mSv. The maximum registered annual individual effective dose was 5.80 mSv, which is below the dose constraints of 8 mSv. The collective dose in 2023 was estimated at 0.36 man.Sv and is below the average collective dose for occupationally exposed individuals at Kozloduy NPP over the past decade.



*Collective effective dose at Kozloduy NPP, 2013-2023*

Occupational exposure in the operation of the Kozloduy NPP Units 5 and 6 is maintained as low as reasonably achievable in compliance with the optimisation principle and is comparable to the occupational exposure in nuclear power plants operating WWER reactors.

### ***Radioactive Discharges and Environmental Monitoring***

During the operation of Units 5 and 6 of the nuclear power plant, radioactive discharges to the environment are continuously monitored. In accordance with the Regulation on Ensuring the Safety of Nuclear Power Plants, the permitted levels of gaseous and liquid radioactive discharges to the environment are defined in the technical specifications for the operation of Kozloduy NPP Units 5 and 6 based on the assessment of the expected radiological effect on representative members of the public. The permitted levels ensure that the annual effective dose for a representative member of the public does not exceed 50  $\mu$ Sv per year. The same dose constraint (50  $\mu$ Sv per year) applies for liquid discharges in the hydrosphere.

The results from the monitoring of the atmosphere discharges' activity and radionuclide composition in 2023 and the permitted annual levels are shown in the table below:

	<b>Gaseous discharges</b>	<b>Permitted annual activity levels based on regulations</b>	<b>Gaseous discharges compared to the permitted annual levels (%)</b>
<b>Radioactive noble gases (RNG)</b>	<b>1.75 TBq</b>	<b>3,500 TBq</b>	<b>0.05</b>
<b>Iodine-131</b>	<b>0.0286 GBq</b>	<b>32 GBq</b>	<b>0.09</b>
<b>Radioactive long-lived aerosols (LLA)</b>	<b>0.00667 GBq</b>	<b>29 GBq</b>	<b>0.02</b>
<b>Carbon-14</b>	<b>0.673 TBq</b>	<b>27 TBq</b>	<b>2.49</b>
<b>Tritium</b>	<b>0.659 TBq</b>	<b>180 TBq</b>	<b>0.37</b>

In 2023, the registered activity of gaseous discharges to the atmosphere was significantly lower than the permitted annual levels set in the technical specifications of Units 5 and 6. The activity of the non-reusable and waste water discharged in the Danube River was 0.237 GBq (excluding tritium), and the activity of the discharged tritium was 22.60 TBq. These levels are significantly lower than the permissible annual levels - 296 GBq (excluding tritium) and 163.9 TBq for tritium. These data confirm the effectiveness of the purge ventilation systems and reactor water clean-up systems at Kozloduy NPP facilities.

Kozloduy NPP performs ongoing monitoring of the permitted levels of radioactive discharges to the environment using automated radiation monitoring systems and special laboratory equipment for radiometric, radiochemical and spectrometric measurements. The results of the radiation monitoring provide the information necessary to assess radiation exposure of the population, including to monitor the condition of the protective barriers in the operation of Kozloduy NPP Units 5 and 6. Radiation monitoring of the environment in the Kozloduy NPP area is performed based on programmes, which are coordinated with the BNRA and comply with the provisions of Art. 35 of the EURATOM Treaty, IAEA's recommendations, and international good practices. The results registered in 2023 are similar to previous years and show that the radiation status of the environment remains unchanged and meets nuclear protection regulatory requirements.

The annual effective dose for members of the public caused by radioactive discharges is estimated conservatively at 4.23  $\mu$ Sv for 2023 and is similar to estimates made in previous years. This value is much lower than the regulatory dose constraint for members of the public, which is 150  $\mu$ Sv in situations of planned exposure.

The BNRA exercises independent regulatory oversight of Kozloduy NPP radioactive discharges. The radiochemical analyses of samples from the discharges to the atmosphere and to the hydrosphere are performed by the Institute for Nuclear Research and Nuclear Energy at the Bulgarian Academy of Sciences (INRNE - BAS). The results obtained in 2023 confirm the results of the monitoring carried out by Kozloduy NPP specialised laboratories.

In accordance with Art. 36 of the EURATOM Treaty, the BNRA submits annual reports to the European Commission on the registered discharges from the nuclear facilities at the Kozloduy NPP site.

## **7. Physical Protection.**

The physical protection of the individual nuclear facilities at the Kozloduy NPP site is part of the physical protection of the entire site and its functioning is generally inspected for all facilities as a whole. The regulatory oversight shows that the Kozloduy NPP's physical protection system is fulfilling its designated functions and secures the required counteraction to the identified potential threats to the facilities.



*Photo Kozloduy NPP*

## SPENT FUEL STORAGE FACILITIES

### 1. Operation of the Storage Facilities – Compliance with the Licence Requirements.

The Spent Fuel Storage Facility (SFSF) and the Dry Spent Fuel Storage Facility (DSFSF) operate in accordance with their licences. In accordance with the licence terms and conditions, the BNRA receives regular information on the facilities' safety status. The scope of regulatory oversight includes review and assessment of the incoming information and the inspections conducted at the facilities. The results show that the SFSF and DSFSF operate in compliance with the safety requirements of the Act on the Safe Use of Nuclear Energy and its implementing by-laws.



*Spent Fuel Storage Facility, Photo Kozloduy NPP*



As of 31 December 2023, a total of 122 baskets containing 924 WWER-1000 reactor fuel assemblies and 1,268 WWER-440 reactor fuel assemblies were stored under water at the SFSF. Nineteen Constor 440/84 casks containing a total of 1,596 WWER-440 reactor fuel assemblies were stored at the DSFSF.

Over the review period, a total of 120 spent fuel assemblies were transported from Kozloduy NPP Unit 5 and Unit 6 for storage in the SFSF.



*Dry Spent Fuel Storage Facility, Photo Kozloduy NPP*

## **2. Spent Nuclear Fuel Management. Implementation of the Strategy for Spent Nuclear Fuel and Radioactive Waste Management.**

The current Strategy for Spent Nuclear Fuel and Radioactive Waste Management, adopted by the Council of Ministers in 2015, envisages the annual shipment of at least 50 tonnes of heavy metal in the form of spent nuclear fuel (SNF) for technological storage and reprocessing. A new Strategy draft is currently under review, which will define the amount of heavy metal subject to transportation for reprocessing. Last year, no SNF was shipped for further reprocessing outside of the country.

### **3. Radiation Protection.**

In accordance with the licence requirements for the operation of the two facilities, the BNRA receives regular information about the dose rate in the premises, the unfixed surface contamination and the volumetric activity of the discharges through the SFSF ventilation stacks. Data show that the measured values of the monitored radiation parameters are significantly lower than the regulatory values and meet the requirements set out in the radiation protection procedures in place for the facilities.

### **4. Physical Protection.**

The physical protection of the two facilities is an integral part of the physical protection of Kozloduy NPP. Regulatory oversight, including on-site facility inspections, is part of the Kozloduy NPP physical protection surveillance.



## STATE ENTERPRISE “RADIOACTIVE WASTE”

### 1. Safety in Managing Radioactive Waste from Kozloduy NPP.

In accordance with Article 12 of the Regulation on Safe Radioactive Waste Management, the activities related to the management of RAW from the Kozloduy NPP is performed based onto a Comprehensive Programme, which describes and justifies the activities undertaken and planned by Kozloduy NPP and SE RAW for the management of all RAW generated until their disposal or regulatory clearance.

In 2023, Kozloduy NPP generated 550 m<sup>3</sup> of compactable solid RAW, 29 t of non-compactable solid RAW, and 160 m<sup>3</sup> of liquid RAW. As are 31 December 2023, 21.8 m<sup>3</sup> of solid RAW, 1723 m<sup>3</sup> of liquid RAW, 132 m<sup>3</sup> of ion-exchange resins, and 55 m<sup>3</sup> of sediments are stored. The capacity of solid and liquid RAW storage facilities at Kozloduy site is sufficient to ensure the normal operation of Units 5 and 6.

Radioactive waste subject to subsequent regulatory clearance under the Act on the Safe Use of Nuclear Energy is stored separately. Established procedures are applied for the regulatory clearance of materials arising from the conduct of permitted activities under the Act on the Safe Use of Nuclear Energy.

### 2. Fulfilment of the Terms and Conditions of the Issued Licences and Permits.

State Enterprise “Radioactive Waste” (SE RAW) performs the safe management of RAW activities in accordance with the regulatory requirements and in compliance with the licences and permits issued under the Act on the Safe Use of Nuclear Energy. SE RAW strictly observes the licence terms and conditions for the operation of the respective nuclear facilities. All SSCs important to safety and physical barriers are maintained in operable in line with their technical specifications. Qualified and licensed staff has been secured in accordance with applicable regulations. The final volume of conditioned RAW for subsequent disposal is reduced to the lowest reasonably achievable level. A programme has been developed prescribing specific technical and organisational measures relating to safety analyses and assessments, prevention of incidents and accidents, and enhancement of safety in the management of RAW at the Kozloduy NPP site. Occupational radiation exposure is maintained in accordance with the ALARA principle.

#### ➤ Specialised Division “Decommissioning Units 1-4”

Specialised Division “Decommissioning Units 1-4” (SD D) performs activities related to the decommissioning of the shutdown Units 1-4 of Kozloduy NPP, including dismantling and decontamination of technological systems and equipment. In 2023, equipment and materials totalling 3,234 t were dismantled. Radioactive components of equipment located in the reactor building of Units 1-4 weighing 1010.5 t were decontaminated. Metals with a total weight of 923.2 t were decontaminated up to the regulatory exemption levels under the Act on the Safe Use of Nuclear Energy. The BNRA Chairman issued 58 orders for regulatory clearance of 2,598 t of materials generated in the course of the dismantling activities at Kozloduy NPP Units 1-4.



*Dismantling of steam generator of Unit 3, Photo SE RAW*



➤ Specialised Division “RAW - Kozloduy”

Specialised Division “RAW – Kozloduy” (SD RAW – Kozloduy) carries out the practical operation of the facility for processing and storing of low- and intermediate level radioactive waste generated in the operation of Kozloduy NPP, in compliance with the requirements of the Technical Specifications for safe operation.

In 2023, all solid and liquid RAW delivered to SD RAW – Kozloduy were processed and conditioned, resulting in 80 StBK-1 packages and 36 StBK-3 packages (a total of 116 packages of RAW).

SD RAW – Kozloduy implements a system of safety indicators, which confirm the achieved stable level of safety in the performance of activities permitted under the Act on the Safe Use of Nuclear Energy.

➤ Specialised Division “Permanent Repository for Radioactive Waste - Novi Han”

Specialised Division Permanent Repository for Radioactive Waste – Novi Han (SD PRRAW – Novi Han) stores all RAW generated by nuclear applications in the country. Radioactive sources declared as RAW are accepted in accordance with the Regulation on the Conditions and Procedure for Delivery of Radioactive Waste to the SE RAW.

In 2023, SD PRRAW – Novi Han accepted for storage and subsequent management as RAW a total of 2,245 spent radioactive sources. The Hot cell at the SD PRRAW – Novi Han site is used for manipulations of disused sealed radioactive sources with a maximum activity of 500 TBq. The cell is also used for many other activities related to the processing of received RAW, thus supporting the forthcoming decommissioning process of this nuclear facility.



*Permanent Repository for Radioactive Waste – Novi Han, Photo SE RAW*

The terms and conditions of the licence issued for the operation of a RAW management facility. The results of the radiation monitoring at the permanent repository for radioactive waste site show that there is no deviation from the regulatory requirements for radiation protection.

### 3. Plasma Melting Facility.

The plasma melting facility (PMF) is designed for high-temperature treatment of low- and intermediate-level



short-lived RAW. In 2023, the commissioning programme of the plasma melting facility continued in accordance with the licence terms and conditions. In the course of the tests, 482 m<sup>3</sup> of RAW were treated, reducing the volume of the final RAW product to 7 m<sup>3</sup>. The quantity of generated secondary RAW (including work clothing and filters) is 3 m<sup>3</sup>.



*Plasma Melting Facility, Photo SE RAW*

#### **4. Radiation Protection.**

Radiation protection in the decommissioning of Kozloduy NPP Units 1-4 and in the operation of the RAW management facilities is provided in accordance with the safety principles, standards, and requirements set out in the Act on the Safe Use of Nuclear Energy and the Regulation on Radiation Protection.

##### ***Occupational Exposure***

The individual dosimetry control of occupationally exposed individuals in the decommissioning of the Kozloduy NPP Units 1-4 and the operation of the RAW management facilities is carried out in accordance with the stipulations of the Regulation on Radiation Protection and Regulation No. 32 on the conditions and procedure for performing individual dosimetry control of persons working with sources of ionising radiation.

In 2023, no individual effective doses exceeding the dose constraints of 6 mSv were registered. The collective dose for occupationally exposed persons in SE RAW and workers from outside organisations is 0.10 man.Sv.

##### ***Radioactive Discharges and Environmental Monitoring***

During the decommissioning of Kozloduy NPP Units 1-4 and the operation of the RAW management facilities, radioactive discharges to the environment are monitored.

The results of monitoring of discharges to the atmosphere show that in 2023 the annual individual effective dose for members of the public resulting from the decommissioning activities at Units 1-4 was much lower than the level of negligible radiation risk (10 µSv).

In 2023, the total activity of non-reusable water discharges registered via gamma-spectrometric measurements was 0.0003 GBq, which is much lower than the reference level.

## 5. Physical Protection.

In 2023, an inspection of SD PRRAW – Novi Han's physical protection was carried out. The inspection found that the physical protection system of the specialised division had improved and complies with the existing requirements.

## NEW NUCLEAR FACILITIES PROJECTS

### 1. Kozloduy NPP Units 7 and 8 – Licensing Procedure Stage.

In January 2023, the National Assembly adopted a decision to build a new nuclear unit at Kozloduy NPP. With this decision, the National Assembly instructs the government to negotiate with the US government and conclude an agreement for the construction of the new nuclear unit utilising Westinghouse AP1000 technology. The decision also instructs the Council of Ministers, through the minister of energy, to undertake all necessary actions to build Unit 7 and commence the licensing procedure and the EIA procedure for the building of Unit 8 at Kozloduy NPP using the same technology. The Unit 7 licensing procedure is currently at the stage of approved site. The Chairman of the BNRA has issued an order approving the selected site. The next step in the licensing process is for Kozloduy NPP – New Build to apply for a design permit. In October 2023, the Council of Ministers issued a decision granting an approval in principle for the building of Kozloduy NPP Unit 8. The next step is to find effective solutions for launching the licensing procedure of the new nuclear unit. A possible solution would be to launch the procedure with an application for an amendment to the site approval order for Unit 7 site accompanied by all relevant documents, including a full reassessment of the site data taking into account current safety requirements.



*AP1000 Nuclear Power Plant, Photo Westinghouse*

### 2. National Repository for Low- and Intermediate-level radioactive wastes – Licensing Procedure Stage.

The Specialised Division National Disposal Facility for radioactive waste (NDF) of SE RAW organises, coordinates and controls the construction of a disposal facility for low- and intermediate level short-lived radioactive waste. The repository is a near-surface multi-barrier engineering facility of modular type for the disposal of conditioned RAW generated in nuclear facilities and nuclear applications in the country.

In 2023, about 90% of all planned construction activities were completed. These activities were carried out in accordance with the decision issued by the BNRA Chairman.





*National Disposal Facility, Photo SE RAW*

## RESEARCH REACTOR

The facility has been shut down and its site has been cleared of nuclear fuel. The performed activities are reduced to maintaining the systems related to radiation protection and site monitoring. In 2023, no activities were carried out in connection with the Council of Ministers' decision of 2001 for the reconstruction and refurbishing of the facility into a low-power reactor.

### SUMMARY

The results of last year's regulatory oversight give grounds to draw the following general conclusions regarding the condition of nuclear safety and radiation protection in the nuclear facilities in the country:

- The operation of the nuclear facilities is based on a documented management system, prioritising the activities that ensure safety over all others.
- Nuclear facility operators have established and maintain an effective internal organisation for the implementation and monitoring of the terms and conditions of licences and permits issued by the BNRA, which helps maintain the required level of safety in the nuclear facilities.
- Licensees maintain a training and qualification system that facilitates the provision of a sufficient number of employees having the necessary qualification and experience for the safe operation of the nuclear facilities.
- The condition of the nuclear facilities meets the requirements of the defence-in-depth concept. Physical barriers and protection levels are maintained in accordance with existing requirements.
- Safety indicators values demonstrate the achieved sustainable state of safety in the operation of the nuclear facilities.
- The results of the ongoing and follow-up regulatory oversight show that the activities are performed in compliance with the regulatory requirements and the terms and conditions of the issued licences and permits.



- All non-conformances and deviations found in the course of regulatory oversight activities, and the recommendations and proposals that were made, have been documented and resolved by the licensees through adequate corrective actions.
- The permitted activities are performed in accordance with the regulatory requirements and the terms and conditions of the issued licences and permits.
- The recorded annual individual effective doses of occupationally exposed persons are way below the regulatory threshold of 20 mSv and occupational exposure rates are maintained as low as reasonably achievable.

## II. ACTIVITIES INVOLVING SOURCES OF IONISING RADIATION

According to the Act on the Safe Use of Nuclear Energy, all activities involving sources of ionising radiation carried out for business, medical, veterinary, scientific purposes or monitoring functions are subject to regulation. Regulation is exercised through a notification regime and authorisation regime (issuance of licences, permits or registration certificates) in accordance with the Act on the Safe Use of Nuclear Energy and its by-laws.

Activities involving sources of ionising radiation related to occupational exposure, exposure of members of the public or medical exposure must be justified in terms of radiation protection. Activities are permitted after proving that they will be performed and managed safely, ensuring an acceptable level of radiation risk. This includes ensuring the necessary organisational structure, appropriate technical and material resources, licensed and competent staff to perform the respective activities.

All issued individual administrative acts related to activities involving sources of ionising radiation and their amendment, renewal, termination or revocation are entered in the public registers under Article 27 of the Act on the Safe Use of Nuclear Energy. Submitted notifications relating to activities under Article 56, para. 2 of the Act on the Safe Use of Nuclear Energy are also entered in the public registers.

In the end of 2023, there were 1,268 active licences for activities involving sources of ionising radiation, distributed in areas as follows:

- for medical and veterinary purposes – 1,048;
- for business purposes – 96;
- for scientific purposes – 12;
- for oversight functions – 32;
- for transportation of radioactive substances – 34;
- for working with sources of ionising radiation – 44;
- for production of sources of ionising radiation – 2.

There are 274 active permits for construction, installation and pre-trials of SIR sites, and 274 permits for temporary storage of radioactive substances. There are 84 issued registration certificates.

The country uses 53 charged particle accelerators, 4 gamma-ray irradiators for medical purposes, and 2 gamma-ray irradiators for business and scientific purposes, 6 gamma-ray irradiators for metrological control, 95 gamma-flaw detectors (109 in storage), 99 X-ray flaw detectors (25 in storage), 7 systems for high-dose brachytherapy and 2,993 X-ray systems for diagnostics and therapy (excluding dental X-ray machines for sector graphs).



*EDGE (Varian) medical linear accelerator at the Deva Maria University Hospital*

The total number of sources of ionising radiation included in licences and permits for activities involving sources of ionising radiation is 6,371.

All activities involving sources of ionising radiation are subject to control by means of documentary checks and/or on-the-spot inspections in accordance with the procedure established by the Act on the Safe Use of Nuclear Energy. In 2023, no deviations from the dose constraints and regulatory dose constraints for occupationally exposed persons and members of the public were found.

### **III. ADMINISTRATIVE CAPACITY**

#### **1. HUMAN RESOURCES.**

One of the most significant requirements embedded in the national legislation as well as in international conventions and European Union legislation is the provision and maintenance of the necessary human resources holding proper education and qualifications in the field of nuclear safety and radiation protection.

It is a key priority of the BNRA to purposefully and consistently strengthen and develop the Agency's administrative capacity.

#### ***IAEA Project on Implementing an Integrated Approach for Capacity Building at the Nuclear Regulatory Agency***

In end-2023, the project implemented under the IAEA Technical Cooperation Programme aimed to enhance, develop and expand the BNRA's existing activities and practices in the field of knowledge management, staff training, knowledge networks and human resource development was successfully completed. Further to exchange of experience with other nuclear regulators, the project also resulted in building a unified digital knowledge management system at the Agency.



### ***National Training Course – IAEA Safety Standards***

In June last year, the BNRA hosted a national training course on the IAEA Safety Standards. This was the first national training course on this topic organised by the IAEA in one of its member states.

The IAEA Safety Standards are a series of publications containing principles, requirements and recommendations for achieving a high level of nuclear safety and radiation protection. They serve as a global framework for national regulation systems and many countries, including Bulgaria, implement them in their national regulatory documents. The IAEA standards are also underlying several international legal instruments, such as the Nuclear Safety Convention.

The course programme included an exhaustive presentation of all general and specific safety requirements and their relevant guidelines. The training included practical sessions focused on the use of various resources and tools, including the IAEA Nuclear Safety and Security Online User Interface (NSS-OUI) for accessing and navigating the Safety Standards publications.

The training course targeted Bulgarian organisations in the field of nuclear energy, RAW management, decommissioning, radiation protection, safety in activities involving radioactive sources, etc. Nearly 70 representatives of Kozloduy NPP, Kozloduy NPP - New Build, the National Centre of Radiobiology and Radiation Protection, the State Enterprise Radioactive Waste, the Institute for Nuclear Research and Nuclear Energy, the Nuclear Regulatory Agency and GCR took part in the event. The speakers were experts from the IAEA.

### ***National Strategy for Human Resource Development in the Nuclear Sector 2022-2032***

In 2023, as part of the implementation of the National Strategy for Human Resource Development in the Nuclear Sector 2022-2032 and with the leading role of the BNRA, the first three-year plan on the Strategy implementation was prepared. The plan was green-lighted by a Decision of the Council of Ministers dated 26 April 2023 and envisions specific activities to achieve its strategic goals, as well as indicators, institutions responsible for its implementation, deadlines, indicative budget and funding sources, and expected results.





Work on implementing the plan has also started. In 2023, the BNRA, acting as a leading institution responsible for the strategy implementation, organised two working meetings with experts from the Ministry of Energy, the Ministry of Education and Science, the Employment Agency, the Sofia University “St. Kliment Ohridski”, the Technical University in Sofia, Kozloduy NPP and SE RAW, where various aspects of the implementation of the activities planned over the period were discussed.

### **1.1. Human Resources Development.**

Despite the challenging situation on the nuclear labour market, BNRA’s management continues to invest efforts to ensure the administrative capacity needed to provide for the Agency’s regulatory functions. In 2023, the BNRA held ten competitions for vacant positions and appointed five civil servants. Thus, at the end of 2023 the total number of BNRA employees reached 107 people.

Over 90% of all employees in the agency hold higher education degrees. More than half of BNRA employees hold a grade higher than the minimum required for the particular position, and the average professional experience in the specialised administration is over 20 years.

In 2023, for the first time ever the BNRA organised student internships in its specialised administration. Five students studying natural and technical sciences had the opportunity to get a first-hand impression of the regulator’s inspecting activities. The internships had an average duration of six weeks and were highly beneficial both for the students, and for the Agency employees.



## 1.2. Training and Qualification.

Specialised training is provided to maintain and improve the qualification of employees, including opportunities to gain additional knowledge and skills to ensure the high-quality performance of their duties. The Agency applies a systematic approach to training based on an internationally recognised methodology.

The training process is channelled in three main directions:

### ➤ Training by the Institute of Public Administration (IPA)

In 2023, all employees refreshed and upgraded their knowledge by joining training courses organised by the IPA in the field of cybersecurity, digital competencies, and public policies. In addition, BNRA management attended a two-day IPA training course dedicated to “Crises and Change Management. Strategic Leadership and Coping Skills.”

### ➤ Specialised Training.

In 2023, 13 trainings were conducted in accordance with the approved Annual Plan for Specialised Training, 9 of which were conducted by visiting lecturers.

➤ Training by International Organisations (IAEA, bilateral cooperation agreements) and Participation in International Meetings, Projects, Seminars, Conferences, etc.

Over the past year, over 40 BNRA employees participated in 80 training courses, seminars and other forums. Furthermore, BNRA experts joined seven international events in virtual format.

## 1.3. Knowledge Management.

Activities related to knowledge management, which include retaining the accumulated expert experience and passing it on to younger experts, are of paramount importance to the Agency. Over the review period, the existing database containing reports, presentations, training courses and other materials from various national and international events continued to be expanded, and the whole staff was provided with free access to these, as well

as to all trainings conducted under the Annual Specialised Training Plan. A comprehensive digital Knowledge Management System (KMS) was also built. The KMS is a structured digital portal containing updated information, which is important for BNRA's activities. The system offers employees an opportunity to access various types of categorised resources, including materials from trainings, workshops, working meetings and business travels, reports, etc. Each employee has a personal qualified digital profile containing information about their professional development at the BNRA, including trainings and courses they have attended, certificates obtained, etc. The KMS is organised in three modules - training, information, and library.



#### **1.4. Knowledge Exchange Networks.**

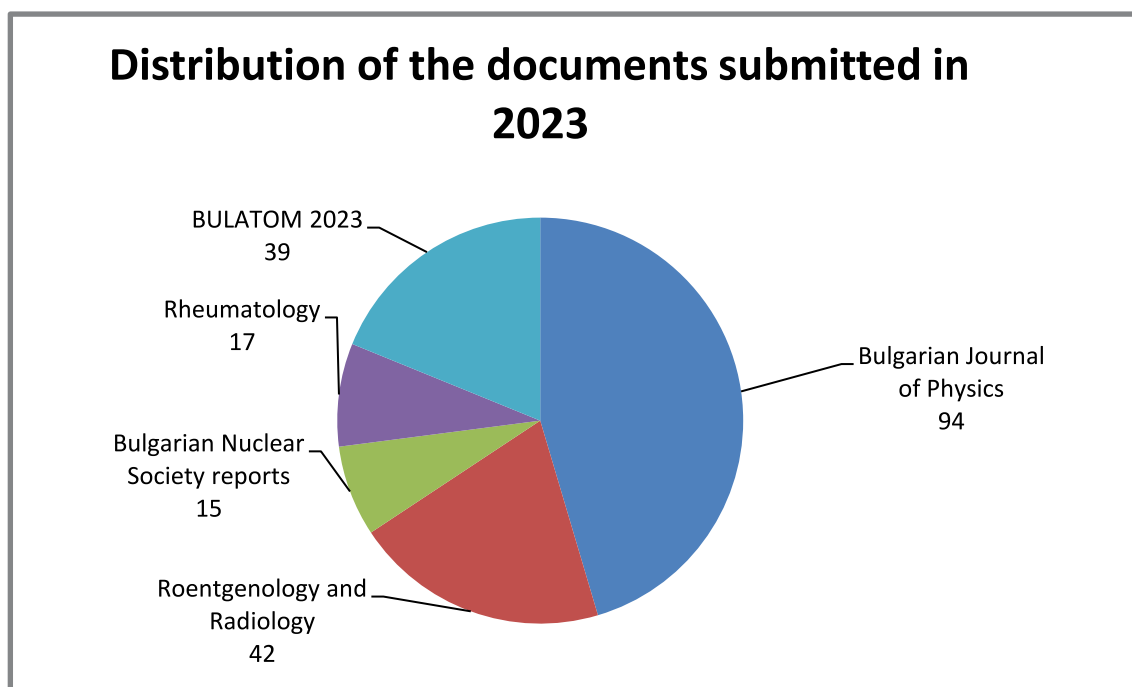
##### **INIS National Centre**

Bulgaria has been a member of the IAEA International Nuclear Information System (INIS) since its establishment in 1970. The National INIS Centre is responsible for uploading inputs to the system from Bulgaria. In 2023, over 500 documents were reviewed and categorised, 207 of which were referred to INIS. Of these documents, 168 are articles published in specialised Bulgarian magazines, and 39 documents are reports from the international conference of the Bulgarian Atomic Forum, BULATOM. Thus, the total number of documents uploaded to the INIS Repository by Bulgaria since the system's creation has reached 14,463, including 3,474 full-text documents.

In 2023, BNRA employees took part in the meetings of the European and Central Asia Safety Network (EuCAS) (Regional network for information exchange in the field of nuclear safety) and the IAEA Global Nuclear Safety and Security Communication Network (GNSSCOM), as well as in the meeting of the Nuclear Energy Agency (NEA) Regulators Forum (RWMNC-RF).

On a national level, BNRA employees took part in events organised by non-government organisation in the sector such as BULATOM, the Bulgarian Nuclear Society, the Bulgarian Energy and Mining Forum.





## 2. FINANCIAL RESOURCES

The budget of the BNRA for the respective year is determined by the State Budget of the Republic of Bulgaria Act.

### 2.1. Revenues.

The revenues generated by the BNRA come from fees charged for issuing licences and permits under the SUNEА in accordance with the Tariff of Fees Collected by the Nuclear Regulatory Agency under the Act on the Safe Use of Nuclear Energy.

The 2023 State Budget of the Republic of Bulgaria Act allocates BNRA's revenues at BGN 8,500,000.

In relation to an amount received from the IAEA on a proposal of the BNRA Chairperson pursuant to Art. 110, para. 1 of the Public Finance Act, the Minister of Finance made an adjustment to the Agency's budget increasing the *Revenues, Aid, and Donations* item by an amount of BGN 116,507.

In the period 01 January 2023 - 31 December 2023, the BNRA's budget received revenues from state fees amounting to BGN 10,612,916; revenues from interest, fines and sanctions amounting to BGN 9,512; other non-tax revenues amounting to BGN 2,742, and revenues from aid and donations from abroad amounting to BGN 116,507. Over the review period, the total amount of revenues reported in the budget of the BNRA on a cash basis was BGN 10,741,677.

The 2023 revenue overperformance from state fees is the result of fees collected for permits that cannot be foreseen, for the Kozloduy NPP design modification, as well as fees for permits issued for the transit of fresh nuclear fuel across the country.

### 2.2. Expenditures.

Under the Act on the State Budget of the Republic of Bulgaria for 2023, functional area "Regulation of Nuclear Safety and Radiation Protection of the Republic of Bulgaria", budget programme "Regulation and Oversight of Nuclear Safety and Radiation Protection of the Republic of Bulgaria", the BNRA's expenditures were set to BGN 8,435,300, including personnel costs amounting to BGN 4,374,900 and capital expenditures worth BGN 170,000.

In relation to an amount received from the IAEA on a proposal of the BNRA Chairperson pursuant to Art. 110, para. 1 of the Public Finance Act, the Minister of Finance made an adjustment to the Agency's budget by increasing the Capital Costs item by BGN 116,507. The costs were allocated to funding an integrated knowledge management system for the regulator's employees and the necessary equipment to support the system.

Pursuant to Art. 112, para. 2 of the Public Finance Act, the expenditure allocated to acquisition of fixed assets was increased by BGN 115,145 on account of a reduction of maintenance and other current expenditure. The Minister of Finance was duly notified of this.

Following the adjustment made to the BNRA's budget as of 31 December 2023 according to the updated specified plan, the total amount of expenditures is BGN 8,551,807, including personnel expenditures of BGN 4,374,900 and capital expenditures of BGN 401,652.

Reported expenditures in 2023 went to cover the Agency's current maintenance costs, remuneration of the staff, social and health insurances, expert assistance in the "Regulation of Nuclear Safety and Radiation Protection of the Republic of Bulgaria" functional area, membership fee of the Republic of Bulgaria paid to the International Atomic Energy Agency, acquisition of fixed tangible assets, etc. Expenditure totalled BGN 7,564,938.

### 3. PUBLIC RELATIONS AND ACCESS TO PUBLIC INFORMATION

The top priority of the BNRA is to ensure nuclear safety and radiation protection. To fulfil its mission, the national regulator abides by the principles of independence, reasonableness, and open dialogue with all stakeholders. It is the Agency's conviction is that free access to public information related to safety reinforces public trust in nuclear energy and the regulator.

The BNRA is striving to stay abreast with modern trends in the field of public communications, applying the best international practices in the field. In 2023, Bulgaria joined a newly established Expert Group on Public Communication of Nuclear Regulatory Organisations (EGPC) at the Nuclear Energy Agency (NEA).

The BNRA is implementing a communication policy aimed at organising communication in a way that makes the Agency recognisable, sought-after, and credible source of accurate and up-to-date information. The communication policy covers the long-running processes of building public trust and positive attitude towards the Agency's activity by maintaining full-fledged dialogue with all stakeholders, including the media, institutions, and citizens.

The main communication channels the BNRA uses to communicate with stakeholders are its official website and its social media accounts – Facebook page and active LinkedIn profile.

In 2023, news, current information and draft regulations were published on the regulator's website and on its social media profiles. This included coverage of important events related to the nuclear and radiation safety of activities and facilities, as well as the Agency's operations.



Led by its policy of openness and transparency and by increased public interest in the topic, the regulator has created a special section on its website to publish up-to-date information on ongoing developments in the permit issuance process for the use of a new type of nuclear fuel at Kozloduy NPP Unit 5.

In February 2023, the BNRA held its traditional annual press conference where the Chairman briefed journalists on the key highlights of the regulator's activities during the previous year.

In September 2023, the BNRA organised a two-day training workshop for journalists. As part of the event, the Agency's management met media representatives to discuss current issues related to the development of nuclear energy and the sector's regulatory framework.



Last year, the Agency registered eight requests for access to public information. All requests were satisfied and the required information was provided within the legally set timeframe. All registered requests for access to public information came from natural persons.

## **BNRA ACTIVITIES**

### **1. Regulatory Framework Development.**

In relation to the prepared draft of a new Regulation on Emergency Planning and Emergency Preparedness in the Event of Nuclear and Radiological Emergencies, meetings between representatives of the Directorate General for Fire Safety and Civil Protection and the BNRA were held in 2023 to discuss contentious issues related to the legal aspects of the regulation draft. As at the end of 2023, there was no change in the already established positions of the parties related to the regulation's scope. The provisions of the Act on the Safe Use of Nuclear Energy and the Disaster Protection Act do not contain special authority of the BNRA Chairperson related to the development and control of the Off-site Emergency Plan implementation. The Regulation is not in a procedure of adoption by the Council of Ministers.

In 2023, the review and update of regulatory guides continued. Three new guides were approved and published on the BNRA website – Guide on Applying a Graded Approach in Activities Involving Sources of Ionising Radiation, Guide on Protection against Internal Fires in Nuclear Power Plants, and Guide on Applying Probabilistic Safety Analysis in the Management of Safety in Nuclear Power Plants.



As a result of the analysis and assessment of the compliance of the Regulation on the Terms and Conditions for the Transport of Radioactive Material with the IAEA recommendations on the safe transport of radioactive substances, a draft amendment to the document will be prepared. The National Report in fulfilment of Council Directive 2006/117/EURATOM on the supervision and control of shipments of radioactive waste and spent fuel was prepared in a timely manner.

## **2. Inspections of Nuclear Facilities.**

In accordance with the BNRA's inspection activities plan, a total of 30 inspections were conducted in the nuclear facilities in 2023. Appendix No. 2 contains a list of the inspections.

Results of the major inspections conducted at Kozloduy NPP:

### ***Organisation and Management of Activities Related to Chemical and Radiochemical Control***

The goal of the inspection was to check the organisation and implementation of activities related to the management of the physical and chemical taking place in the operation of Kozloduy NPP equipment, including corrosion control of technological equipment and radiochemical technological control at Units 5 and 6. The inspection found that there is an organisation in place to determine the scope of corrosion control, its frequency, the indicators that should be monitored, specific requirements to sampling and the procedure in place to document monitoring results. The scope of radiochemical technological control of the various technological systems has also been defined, as well as control of the nuclear fuel integrity. The implementation of all activities and the documentation of their results have also been inspected. No non-conformities to the established regulatory requirements were found. However, areas for improvement were noted where performance can be improved.

### ***Operation, Maintenance and Lifetime of Kozloduy NPP Units 5 and 6 Control Safety Systems***

The purpose of the inspection was to verify the implementation of the activities related to the operation, maintenance and lifetime of control safety systems. It was found that the necessary surveys of the condition and the lifetime of the system components have been performed; the availability of a sufficient number of spare parts to ensure the maintenance and operation of the systems has been established. The walkdowns in the control safety systems premises found that housekeeping and equipment condition were good. In conclusion, it was found that the systems are operated, tested and maintained in accordance with the requirements.



### ***Preparedness of Units 5 and 6 for Start-up and Operation after the Planned Annual Outages***

In accordance with the terms and conditions of the operating licences, inspections have been carried out to determine the readiness of the units for start-up and operation following the planned annual outage. The scope of these inspections included the maintenance works on the equipment, the design modifications, the implementation of measures set out in the integrated programmes, the results of the performed non-destructive testing of the equipment, etc. Housekeeping and the equipment condition were also checked, as well as the readiness of the systems for start-up.

The inspections found no deviations or non-conformances to the requirements that could prevent the safe start-up and operation of the units.

### ***Operation and Maintenance of Auxiliary Building-3 Facilities***

The inspection aimed to check the operational condition of Auxiliary Building 3 (AB-3), as well as the performance of activities related to the operation and maintenance of the systems and equipment therein. The inspection found that the systems and equipment were operated in accordance with the requirements. Preventive maintenance and repair of the equipment are carried out based on approved time schedules. Operating documentation is kept up-to-date. The walkdowns and observations of the condition and housekeeping in the premises found that the premises and the equipment were in good condition.

### ***Radiation Monitoring of Gaseous Discharges to the Environment by the Kozloduy NPP***

The inspection covered the activities related to the organisation and performance of radiation monitoring of gas and aerosol radioactive emissions, including: ongoing and periodic monitoring; distribution of obligations and responsibilities among the respective organisational units; documenting and reporting the results; technical condition; service, repair and metrological assurance procedures for the measurement equipment and systems; control of the effectiveness of the ventilation clean-up systems. The conclusion was that radiation monitoring of gaseous discharges to the environment had been organised in compliance with regulations in force and licensing terms and conditions.

### ***State Enterprise Radioactive Waste***

Inspections at the specialised divisions of SE RAW were carried out in accordance with the 2023 inspection plan approved by the BNRA Chairman. Seven inspections were conducted on the following topics:

- compliance with the requirements set out in Chapter 9, Section 5 of the Regulation on Safety in Radioactive Waste Management at the SD PRRAW – Novi Han;
- performance of the activities set out in the decommissioning plan of Units 1-4 and safe management of RAW generated as a result of these activities;
- organisation of activities related to the management and implementation of the project on the modernisation of the RAW processing and storage facility operated by SD RAW-Kozloduy;
- organisation of operations and radiation control at the Size Reduction and Decontamination Workshop;
- implementation of the activities related to the building of a National Disposal Facility for RAW in accordance with the requirements of Chapter 9 of the Regulation on Safety in Radioactive Waste Management;
- emergency planning and preparedness at the SD PRRAW – Novi Han;
- securing physical protection in SD PRRAW – Novi Han.

## **3. Inspections at Sites with Sources of Ionising Radiation.**

Inspections at sites with sources of ionising radiation aim to check the fulfilment of the terms and conditions of issued licences, permits and registration certificates, as well as the compliance with regulatory requirements regarding radiation protection and safe use of sources of ionising radiation used to perform the respective activities.

All planned inspections at sites and activities involving sources of ionising radiation are performed based on an approved annual plan for the BNRA inspection activities. When defining the scope and frequency of each planned inspection, a graded approach is applied based on the radiation risk, taking into account the complexity and specifics of the permitted activities with SIR, as well as the type, category and radiation characteristics of the respective sources of ionising radiation.

In 2023, 77 planned inspections and 26 non-planned (extraordinary) inspections were carried out at sites

with sources of ionising radiation. Furthermore, eight inspections were carried out to check the commissioning preparedness of new sites with sources of ionising radiation;

- Radiotherapy Ward and Nuclear Medicine Ward at the Pulmed University Hospital, Plovdiv;
- Radiotherapy Ward and Nuclear Medicine Ward at the Deva Maria University Hospital, Burgas;
- Radiotherapy Ward and Nuclear Medicine Ward at the Sofamed University Hospital, Sofia;
- Radiotherapy Ward at the St. Mina Hospital, Blagoevgrad;
- Nuclear Medicine Ward at the Medical Centre “Beroe Medical Complex”, Stara Zagora;
- Gamma-flaw detectors storage facility at SGS Bulgaria, Varna.



*Medical linear accelerator TrueBeam HD120MLC (Varian) at the Sofamed University Hospital – at its installation and after commissioning*

In 2023, six inspections to check activities involving materials with increased content of natural radionuclides were carried out to monitor compliance with the regulatory requirements for radiation protection.

A total of 117 records of findings were compiled to document the results of the inspections carried out in 2023. Depending on the nature of the established irregularities and deviations from the regulatory requirements and the terms and conditions of the administrative acts issued under the Safe Use of Nuclear Energy Act, the respective instructions and recommendations were given in the records of findings. In 2023, three prescriptions and three acts of administrative violations were compiled and served. No coercive administrative measures under the Act on the Safe Use of Nuclear Energy were imposed.

In 2023, the state of the physical protection of the gamma-irradiating installations (research irradiator, irradiator for metrological control and G10-1-12-E) at the Reference Radiation Facilities division with the National Centre for Radiobiology and Radiation Protection was inspected. According to the findings, substantial improvements have been made to the physical protection system and it fully meets the existing requirements

#### **4. Licences and Permits for Performing Activities at Nuclear Facilities.**

##### **Kozloduy NPP**

*Number of issued permits – 42, distributed as follows:*

- for modification of safety-related structures, systems, and components – 29, including 14 at Unit 5, 12 at Unit 6, and 3 at the SFSF;
- of internal rules for the implementation of the activity, including procedures, programmes, technical



specifications and other documents attached to the operating licences – 3;

- for import of nuclear material – 2;
- for transportation of nuclear material – 2;
- for transit of nuclear material – 5.
- one permit for amending the Regulation on the Organisation and Activity of the company related to organisational changes in Kozloduy NPP structure.

The key activities governed by the issued permits relate to the following:

➤ enhancing the reliability and maintainability of the facilities and equipment - upgrading the operators' control panels used in the Unit 5 main control room; replacement of secondary sealings of the main coolant pumps' main flanges; introduction of a new system for temperature and level measurement in the compartments for SNF acceptance, loading and storage at the SFSF, etc.;

➤ implementation of measures related to the long-term operation of the units, such as migration of the computer information control system of Unit 5 to a new-generation platform; gradual replacement of components of systems important to safety and major equipment (replacement of valves, hydraulic snubbers; pump units, electric motors and batteries).

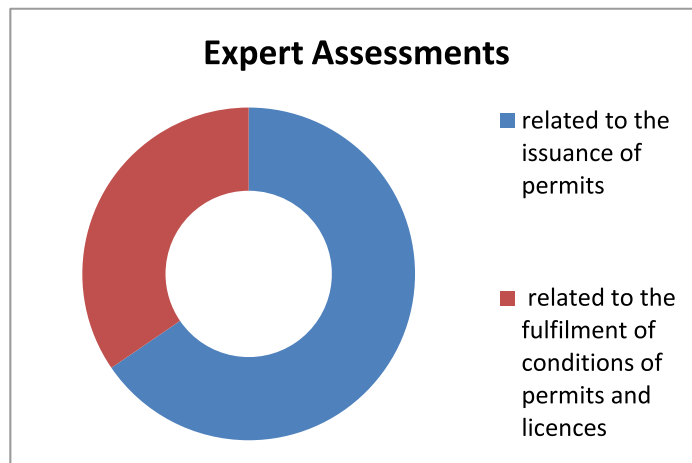


In addition, the BNRA reviewed and assessed 28 technical solutions for modifications of SSCs in nuclear installations, which are not in the scope of the licensing regime but have some relevance to safety.

A key element of the permitting and licensing process at the BNRA is the review and the assessment of the compliance of documents accompanying applications for permits and licenses with regulatory requirements. The review and assessment of the submitted information take into account both regulatory provisions and the instructions of BNRA's regulatory guidelines, as well as the IAEA Safety Standards.

The reviews and assessments carried out in 2023 mainly covered modification permission applications related to:

- implementation of measures to improve safety and modifications of structures, systems and components important to safety in the nuclear facilities;
- proposed changes to the operating limits and conditions of nuclear facilities, on the basis of which an operating licence has been issued;
- amendments to internal rules for the implementation of activities, including regulations, procedures, and programmes attached to the operating licences of the facilities.



As a result of the reviews and assessments, 110 expert statements were produced on the compliance of the submitted documents with regulatory safety requirements, two-thirds of which were related to the issuance of permits and renewal of the SFSF licence.

A substantial part of the human and time resources invested in expert assessments over the year were related to reviewing documents for the licensing of a new type of nuclear fuel for Kozloduy NPP Unit 5. In July, the BNRA received an application to issue a permit under the Safe Use of Nuclear Energy Act for the gradual transition of Kozloduy NPP Unit 5 to operations using RWFA type nuclear fuel, produced by Westinghouse. The application came with a large volume of technical documentation aimed to demonstrate the new fuel assembly design safety and confirm the safe operation of Unit 5 with homogeneous and mixed loading of the reactor core. To ensure technical support in the safety review and assessment process, agreements were signed with external consultants – the French Institute for Radiation Protection and Nuclear Safety (IRSN) and Czech-Ukrainian consortium ESG EU. The purpose of the expert assessment was to review individual safety analysis reports of the new type of fuel RWFA and assess the compliance with all applicable safety requirements, including the IAEA Safety Standards. The expert assessment process included regular meetings with contractors to discuss any arising technical issues and the review results. The consultants' experience in licensing a new type of nuclear fuel, the professionalism of the experts and effective project management are essential for the success of the expert assessment. The regulatory review and independent assessment of the documents submitted with the application are expected to be completed in the first quarter of 2024.



*Fuel Assembly RWFA, Photo Westinghouse*

Over the year, substantial efforts were also invested in assessing the SFSF periodic safety review reports that were received along with an application for the renewal of the operating licence. The results of the periodic safety review and the planned safety improvement measures arising thereby give assurance that the storage facility can be operated safely during the period until its next periodic safety review.

### **State Enterprise Radioactive Waste**

In 2023, three permits were issued to the SE RAW for making changes related to the implementation of technical solutions for:

- building a zone for steam generators fragmentation in the turbine hall;
- installation of equipment to extract and process legacy RAW from Units 1-4;
- storage of waste with a very low level of radioactive contamination in Spray Pond 1.

### ***Specialised Training Licences and Certificate of Competency***

In 2023, the specialised training licence of the Directorate General Fire Safety and Civil Protection at the Ministry of Interior was renewed. In relation to the performance of regulatory oversight, the following licence holders were inspected over the period - Directorate General Fire Safety and Civil Protection, Kozloduy NPP and IvEm Learning. The inspections found that the licence holders' activities meet the existing regulatory requirements and the terms and conditions of the licences issued.

The Qualification Examination Commission appointed by the BNRA Chairman held 12 sessions; as a result issued 25 certificates of competency to individuals carrying out activities at nuclear facilities (15 for operational personnel and 10 for management staff). Information on the issued certificates is published in a public register maintained by the Agency.

Last year, a total of 2,866 certificates of competency were issued, certifying their holders have passed initial and continuing specialised training to perform activities in nuclear facilities and with sources of ionising radiation. Information on the issued certificates and e-signed copies of the certificates are available in the BNRA's e-service system.

## **5. Licences and Permits for Activities Involving Sources of Ionising Radiation.**

The regulation of activities involving sources of ionising radiation applies a gradual approach based on an assessment of the radiation risk. Under the Safe Use of Nuclear Energy Act, all activities involving sources of ionising radiation may be carried out only after obtaining a permit, licence or registration certificate, or after submitting a notification in the cases stipulated by the law. In 2023, documents related to the regulation of activities involving sources of ionising radiation submitted to the BNRA were reviewed, analysed and assessed.

A total of 155 licences for activities involving sources of ionising radiation were issued, as follows:

- 140 for medical and veterinary purposes;
- 13 for business and scientific purposes and for control functions;
- 2 for the transportation of radioactive substances.

The number of issued licences for the use of sources of ionising radiation for medical and veterinary purposes was up 40% from the previous year.

By orders of the BNRA Chairman, 164 licences for activities involving sources of ionising radiation were amended. In 2023, 26 licences for activities involving sources of ionising radiation were terminated.

In 2023, a total of 338 permits for activities involving sources of ionising radiation were issued, as follows:

- temporary storage of radioactive substances – 13;
- site construction, installation and pre-trials of sources of ionising radiation – 221;
- single transportation of radioactive substances – 1;
- transit transportation of radioactive substances – 1;
- import and export of sources of ionising radiation – 99;



- decommissioning of a site with radioactive substances – 3.

The number of issued permits for activities involving sources of ionising radiation was up 30% from the previous year.



Seventeen permits for activities involving sources of ionising radiation were amended.

In 2023, 25 registration certificates were issued under Art. 56, para. 3 of the Safe Use of Nuclear Energy Act for work with sources of ionising radiation for the purpose of maintenance, installation, dismantling, measurements, construction and repair activities and other services for individuals who use or produce sources of ionising radiation.

In 2023, 142 notifications for performing activities of insignificant radiation risk were registered in the public register under Art. 27, para. 2 of the Act on the Safe Use of Nuclear Energy.

Pursuant to Council Regulation (EURATOM) 1493/93 on shipments of radioactive substances between Member States, a total of 91 import declarations for radioactive sources were processed and certified.

In 2023, a total of 958 administrative acts under the Act on the Safe Use of Nuclear Energy related to regulating activities involving sources of ionising radiation were issued. For the past five years, their number has increased by over 40%.

## 6. Nuclear Material Accounting and Control.

The safeguards system under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is applied in accordance with the signed Agreement on Safeguards Implementation between the EURATOM countries, the IAEA, and Bulgaria. Taking into account the information sent in implementation of the Agreement and the Additional Protocol thereto, and on the basis of the performed inspections, assessments and analyses, the IAEA has concluded that Bulgaria meets the requirements of the NPT.

According to the Agreement, Bulgaria provides to the European Commission information on the nuclear materials control and accounting. After reviewing and verifying this information, the European Commission in turn submits it to the IAEA. The material balance areas subject to reporting include Kozloduy NPP, SD Decommissioning at the SE RAW at the Kozloduy NPP site, SD PRRAW - Novi Han, the line for regeneration and clean-up of ion-exchange resins - village of Eleshnitsa, the Institute for Nuclear Research and Nuclear Energy (INRNE), as well as the designated material balance area for sites with small quantities of nuclear material on the territory of the entire country. In relation to the preparation activities for the decommissioning of SD PRRAW - Novi Han, a new material balance area was set up for the temporary storage of RAW representing nuclear material for the purposes of the safeguards.

In 2023, the BNRA met on time its obligations under the Agreement to prepare and submit to the EC monthly and annual reports on the quantities of nuclear material in the material balance area, for which it is directly responsible, and which includes sites with small amounts of nuclear material on the territory of the entire country. To this end, the BNRA organised the receipt of the necessary information from the licensees, its subsequent processing, as well as the preparation and submission of the updated declarations under the Additional Protocol of this area. The relevant declarations under the Additional Protocol were sent to the IAEA and the EC in a timely manner.

In 2023, 11 inspections were carried out jointly with IAEA and EC inspectors to check the compliance with the Safeguards and the Additional Protocol: Nine inspections at Kozloduy NPP, one at IRT-2000 of the INRNE and one at the Line for regeneration and clean-up of ion-exchange resins - village of Eleshnitsa. The inspections confirmed the conformity between the nuclear material declared in the reporting documents and the available nuclear material in terms of quantity, enrichment, type, and isotopic composition.



*Photo Kozloduy NPP*



Over the review period, EURATOM's inspectors conducted a comprehensive documentary review of all sites in the material balance area, including sites with small quantities of nuclear material. IAEA, EURATOM and BNRA inspectors also performed nine joint inspections at a site on the territory of the city of Lovech and eight sites on the territory of the city of Sofia. It was found that the small quantities of nuclear material available on-site comply with the declared quantities and oversight performed on them meets requirements.

In 2023, following a request from the IAEA, the first “complementary access with advance notice” inspection in Bulgaria was held at a site that was not within the scope of the annual declarations under the Additional Protocol. The inspection was performed jointly by the IAEA, the EC and the BNRA and found no undeclared activities and nuclear material.

## 7. Emergency Preparedness.

In accordance with the Act on the Safe Use of Nuclear Energy, the BNRA Chairperson acts as a central body and point of contact for notification in the event of an emergency and assistance in accordance with the Convention on Operational Notification of a Nuclear Accident and the Convention on Assistance in the Event of a Nuclear Accident or Radiation Emergency. According to the Disaster Protection Act, a Unified Rescue System (URS) has been set up aimed mainly at performing activities ensuring public protection. The BNRA is part of this system, and in the event of a nuclear or radiation accident, the BNRA Chairperson participates in the National Task force (NT).

To fulfil its obligations under the National Disaster Protection Plan, the BNRA maintains an emergency response team. In the event of a nuclear accident or accident related to sources of ionising radiation, the main functions of the team are related to analysing the incoming data, forecasting the accident evolution, estimating the consequences, and producing justified proposals to the National Task force on applying protective measures. The BNRA emergency team participated in four joint exercises with Kozloduy NPP. Over the review period, members of the emergency team underwent specialised training covering topics related to emergency planning training and preparedness on a national level, protective measures and criteria for their implementation, bilateral agreements and notification of international organisations and the work of the emergency response team.





In 2023, the BNRA registered 60 cases related to goods and materials elevated content of radioactive isotopes detected at border checkpoints or at the entrances of large metallurgical companies. In most cases, higher cargo activity levels resulted from the presence of natural radioactive isotopes such as K-40, Ra-226, and Th-232. Depending on the particular case, approved inter-institutional response procedures were applied. None of these cases caused any radiation consequences or hazard for the public and the environment.

## 8. Nuclear Harmonisation and Standardisation Initiative.

Over the past few years, significant progress has been made in designing and developing new reactor technologies. There are already more than 80 small modular reactor (SMR) designs in various stages of development worldwide. These reactors can use innovative safety technologies, including the broad use of passive systems and intrinsic safety features, various types of fuel and coolants and various approaches to practically all aspects of a reactor's lifetime such as construction, commissioning, operation, decommissioning, radioactive waste and spent fuel management. Similar to existing plants, the suppliers and operators of innovative design reactors should be able to demonstrate that the new design aspects meet safety requirements.



*SMR Project, Photo Westinghouse*

In 2022, IAEA Director General Mr. Rafael Grossi announced the launch of the Nuclear Harmonisation and Standardisation Initiative (NHSI), consisting of two tracks - regulatory and industrial. The goal of the Initiative is to ensure effective global deployment of safe and secure advanced nuclear reactors, and the specific goals of the Regulatory Track are minimal repetition among regulatory reviews by different Member States, Minimal need for design changes arising from differences among Member States' regulations, and establishment of a common basis for the Member States' regulatory decisions while preserving their sovereignty. The NHSI Regulatory Track has three Working Groups. Ever since the Initiative's launch, the BNRA has been actively involved in Working Group 2 of the Regulatory Track, where it has its own representative. This working group is working on developing a process and reference framework for multinational pre-licensing regulatory reviews of a modern nuclear reactor by several nuclear regulators. Work on this document began in October 2022 and continued throughout 2023. Work on the document is expected to be successfully completed in end-2024, and the IAEA will publish it as part of its TECDOC series.

## 9. Second Topical Peer Review Organised by the EC on Fire Safety.

Council Directive 2014/87/Euratom amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations introduces a European system of topical peer reviews held once every

six years to provide EU member states with a mechanism to review topics of strategic importance for nuclear safety, exchange experience, and identify measures to improve nuclear safety. The topical peer review process involves three phases - national self-assessment, submission of national self-assessment reports for peer review and publication of a report containing findings and proposals for actions to resolve them.

The European Nuclear Safety Regulators Group (ENSREG) organised the second topical peer review on Fire Safety with a scope covering the energy units under operation, under decommissioning, and waste spent fuel storage facilities on the site of the nuclear installations. In the first phase of the peer review, each country performed a national self-assessment of its compliance with the pre-defined requirements and in October 2023 each country published a National self-assessment report. The National Report of Bulgaria presents the regulatory framework and overall approach of licensees to fire safety - fire hazard analyses performed, fire protection concept and various aspect of fire protection defence in depth: fire prevention, active fire protection and passive fire protection. In 2024, the National Reports will be reviewed and discussed and an action plan will be developed to resolve the findings contained in the national self-assessment reports and the peer review process.

## **10. Interaction and Coordination with Other State Bodies for Specialised Control.**

According to the Act on the Safe Use of Nuclear Energy, the BNRA Chairperson interacts with specialised control bodies, which have been granted regulatory and supervisory functions in respect of the use of sources of ionising radiation. Public registers are kept of all licences, permits and registration certificates issued by the BNRA Chairperson, as well as all submitted notifications for performing activities under Art. 56, para. 2 of the Act on the Safe Use of Nuclear Energy. The BNRA provides specialised control bodies with periodic and on-demand information on holders of licences, permits and registration certificates for activities involving sources of ionising radiation, including sources of ionising radiation used and stored in the country.

In 2023, joint inspections were carried out with employees of the State Agency for National Security and the Ministry of Interior at sites containing radioactive substances. Licences and permits for sites with radioactive substances are issued after coordination with the Ministry of Interior regarding their physical protection.

On its website, the BNRA publishes daily updates of the country's registered background gamma radiation in accordance with an inter-institutional procedure coordinated with the specialised oversight bodies.

In cases where orphan sources are found on the country's territory or in case of illegal trafficking of radioactive materials, the approved inter-institutional procedures are applied, defining the actions and responsibilities of the specialised oversight bodies.

## **11. International Cooperation.**

### **International Atomic Energy Agency (IAEA)**

#### ***IAEA General Conference***

In 2023, two sessions of the IAEA General Conference were held - one extraordinary session in January on the organisation's budget, and a regular session in September. The Bulgarian delegation was led by the BNRA Chairman.

In his speech to the delegates at the 67th Regular Session of the IAEA General Conference, the BNRA Chairman outlined the main aspects of our collaboration with the IAEA in the field of nuclear safety and security and technical cooperation. He highlighted the IAEA's role in developing internationally recognised safety standards and regulatory approaches, including in relation to newly arising technologies in nuclear energy. Bulgaria's support for the implementation of the Treaty on the Non-proliferation of Nuclear Weapons was pointed out, and in this context the need to strictly apply the IAEA safeguards system for non-proliferation of nuclear weapons and technologies.

At the 67th Session of the IAEA General Conference, Bulgaria participated with a joint stand with the European Commission and Spain titled "International Cooperation in the EU in the Field of Nuclear Safety and Security." The stand was organised by the BNRA in cooperation with the SE RAW and Kozloduy NPP, whose experts answered questions and presented the achievements of nuclear energy in our country. The official opening ceremony of the stand was attended by IAEA Director General Mr. Rafael Grossi, Mr. Massimo Garribba, Deputy Director General of DG Energy of the European Commission, Deputy Minister of Energy Nikolai Nikolov, and other officials. The presentation of our country aroused serious interest and demonstrated the notable presence of the Bulgarian delegation at the session.





As a Vice Chairman from Bulgaria in the IAEA Board of Governors for the 2022-2024 period, the BNRA Chairman took part in the Board's sessions, the Programme and Budget Committee, and the Technical Assistance and Cooperation Committee.

### ***Fulfilment of the Obligations of the Republic of Bulgaria under International Treaties***

In the period 20-31 March 2023, the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety of the IAEA was held. The Bulgarian delegation was led by the BNRA Chairman.

The report on Bulgaria approved as part of the review points out our country's progress in the field of nuclear safety, highlighting two areas of good performance:

- the Strategy for Human Resource Development in the Nuclear Sphere for the period 2022-2032;
- the active and voluntary hosting of peer reviews and safety review missions at the nuclear facilities in the country.

A conclusion was made that Bulgaria had successfully addressed all recommendations set out in the Seventh Review of the Convention on Nuclear Safety, and no new recommendations were made to our country.

A representative of the BNRA was a coordinator of one of the groups of countries in the review.

### ***Participation in IAEA Bodies and Activities***

BNRA representatives were regularly involved in the work of the IAEA Safety Standards Committees and other working bodies and groups, performing their duties and obligations as national coordinators under the IAEA Safeguards System and various IAEA information systems.





In 2023, BNRA employees took part in over 60 events organised by the IAEA (symposia, technical meetings, seminars, etc.). A representative of the BNRA was member of the IAEA IPPAS mission in Kuwait.

### ***IRRS Mission***

BNRA continued its preparation works for the IAEA Integrated Regulatory Review Service (IRRS) in Bulgaria, which is scheduled to take place in November 2024. In February 2023, a workshop was organised at the BNRA to introduce the SARIS information system related to the national self-assessment for the purposes of the mission.

### ***Technical Cooperation***

The implementation of the IAEA Technical Cooperation Programme for the 2022-2023 continued in 2023 with three projects:

- Customising Existing National Nuclear Capacity by Building Infrastructure to Support Human Resource Development and Nuclear Knowledge Management Aspects, the beneficiary of which is the College of Electronics and Energy at the Technical University in Sofia with a budget of EUR 220,080.
- Chemigation for Improved Management of Orchards and Environmental Protection with a beneficiary the Fruit Growing Institute, Plovdiv. The project's budget is EUR 239,772.
- Enhancing National Capacity for Ensuring Radiation Protection of Patients Undergoing High Dose Medical Imaging Procedures. The beneficiary of the project is Alexandrovska University Hospital with a total budget of EUR 343,290.

The call for proposals for national projects for the 2024-2025 cycle was successfully completed. Bulgaria will participate in it with two new projects:

- Enhancing the Capacity of Cyclotron and Small-Scale Radiopharmaceutical Production. The beneficiary of the

project is Alexandrovska University Hospital;

- Increasing the Yield and Quality of Staple Vegetable Crops through Nuclear Technologies to Create Resilience to the Impacts of Climate Change. The beneficiary is the Maritsa Vegetable Crops Research Institute (MVCRI) in the city of Plovdiv.

In May, with the assistance of the BNRA, the National Diagnostic and Research Veterinary Institute at the Bulgarian Food Safety Agency hosted a regional training course on the verification of standard operating procedures related to new serological and molecular techniques. The course was organised as part of the IAEA ZODIAC initiative aimed to help member states in their fight against zoonotic diseases and prevent future pandemics. Bulgaria has supported the ZODIAC initiative since its onset, including as a financial donor.

## **Cooperation with EU Structures**

### ***European Nuclear Safety Regulators Group (ENSREG)***

Last year, the BNRA Chairman took part in the ENSREG regular plenary meetings and successfully fulfilled his commitments as a member of the ENSREG Stress Test Board in third countries.

### ***Western European Nuclear Regulators Association (WENRA)***

The BNRA Chairman joint WENRA's spring and autumn sessions, where the organisation's new strategy and mandate were discussed and adopted to become effective as of January 2024. A representative of the Agency was actively involved in the work of the Reactor Harmonisation Working Group at WENRA.

### ***Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development (OECD)***

BNRA's representatives continued to be actively involved in the NEA committees and working groups activities within its competence.

The BNRA also participated in the activities of the permanent Interdepartmental Coordination Mechanism for Bulgaria's Accession to the Organisation for Economic Co-operation and Development (OECD).

Bilateral Cooperation.

### ***Arrangement between the U.S. Nuclear Regulatory Commission and the BNRA for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters***

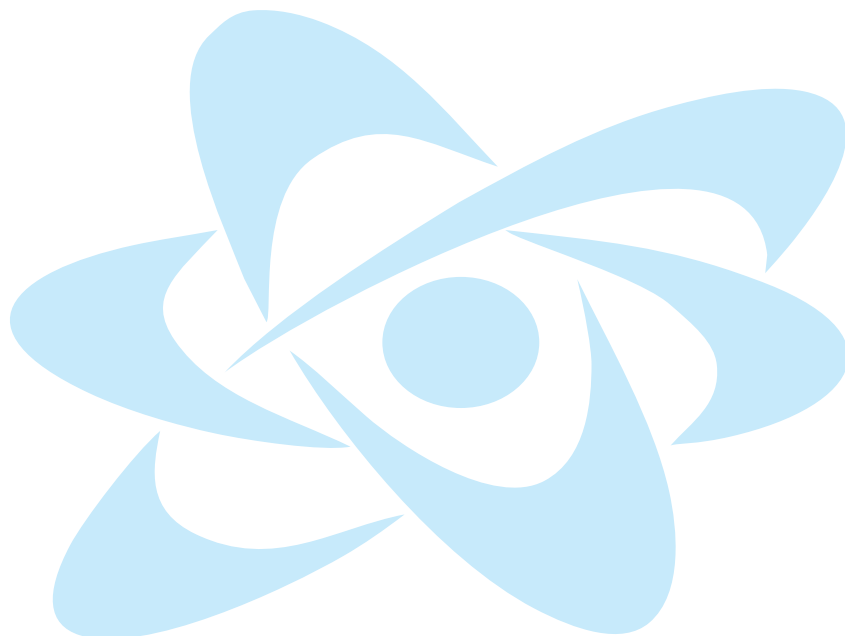
In 2023, the BNRA renewed its Arrangement for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters with the U.S. Nuclear Regulatory Commission. The Arrangement renewal aims to maintain and develop the strategic partnership between the nuclear regulators of the two countries and foresees information exchange between the parties related to regulation and oversight of nuclear facilities and radioactive materials safety and security, as well as scientific research programmes in the field of nuclear safety.

### ***Agreement between the BNRA and the Greek Atomic Energy Commission for early notification of a nuclear accident and cooperation in the field of nuclear safety and radiation protection regulation***

The agreement was signed in the framework of the 67th session of the IAEA General Conference and extends the existing arrangements between the two regulators, providing for exchange of information and documentation, as well as regulatory experience in the field of nuclear safety and radiation protection, expert visits, joint workshops, meetings, training courses and working meetings.



In the period 28 February – 2 March 2023, a delegation of the Greek Atomic Energy Commission headed by its Chairman Christos Housiades visited Bulgaria. The visit was dedicated to exchange of experience in the field of emergency planning and preparedness and regulation of radioactive waste management.





## APPENDIX 1

List of operational events, which occurred in the nuclear facilities in 2023, reported to the BNRA

N o.	Date	Site	Description	INES
1.	23 January	Unit 6	A diesel generator from a safety system second train was off stand-by mode	0
2.	22 June	Unit 6	A pump from the emergency boron injection system in the primary circuit failed to switch off from the control switch	0
3.	16 October	Unit 6	Unplanned actuation of the safety systems third train	0
4.	08 November	Unit 6	Coolant was accidentally released into the containment structure	0

**APPENDIX 2**

## Nuclear Facilities Inspections in 2023

No.	Site	Period	Inspection Topic
1.	Kozloduy NPP	07÷08 March 2023	Application of the Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons with short notice, Unit 5
2.	Kozloduy NPP	01÷02 May 2023	Application of the Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons – jointly with the IAEA and EC inspectors, Unit 5
3.	INRNE-BAS	25 May 2023	Application of Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons - together with the IAEA and EC inspectors
4.	Kozloduy NPP	27÷28 May 2023	Application of the Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons – jointly with the IAEA and EC inspectors, Unit 5
5.	Kozloduy NPP	28 May÷01 June 2023	Preparedness of Unit 5 for start-up and operation following planned annual outages
6.	Kozloduy NPP	31 May 2023	Surveillance of fresh nuclear fuel transportation
7.	SD PRRAW-Novı Han	27 June 2023	Ensuring the physical protection of SD PRRAW - Novi Han
8.	Kozloduy NPP	03÷05 July 2023	Emergency planning and preparedness
9.	Kozloduy NPP	05÷07 July 2023	Organisation and management of activities related to chemical and radiochemical control
10.	Kozloduy NPP	19÷21 July 2023	Operation and maintenance of facilities in AB-3
11.	Kozloduy NPP	11÷12 September 2023	Application of the Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons – jointly with the IAEA and EC inspectors, EP2 (Units 5 & 6), SFSF and DSFSF
12.	Kozloduy NPP	25÷27 September 2023	Radiation monitoring of gaseous radioactive emissions to the environment
13.	Kozloduy NPP	10÷14 October 2023	Preparedness of Unit 6 for start-up and operation following planned annual outages
14.	Kozloduy NPP	11 October 2023	Application of the Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons – jointly with the IAEA and EC inspectors, Unit 6
15.	Kozloduy NPP	23÷25 October 2023	Implementation of activities under the Programme for Enhancement of SFSF Safety and provision of independent power supply and fluids
16.	Kozloduy NPP	25÷27 October 2023	Meeting the terms and conditions of the licence for carrying out specialised training and issuance of certificates of competency for activities in nuclear facilities and with

No.	Site	Period	Inspection Topic
			sources of ionising radiation
17.	Kozloduy NPP	06÷10 November 2023	Annual inventory check at Units 5 and 6, SFSF and DSFSF
18.	Kozloduy NPP	07 November 2023	Surveillance of fresh nuclear fuel receipt
19.	Kozloduy NPP	20÷21 November 2023	Diagnostics, operation, maintenance and lifetime systems
20.	Kozloduy NPP	20÷23 November 2023	Ensuring the physical protection of Kozloduy NPP
21.	Kozloduy NPP	20÷21 November 2023	Organisation and performance of activities related to the visual inspection of the condition of primary circuit equipment
22.	SD PRRAW-Novi Han	23÷24 November 2023	Emergency planning and preparedness
23.	Kozloduy NPP	29÷30 November 2023	Application of the Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons with short notice, DSFSF
24.	Kozloduy NPP	12÷14 December 2023	Operational events, identification and effectiveness of corrective actions
25.	Kozloduy NPP	12÷14 December 2023	Operation, maintenance and lifetime of control safety systems
26.	SD PRRAW-Novi Han	26 July 2023	Compliance with the requirements set out in Chapter 9, Section 5 of the Regulation on Safety in Radioactive Waste Management
27.	SD Decommissioning Units 1-4	11÷13 December 2023	Level of completion of the activities set out in the decommissioning plan of Units 1-4. Safe management of RAW generated as a result of these activities
28.	SD RAW-Kozloduy	18÷20 October 2023	Organisation of activities related to the management and execution of the project on the modernisation of SD RAW-Kozloduy;
29.	SD Decommissioning Units 1-4	15÷17 November 2023	Organisation of operations and radiation control at the Size Reduction and Decontamination Workshop
30.	SD NDF	1÷3 November 2023	Fulfilment of the activities related to the building of a National Disposal Facility for RAW in accordance with the requirements of Chapter 9 of the Regulation on Safety in Radioactive Waste Management.



## ABBREVIATIONS

NPP	Nuclear Power Plant
RS	Reactor Scram
UNAP	Updated National Action Plan
NEA	Nuclear Energy Agency
BNRA	Bulgarian Nuclear Regulatory Agency
BAS	Bulgarian Academy of Sciences
SFP	Spent Fuel Pools
PSA	Probabilistic Safety Analysis
WWER	Water-Water Energy Reactor
NA	Naval Academy
MMA	Military Medical Academy
WChR	Water Chemistry Regime
NFSCP DG	National Fire Safety and Civil Protection Directorate General
SANS	State Agency for National Security
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
SE RAW	State Enterprise Radioactive Waste
EC	European Commission
EU	European Union
URS	Unified Rescue System
ASUNE	Act on Safe Use of Nuclear Energy
CSA	Civil Servants Act
EEA	Executive Environment Agency
SIR	Sources of Ionising Radiation
INES	International Nuclear and Radiological Event Scale
IRT-2000	Research Reactor at INRNE- BAS
IPA	Institute of Public Administration
INRNE	Institute for Nuclear Researches and Nuclear Energy
SSCs	Structures, systems, and components
CCI	Complex Chemical Indicator
CNS	Convention on Nuclear Safety
IAEA	International Atomic Energy Agency
MHAT	Multidisciplinary Hospital for Active Treatment
MI	Ministry of Interior
MH	Ministry of Health
MEW	Ministry of Environment and Water
CM	Council of Ministers
NEK	Natsionalna Elektricheska Kompania EAD
NRSIR	National Register of SIR

## ABBREVIATIONS

RTCEPESA	Regulation on the Terms and Conditions for Evaluation of the Performance of Employees in the State Administration
NRWR	National Radioactive Waste Repository
NCRBRP	National Centre of Radiobiology and Radiation Protection
NH	National Headquarters
OECD	Organisation for Economic Co-operation and Development
JINR	Joint Institute for Nuclear Research - Dubna
SNF	Spent Nuclear Fuel
PRRAW	Permanent Repository for RAW
RAW	Radioactive Waste
Sss	Safety Systems
PMF	Plasma Melting Facility
TPR	Topical Peer Review
UMHAT	University Multidisciplinary Hospital for Active Treatment
RAWTF	Radioactive Waste Treatment Facility

