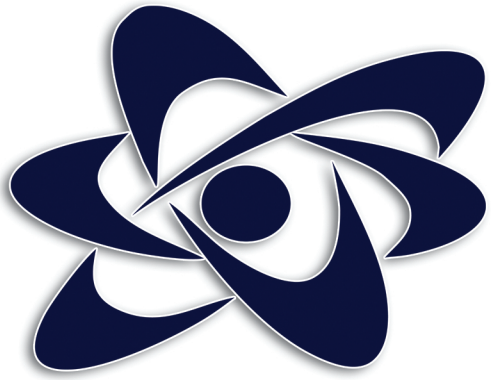
BULGARIAN NUCLEAR REGULATORY AGENCY



REPORT
2021

The unprecedented health crisis for the second year in a row has had a profound effect on all aspects of our lives. Despite the difficulties, the timely measures taken and the work of the highly qualified experts of the Bulgarian Nuclear Regulatory Agency made possible the carrying out of all planned checkups and inspections of nuclear facilities and in sites with sources of ionizing radiation in the past year.

With the present report, the Bulgarian Nuclear Regulatory Agency presents to all stakeholders the state of nuclear safety and radiation protection in nuclear facilities and sites with sources of ionizing radiation in the Republic of Bulgaria for the year 2021.

The results of the conducted inspections show that the activities on operation and decommissioning of the nuclear facilities in the country are carried out in accordance with the requirements and standards for radiation protection, observing the conditions of the issued licenses and permits. The radioactive emissions from the nuclear facilities are significantly lower than the permissible annual levels, and the annual effective doses for the population are negligibly low in terms of the standards for radiation protection. The dose rate of occupationally exposed persons is below the normative limits.

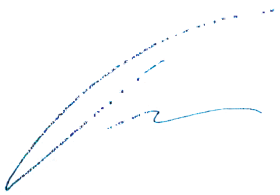
The results of the carried out control of the two operating power units of the Kozloduy NPP confirm that the monitoring and testing programs are implemented in the planned volumes, which ensures the reliable and safe operation of the units. The safety systems are maintained at the required level of reliability and preparedness. The activities of the licensee aimed at improving safety were subject to in-depth review and evaluation by the Agency. As a result, 37 permits were issued for safety-related activities. The information provided by the licensee from the system of self-assessment indicators shows that the values of the safety indicators indicate a stable state of safety during the operation of units 5 and 6.

The inspections carried out in 2021 in the specialized divisions of the State Enterprise "Radioactive Waste" showed that the operation of the facilities for radioactive waste management is carried out in accordance with the requirements for safe operation and in accordance with the permits and licenses issued by the Agency.

In 2021, 59 planned inspections were carried out in sites with sources of ionizing radiation. In addition, inspections were carried out for the commissioning of sites with sources of ionizing radiation. The data from the public registers of the issued licenses, permits and certificates for registration for activities with sources of ionizing radiation and of the submitted notifications maintained by the Bulgarian Nuclear Regulatory Agency show that at the end of 2021 the current licenses were 1251, permits - 259, certificates for registration - 61. The total number of registered sources of ionizing radiation, which are subject to permissible activities under the Act on Safe Use of Nuclear Energy, is over 6000.

One of the important aspects for ensuring the safety of nuclear facilities is the availability of a sufficient number of specialists with appropriate education and qualifications. In order to meet the challenges in this field, an Interdepartmental Working Group was established last year at the initiative of the Agency, which developed and submitted to the Council of Ministers a National Strategy for Human Resources Development in the Nuclear Sector for the period 2022-2032.

The outcome from the activities of the Bulgarian Nuclear Regulatory Agency in all these aspects, achieved in 2021, is the result of good organization, professionalism and experience of our employees. The main principles we follow in our work are independence, justification and open dialogue with all stakeholders. We are committed to continuing to pursue our top priority, namely ensuring nuclear safety and radiation protection for society as a whole and the environment.



Mr. Tsanko Bachiyski, Chairman of the BNRA

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I. NUCLEAR FACILITIES

POWER UNITS OF THE KOZLODUY NPP

1. Operation of the units - compliance with the terms of the licenses. Implementation of measures from the integrated program.

In 2021, Units 5 and 6 of Kozloduy NPP were operated within the designated regimes in the design and in accordance with the operating licenses issued by the Bulgarian Nuclear Regulatory Agency (BNRA). During the year the two units operated in base mode at nominal power. After the planned annual outages (PAO), the two units are in the 28th and 27th fuel cycles, respectively.

During the past year, Units 5 and 6 have been subject to preventive, current and subsequent control by the BNRA. The scope of preventive control includes both activities pertaining to changes in structures, systems and components (SSC) related to safety, and changes in the documents on the basis of which the operating licenses are issued. The current and subsequent control is carried out through the performed inspections and check-ups for fulfillment of the conditions under the issued permits and licenses. The purpose of the regulatory control is to establish the state of nuclear safety and radiation protection of units 5 and 6 of the Kozloduy NPP and their compliance with the requirements of the Regulation on ensuring the safety of nuclear power plants. During the operation of the units in 2021, the necessary permits have been issued to carry out activities that increase the resilience of the units with regard to the development of deviations from normal operation into accidents. As a confirmation of the effectiveness of the undertaken measures, a consistent tendency to maintain the number of events that have occurred and were reported to the BNRA during the year was established.

In connection with the conditions of the licenses for operation of the units, in 2021 the implementation of the measures from the integrated programs for improving the safety of the facilities continued. The scope of the programs includes a number of measures with deadlines for implementation during the period of validity of the licenses and arising from the periodic safety reviews, projects to extend the operational lifetime, recommendations from the conducted "stress tests" as well as the planned additional safety analyzes. At the end of the year, from the integrated programs for the two units, 32 out of a total of 63 measures were implemented - for Unit 5, and 17 out of a total of 48 measures - for Unit 6.

In December 2021, the National Action Plan after the accident at the Fukushima NPP was updated. Of the 78 measures contained in the plan, 75 (96%) have been implemented by the end of 2021, and the remaining 3 measures are planned to be completed in 2022.

In order to confirm the fulfillment of the conditions of the issued licenses and permits, of the made recommendations and prescriptions and of the normative and regulatory requirements, the BNRA reviews and evaluates the documents certifying their fulfillment. The reviews and evaluations of documents submitted in 2021, in compliance with the conditions of the licenses for operation of the power units, are mainly related to:

- reporting on the implementation of the Integrated Programs for the implementation of measures to improve the safety of Units 5 and 6, resulting from the periodic safety review and the programs for extending the operational lifetime of the units;
- the update of the safety analysis reports of the units;
- periodic information on the state of nuclear safety and radiation protection, indicators for safe operation, radioactive discharges, etc.

The results of the performed inspections and assessments confirm that Units 5 and 6 are operated in accordance with the conditions of the licenses and the requirements for safe operation.

1.1. Maintenance and repair - main conclusions as a result of the performed control, including the inspections after the planned annual outages of the units

In 2021, the activities related to the maintenance and repair of the SSC of the units were carried out according to pre-developed schedules and in accordance with approved instructions and programs. The implemented regulatory control, covering both the amendments to the design and the on-site inspections, confirms the successful implementation of the activity on maintenance and repair of the equipment. In this regard, the main findings of the inspections of the preparedness of the units for startup and operation after the planned annual outages are:

- the planned repairs of the equipment and the activities for the operational control of the metal are performed in volume and quality, which ensure the operability of the systems and constructions;
- the changes in the design, leading to increased safety, have been implemented in the required volume and quality;
- the performed functional tests of the systems, important for safety, certify their readiness for operation in accordance with the design characteristics.

1.2. Supervision and testing programs - performance evaluation

At Kozloduy NPP, an equipment supervision program is being implemented for Units 5 and 6. The purpose of the program is to regulate the activities for ensuring the reliability of SSC and checking the compliance of the condition of the equipment, the criteria, the limits and the provisions contained in the design. The regulation and implementation of these activities leads to the timely detection of signs of deterioration of the SSC characteristics, which could lead to disruption of the equipment or failure to perform its design functions. The main activities covered by the program are:

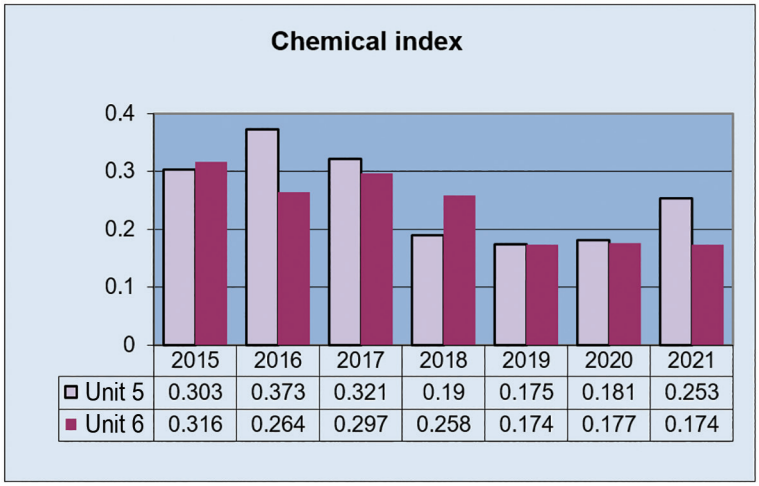
- control and diagnostics of the technical condition of SSC;
- corrective measures in case of deviations of SSC from normal operation;
- inspection of measuring instruments;
- testing of components and systems;
- maintenance and repair;
- ageing management.

In 2021, as part of the technical supervision program, a new version of the instruction on SSC supervision of Units 5 and 6 has been developed and implemented. The purpose of the revision is to improve the regulation of the activities and methods related to the supervision of the facilities important for safety, and to optimize the documents on the frequency, scope and responsibilities in the implementation of activities.

The implementation of the supervision and testing programs is within the scope of the daily operational control of the Kozloduy NPP site, carried out by the BNRA. The operational control is carried out by the BNRA inspectors constantly working on the site and includes daily walk downs, interviews with staff and control of the results of the SSC tests for compliance with the adopted success criteria, etc.

1.3. Water chemistry regime

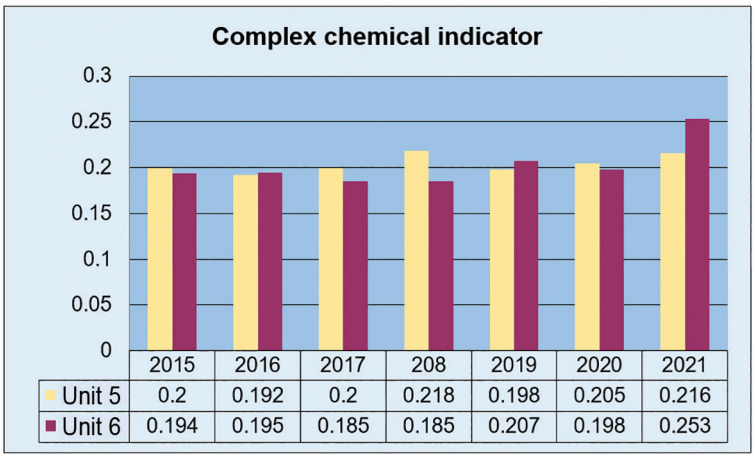
Maintaining the optimal water-chemistry regime (WCR) of the coolant in the primary and secondary circuit reduces the corrosion of construction materials and increases the life of the equipment. The quality of the maintained water chemistry regime is assessed by two indicators: chemical index and complex chemical indicator (CCI) The quantitative assessment of the quality of the water chemical regime during operation of the unit is determined by a chemical index, which represents the ratio of the actual values of the parameters in the coolant (pH, conductivity and impurity content) to the determined values of the limits for normal operation. The values of the indicator are: 0.253 - for unit 5, and 0.174 - for unit 6, with a maximum permissible value of 1.0.



	2015	2016	2017	2018	2019	2020	2021
Unit 5	0.303	0.373	0.321	0.19	0.175	0.181	0.253
Unit 6	0.316	0.264	0.297	0.258	0.174	0.177	0.174

The CCI indicator compares the parameters determining the water-chemistry regime of the primary circuit, the blow up and feed water for the steam generators, with their limit values. The values of the complex chemical indicator are 0.216 - for unit 5, and 0.253 - for unit 6, with a maximum permissible value of 1.0.

The values of these two indicators for the units testify to the maintenance of an optimal water-chemistry regime during operation.



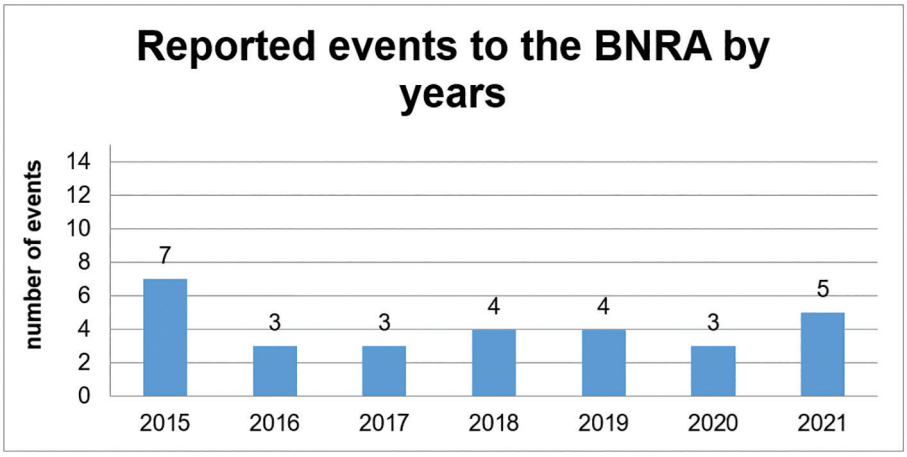
	2015	2016	2017	208	2019	2020	2021
Unit 5	0.2	0.192	0.2	0.218	0.198	0.205	0.216
Unit 6	0.194	0.195	0.185	0.185	0.207	0.198	0.253

1.4. Ageing management

Aging management is the set of engineering, operational and repair activities aimed at controlling the degradation of structures, systems and components within acceptable limits. The Kozloduy NPP has developed and put into operation a "Methodology for determining the scope of structures, systems and components for aging management", in accordance with the requirements of regulations and applicable documents of the International Atomic Energy Agency (IAEA). For all SSCs covered by the aging management process, documents have been developed regulating the operation, maintenance, repair, testing, supervision and inspections in order to ensure their operability. In 2021, all activities of the Kozloduy NPP related to aging management were performed in accordance with the approved documents. The step by step replacement of the engines of the pumps for the sprinkler system was carried out ahead of schedule due to the fact that their production has been discontinued and there are no spare parts available. In 2021 the last of the three engines was replaced with a new one which fact ensures their operational lifetime for the next 30 years.

1.5. Operational events and implementation of corrective measures

The reporting of events from the Kozloduy NPP is carried out on the basis of the requirements of the Regulation on the terms and conditions for notifying the BNRA of events in nuclear facilities, sites and activities with sources of ionizing radiation and transportation of radioactive substances. In 2021, 5 operational events were reported in the BNRA, three of which occurred on Unit 5 and two on Unit 6. The events are due to the activation of technological scrams of equipment, which have led to a decrease in power of the units, such as in two of the events, the activation of equipment scrams has resulted in the activation of reactor scram. One of the events of Unit 5 is related to the switch off of a safety channel due to the failure of a component of the system for emergency introduction of boron solution in the reactor core. A list of events is presented in Annex № 1. Information on all events reported to the BNRA is available on the Agency's website.



The events in question did not lead to a violation of any limits and conditions for safe operation. No changes in the radiation situation in the area of the power plant and exceeding the permissible levels of exposure of the staff and the population have been registered.

All events were rated "Below the Scale / Level 0" on the seven-level International Nuclear Event Scale (INES).

During the period, 29 operational events were analyzed, which are not related to safety and are not subject to reporting to the BNRA in accordance with regulatory requirements. Such events affect the normal operation and performance of the structures, systems and components of the units. The events were analyzed by the Kozloduy NPP. As a result, 185 corrective measures have been identified to prevent the recurrence of such events. Additional 8 measures have been adopted from the analysis of events from foreign operational experience.

The distribution of the shortcomings that have led to the occurrence of the events remains the same as in previous years. The leading part continue to be equipment failures (69%), followed by staff errors (29%) and deficiencies in instructions (2%). The data show that during the year the total number of failures is around and below the average for recent years. This speaks of the sustainable condition of the structures, systems and components of the units in the conditions of their long-term operation.

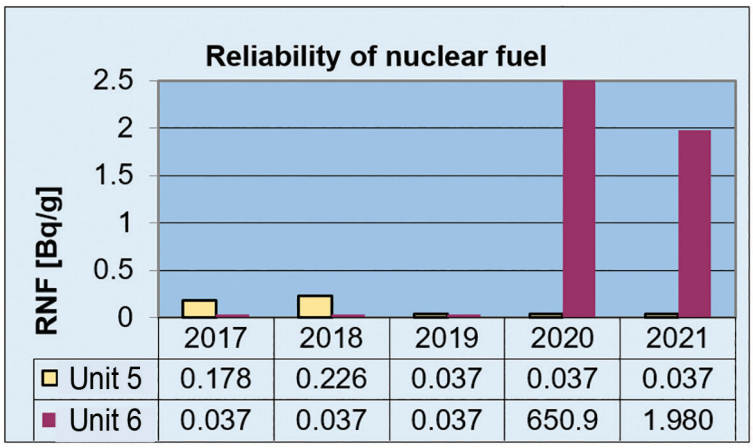
2. Efficiency of operational procedures. Operational indicators.

An assessment of the effectiveness of operational procedures can be made through the system of self-assessment indicators developed at the Kozloduy NPP. One of the main goals of this system is to provide information about the general state of the management process by performing a detailed assessment of the achievement of the formulated goals, principles, performed tasks and processes or to provide feedback.

According to the terms of the licenses for operation of the units, the BNRA regularly presents information on both the values of the indicators and the measures taken by the licensee in case of deterioration of any of the indicators. The incoming information is subject to analysis and evaluation in the BNRA and is taken into account in the planning and implementation of the current and subsequent regulatory control.

The values of the indicators related to the operability of the safety systems, the reliability of the physical barriers and the efficiency of the maintenance of the equipment show a steady tendency to keep their value below the permissible limits. Such results confirm the fulfillment of the set of goals and principles related to ensuring the necessary levels of safety.

The reported increase in the indicator related to the reliability of the nuclear fuel of Unit 6 is due to the identified leaks in the cladding of the fuel rods in the assemblies during the 26th fuel cycle, covering the period from November 2020 to October 2021. The registered leaks have not led to exceeding the limits for normal operation, defined in the Technical specification for safe operation of the unit.

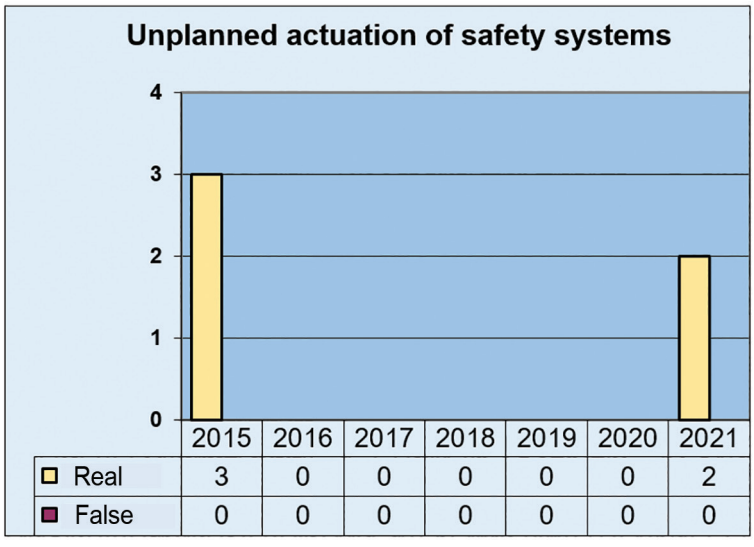


	2017	2018	2019	2020	2021
Unit 5	0.178	0.226	0.037	0.037	0.037
Unit 6	0.037	0.037	0.037	650.9	1.980

3. Status of safety systems

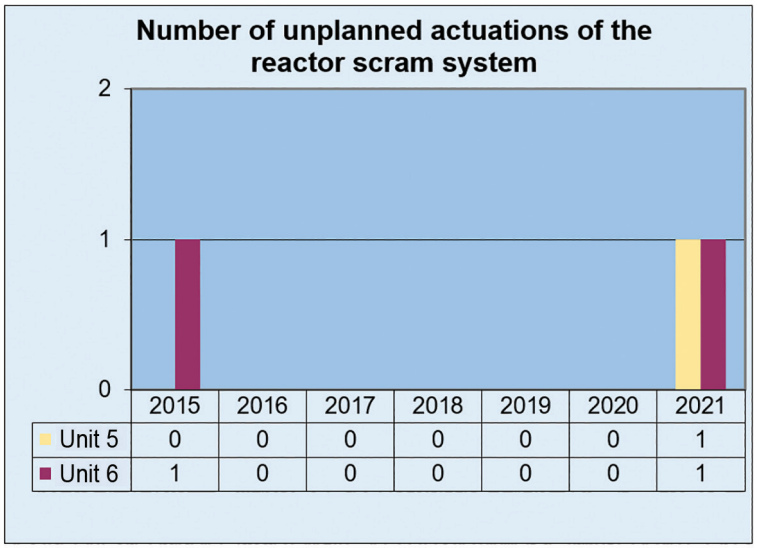
The condition of the safety systems (SS) is checked by performing periodic tests. The results show that the main parameters characterizing the preparedness of the systems to perform their design functions are within acceptable limits, no deviations have been identified that have led to the inoperability of the SS.

The degree of risk associated with the impact upon the SS during operation is determined by the number of unplanned actuations of the systems as per a real parameter. When actuating safety systems, it is taken into account whether the signal that has led to the actuation is a real change in a parameter or is a false signal. In 2021, two events were registered related to the unplanned actuation of the SS by changing the real parameter. The established tendency to keep the values of the indicator low in recent years testifies to the maintenance of the SSC of the units in good condition, as well as to the maintenance of the necessary level of safety. The figure below shows the distribution of the indicator over the last few years.



	2015	2016	2017	2018	2019	2020	2021
Real	3	0	0	0	0	0	2
False	0	0	0	0	0	0	0

In the period under review, two events with actuation of the reactor scram were registered. The occurrence of these two events did not lead to any harmful consequences for the equipment and its resource.



	2015	2016	2017	2018	2019	2020	2021
Unit 5	0	0	0	0	0	0	1
Unit 6	1	0	0	0	0	0	1

Maintaining the required level of reliability and preparedness of the safety systems to perform their design functions significantly reduces the likelihood of core damage in all internal initiating events.

The results of the tests performed on the SS are included in the regulatory control. No deviations leading to system inoperability have been identified. This shows good resilience of the units in terms of the ability of safety systems to prevent the development of modes with deviations from normal operation into accidents.

4. Condition of the containment, filter ventilation system, hydrogen combustion system - tests, monitoring and maintenance programs

The organization of the planning, management and coordination of the activities for monitoring and assessment of the current condition, the remaining lifetime and limiting the ageing of the materials of the containment are regulated in programs for monitoring and managing the ageing of the containment and civil structures of the Kozloduy NPP. The inspection carried out in 2021 confirmed the good operational condition of the containment of Units 5 and 6 of the Kozloduy NPP and the implementation of the programs for testing, supervision and maintenance. The control of the stressed and deformed condition of the containment is performed in accordance with the programs for monitoring and management of ageing. The inspection confirmed the implementation of the recommendations made as a result of the inspection of the technical condition and the remaining lifetime of the containment.

The operability of the filter pressure reduction system in the containment is maintained in accordance with the operative documents. An external inspection of the scrubber is performed annually, and a technical inspection is carried out every 4 years, which includes the results of the non-destructive testing of the welded joints. Hydraulic tests are performed every 8 years to confirm the strength of the scrubber. In 2021, a hydraulic test was performed on Unit 6. Every year, before the commissioning of each of the units after the planned annual outage, functional tests are performed to confirm the operability of the filter ventilation system.

In order to ensure the operability of the systems for control of concentration and emergency release of hydrogen at Kozloduy NPP, procedures for operation, maintenance and repair have been developed and are being implemented. The sensors of the hydrogen detection system are checked monthly, and once a year the elements of the system are disassembled, checked and adjusted. The emergency hydrogen separation system consists of passive autocatalytic recombiners and is subject to periodic inspections - the catalytic capacity of some of the recombiner plates is checked annually, and every 5 years 100% of the plates of all recombiners are inspected.

A system for controlling the concentration of hydrogen, oxygen, carbon monoxide and steam in each unit is also being implemented, designed to assist operators in making decisions in the event of a major accident.

5. Emergency preparedness - emergency drills and exercises

The set of activities and actions related to emergency planning and emergency preparedness on the site of the facilities are established in the internal emergency plans in accordance with regulatory requirements. In this regard, the Kozloduy NPP maintains an internal emergency plan, which defines the necessary functions and actions of the company in case of an accident. The plan also defines the activities related to maintaining emergency preparedness. This is a continuous process at the Kozloduy NPP, which includes planning and conducting periodic training and practical application of the acquired knowledge.

During the past year, the staff and members of the emergency teams have been systematically conducting specialized training on various topics related to emergency preparedness and response. According to pre-approved schedules, a total of 3 exercises and trainings were conducted, including the practical implementation of various elements of the internal plan. Two of the exercises were conducted with the full emergency team of the plant and actually carried out some of the activities envisaged in the plan, such as evacuation of site personnel, firefighting, radiation monitoring and first aid. In the results of the performed analyzes of the conducted exercises and trainings it has been established that the success criteria have been met and the set goals have been achieved.

The regulatory control in the region carried out during the period shows that the emergency preparedness is maintained at the required level and in accordance with regulatory requirements. The personnel performing functions in accordance with the internal emergency plan shall have the necessary knowledge and skills to respond to an emergency.

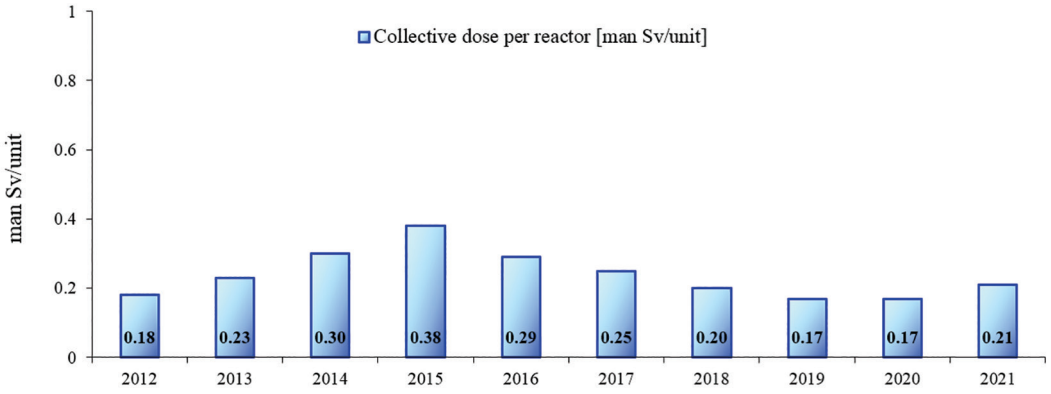
6. Radiation protection

The BNRA carries out systematic regulatory control of the state of radiation protection during the operation of units 5 and 6 of the Kozloduy NPP and of the radiation situation on the site of the nuclear facilities. The main and integral part of the control are verification, analysis and evaluation of the information provided by the Kozloduy NPP and related to the radiation protection of the professionally exposed persons and members from the population.

Occupational exposure

The collective dose from external exposure in 2021 is 0.415 man.Sv. No individual effective dose of internal exposure above the registration level of 1 mSv has been reported.

The average individual annual effective dose of occupationally exposed persons for 2021 is 0.21 mSv. The maximum registered individual effective dose (9.14 mSv) is significantly lower than the statutory annual limit of the effective dose of 20 mSv for persons of category "A".



Collective effective dose at Kozloduy NPP, 2012-2021

The occupational exposure during the operation of units 5 and 6 of Kozloduy NPP is maintained at a reasonably achievable low level in accordance with the principle of optimization.

Radioactive emissions and environmental monitoring

Radiation monitoring in order to assess the exposure of persons in the population during the operation of Kozloduy NPP is carried out under programs agreed with the BNRA and in accordance with the requirements of Art. 35 of the Euratom Treaty, the IAEA recommendations and good international practice.

In 2021, the gaseous and liquid radioactive emissions into the environment during the operation of Kozloduy

NPP are much lower than the permitted annual activity levels according to the licenses for operation of Units 5 and 6.

The following radioactive substances are released into the atmosphere:

- radioactive noble gases (RBG) - 4.42 TBq;
- iodine-131 - 52.3 MBq;
- radioactive aerosols - 8.95 MBq;
- carbon-14 - 0.724 TBq;
- tritium - 0.607 TBq.

Gaseous emissions account for respectively 0.07%; 0.15%; 0.006%; 1.89% and 0.24% of the permitted annual activity levels.

Wastewater with a total annual activity of 0.178 GBq (excluding tritium) is released in the hydrosphere (Danube River). The activity of released tritium is 24.5 TBq. Liquid emissions account for 0.024% and 14.9% of permitted annual activity levels, respectively.

Pursuant to Art. 35 of the Euratom Treaty and a recommendation of the European Commission (EC), independent regulatory control of radioactive emissions from nuclear facilities at the Kozloduy NPP site is carried out. In this regard, in 2021 the BNRA commissioned the INRNE-BAS to perform analyzes of more than 90 samples for assessment of gaseous and liquid radioactive emissions from the Kozloduy NPP.

In accordance with the requirements of Art. 37 of the Euratom Treaty, the BNRA has submitted to the European Commission a detailed report on the annual discharges from nuclear facilities at the Kozloduy NPP site for 2021, prepared in accordance with Recommendation 2004/2/ EURATOM.

Proven computer models based on the CREAM methodology adopted in the European Union (EU) are used to estimate the annual effective dose for the population in the area around the Kozloduy NPP site, taking into account the actual hydrological, meteorological and demographic data.

The maximum individual annual effective dose per capita due to gaseous and liquid emissions into the environment in 2021 is conservatively estimated at 4.54 μSv/a and is 0.18% of the radiation due to the natural radiation background. This value is over 200 times less than the normatively determined annual limit of the effective dose of 1 mSv for persons in the population in situations of planned exposure. These estimates are also confirmed by calculations made on the basis of the IAEA MODARIA platform.

7. Physical protection

The system for physical protection of the individual nuclear facilities of the Kozloduy NPP is an integral part of the physical protection of the entire site and, as a rule, its operation is checked for all facilities. The implemented regulatory control shows that the physical protection system of the Kozloduy NPP performs its main functions and provides the necessary counteraction to the design basis threat.

STORAGES FOR SPENT NUCLEAR FUEL OPERATION - SFSF, DSFSF

1. Operation of the storages - fulfillment of the conditions of the licenses

The activity of the repositories is carried out according to the Licenses for operation of SFSF and DSFSF. In accordance with the terms of both licenses, the Kozloduy NPP sends monthly and annual safety status reports. The regulatory control performed by the BNRA, including the conducted inspections, confirms that the operation of the SFSF and the DSFSF is carried out in accordance with the safety requirements set out in the Act on the Safe Use of Nuclear Energy (ASUNE) and the secondary legislation for its enforcement as well as with the terms of the operating licenses.

By 31.12.2021, a total of 100 baskets containing 660 assemblies from WWER-1000 reactors and 1268 assemblies from WWER-440 reactors are stored in the SFSF. 19 Constor 440/84 containers containing a total of 1596 assemblies from WWER-440 reactors are stored in the DSFSF. During the period, 192 spent nuclear fuel (SNF) assemblies from WWER-1000 reactors were transported abroad for technological storage and processing.

During the period, SNF was transported from the SFP of the units to the SFSF, which ensures the availability of sufficient free space in the SFSF to remove the assemblies from the reactors in case of necessity.

2. Spent fuel management. Implementation of the strategy for management of radioactive waste and spent nuclear fuel

The current Strategy for Spent Fuel Management (SNF) and Radioactive Waste (RAW) was adopted by the Council of Ministers in 2015. One of the main requirements of the SNF and RAW Management Strategy (Strategy) is the annual export of at least 50 tons of heavy metal in the form of spent fuel for technological storage and processing. Due to external reasons for Bulgaria (difficulties in transit through third countries) delays were accumulated in the implementation of this requirement. Following the development of a new transport scheme that eliminates dependence on transit countries, in 2021 the Kozloduy NPP resumed regular removal of spent fuel for technological storage and processing.

3. Radiation protection

Data from measurements of dose rate and surface contamination in the premises of the controlled area of SFSF are submitted monthly to the BNRA, and for the premises in the controlled area of DSFSF - within the report for the first half of the year and in the annual report of the SFSF. The data contained in the presented reports show that the measured values of the controlled radiation parameters (dose rate, aerosol concentration, surface beta-pollution) are significantly lower than the normatively determined values and meet the requirements contained in the radiation protection instructions of the facilities.

4. Physical protection

The physical protection of the facilities appears to be an integral part of that of the Kozloduy NPP. The implementation of the regulatory control, including the on-site inspections of the facilities, is within the control of the physical protection of the Kozloduy NPP.

STATE ENTERPRISE "RADIOACTIVE WASTE" (SE RAW) - SD "Decommissioning", SD "RAW - Kozloduy", SD "PRRAW - Novi Han"

1. Safety in radioactive waste management at the Kozloduy NPP site

The BNRA carries out the state regulation in the field of safe management of radioactive waste according to the permit regime, defined in the ASUNE and its secondary legislation.

The specialized division “RAW - Kozloduy” (SD “RAW - Kozloduy”) operates on the site of the Kozloduy NPP, collecting, sorting, transporting, processing and storing the waste generated by the operation and outages of Units 5 and 6 of the Kozloduy NPP. The management of RAW is carried out in accordance with an approved Complex Program, developed and implemented in implementation of Art. 12 of the Regulation on the safety in RAW management. According to the recommendations of the BNRA, procedures for minimizing the generation of RAW have been developed and are being implemented, regulating appropriate organizational and technological measures for this purpose during the daily work. The obtained results show that an acceptably low level of the amount of RAW generated by the operation of units 5 and 6 of the Kozloduy NPP has been achieved. The RAW generated in 2021 are:

- compressible solid RAW - 513 m^3;
- non-compressible solid RAW - 41 t;
- liquid RAW - 195 m^3.

By December 31, 2021, the Kozloduy NPP stores 45 m^3 of solid RAW and 1537 m^3 of liquid RAW. Liquid radioactive waste (radioactive concentrates, spent ion exchange resins and sorbents) is stored separately in steel tanks in the auxiliary building on the site of the plant until their transfer to SE RAW. In 2021, the entire amount of generated low- and intermediate-level solid RAW was transferred to SE RAW for processing.

2. Fulfillment of the conditions of the issued licenses and permits

• Specialized division "Decommissioning - Units 1 - 4"

The Specialized Division "Decommissioning - Units 1 - 4" carries out activities for decommissioning of the

shutdown nuclear units 1 - 4 at the Kozloduy NPP, managing and operating the remaining technological systems, facilities and equipment of the shutdown nuclear units.

The decommissioning activities of Units 1 - 4 of the Kozloduy NPP are carried out in accordance with the terms of the licenses issued by the BNRA Chairman and include:

- decontamination of structures, systems and components;
- dismantling of structures, systems and components;
- management of the materials obtained during the dismantling activities;
- management of radioactive waste during decommissioning;
- site management of a nuclear facility, as well as activities supporting the implementation of the main activities.

In 2021, the programs for dismantling systems and equipment in the reactor hall of Units 1 - 4 and for managing the materials from dismantling were implemented. The dismantled equipment has a total weight of 550 t.

600 t of radioactive materials from equipment dismantled from the controlled area have been processed (shredded and decontaminated) in the size reduction and decontamination workshop. Up to the levels for exemption from regulation pursuant to the ASUNE, metals with a total weight of 546 t have been deactivated.

The materials received during decommissioning activities of Units 1 - 4 of the Kozloduy NPP are subject to ASUNE regulation. Exemption from regulation for each specific case is envisaged for these materials by an order of the BNRA Chairman. In 2021, 64 orders were issued by the BNRA Chairman for exemption from regulation of materials from dismantling activities carried out on Units 1 - 4 of the Kozloduy NPP.

All structures, systems and components necessary for the safe performance of the decommissioning activities of Units 1 - 4 shall be maintained in their regulated condition.

- **Specialized Division "RAW - Kozloduy"**

The Specialized Division RAW - Kozloduy (SD RAW - Kozloduy) processes the generated solid and liquid RAW obtained from the operation of Units 5 and 6 of the Kozloduy NPP and from the decommissioning of Units 1 - 4, observing the conditions of the issued from the BNRA license.

In 2021, the amount of treated RAW exceeds the quantities of RAW generated by Kozloduy NPP. All solid RAW, handed over to RAW - Kozloduy in 2021, have been promptly processed and conditioned.

For the purposes of RAW treatment generated during the operation of Kozloduy NPP, three types of packaging of conditioned RAW are specified, suitable for storage and disposal of - StBK-1, StBK-2 and StBK-3. In 2021, a total of 96 packages of RAW were produced (58 StBK-1, 2 StBK-2, 36 StBK-3).

The SD RAW - Kozloduy maintains a system of safety indicators, which testify to the preservation of the achieved sustainable level of safety during the operation of the facility. No deviations from normal operation or violations of dose limits and control levels for occupational exposure of own personnel and personnel of external organizations have been reported.

• Specialized Division “Permanent Repository for Radioactive Waste - Novi Han” (SD “PRRAW - Novi Han”)

SD "PRRAW - Novi Han" carries out activities for operation of RAW management facilities in accordance with the requirements for safe operation and the conditions of permits and licenses. The facility receives, processes, sorts and stores RAW generated from the use of sources of ionizing radiation (SIR) in industry, medicine, agriculture and science (so-called "nuclear applications").

In 2021, 149 “units” of RAW were accepted for storage for subsequent management.

The individual effective doses of occupationally exposed persons are maintained below 6 mSv.

The results of the radiation monitoring show that the natural radiation background in the area is not affected by the operation of the permanent storage facility for RAW from nuclear applications.

3. Plasma incineration plant

According to the terms of the commissioning permit issued by the BNRA in 2021, the commissioning program of the Plasma Incineration Plant (PIP) is being implemented. The tests with RAW of the constructions, systems and components of the installation in 2021 were carried out according to the approved program. The "recipes" for RAW processing and for achieving maximum productivity have been optimized. The average productivity of the PIP over 55 kg/h was achieved with an average volume reduction factor over 73. The quantities of secondary RAW generated during the operation of the facility were minimized, processing 3400 m3 of RAW.

4. Radiation protection

Aerosol emissions into the atmosphere

The results of the monitoring of radioactive emissions into the atmosphere show that in 2021 the activity of emissions through the ventilation stacks 1 and 2 is below 0.5% of the value of the set administrative annual limits. The expected annual effective dose for the population as a result of the decommissioning activities of Units 1 - 4 is much lower than the level of negligible radiation risk.

The radioactive emissions from the facility for processing of RAW are also included in the total amount of releases from the Kozloduy NPP

Liquid discharges

The amount of discharged waste water from units 1 - 4 in 2021 is 9500 m^3, with a total activity of 13 MBq, which is about 0.01% of the control level.

Dose rate of occupationally exposed persons

The collective dose of external exposure of the occupationally exposed persons in SE RAW and workers from external organizations is 0,041 man.Sv. In 2021, there are no cases of exceeding the dose limit of 6 mSv for the annual effective dose in occupational exposure.

5. Physical protection

In 2021, an inspection at the SD "PRRAO - Novi Han" was carried out, and it was found that the physical protection system of the SD "PRRAO - Novi Han" is in accordance with the existing requirements and is able to perform its functions.

PROJECTS FOR NEW NUCLEAR FACILITIES

1. Belene NPP - stage of the licensing procedure

The decision taken by the Council of Ministers (CM) in June 2018 instructs the Minister of Energy to resume activities to seek opportunities for the construction of Belene NPP together with a strategic investor. Pursuant to this decision, the Minister of Energy organizes, coordinates and controls the conduct of negotiations with potential investors. As a result of the same decision of the Council of Ministers, the reason for the termination of the licensing process of the project was dropped and the project can be resumed at the request of the licensee from the stage of approval of the technical design. To date, the licensee has not taken action to continue the licensing process.

2. Seventh Unit of Kozloduy NPP - stage of the licensing procedure

In May 2012, a project company Kozloduy NPP - New Build Plc was established with the main purpose of designing, licensing, construction and commissioning of a new nuclear power capacity in the area of the Kozloduy NPP. In fulfillment of its obligations, the project company started the licensing procedure for the construction of the new nuclear power capacity by submitting an application for a permit to determine the location (site selection) of the new nuclear facility. As a result of the permit received in August 2013, all necessary studies were performed and the results were presented to the BNRA with a request for issuing an order for approval of the selected site. After reviewing and evaluating the submitted documents in February 2020, the BNRA Chairman issued an order approving the selected site for the deployment of a nuclear facility - nuclear power plant. The next step in the licensing process is to request a design permit. To date, the project company has not taken action to continue the licensing process of the new nuclear facility.

3. National repository for intermediate and low-level RAW - stage of the licensing procedure

The Specialized Division "National Repository for Radioactive Waste" (NRRAW) to the State Enterprise RAW organizes, coordinates and controls the construction, commissioning and operation of a repository for disposal of low- and intermediate-level short lived radioactive waste.

The main construction works on the NRRAW site in 2021 were carried out in accordance with the terms of the BNRA permit. The technical design of the facility takes into account the technical specifications of the existing RAW packaging, which have already been approved by the BNRA.

RESEARCH REACTOR

The facility has been shut down and its site has been cleared from nuclear fuel. In 2021, no activities were carried out in connection with the decision of the Council of Ministers of 2001 on the reconstruction and refurbishing of the facility into a low-power reactor.

SUMMARY

The results of the regulatory control over the past year give grounds to draw the following general conclusions regarding the state of nuclear safety and radiation protection in nuclear facilities in the country:

- The operation of the nuclear facilities is based on a documented management system of the licensee and is within the legally established licensing regime;

- The operators of the nuclear facilities have established and maintain an effective internal organization for implementation and control of reporting the conditions of the licenses and permits issued by the BNRA. The planning and implementation by the operator of measures arising from the terms of the BNRA licensing acts contribute to maintaining the required level of safety in the nuclear facility;

- The values of the safety indicators indicate the achieved sustainable state of safety during the operation of the nuclear facilities;

- The activities are performed in accordance with the regulatory requirements and the conditions of the issued licenses and permits;

- The discrepancies, as well as the recommendations and proposals made, are documented and eliminated by the licensees by taking adequate corrective measures.

The activities for operation and decommissioning of the nuclear facilities in the country are carried out in accordance with the requirements and norms for radiation protection, observing the conditions of the issued licenses and permits. The radioactive emissions from nuclear facilities are significantly lower than the permitted annual levels, and the annual effective doses for the population are negligibly low in terms of radiation protection.

Individual and collective doses of occupational exposure are kept as low as reasonably achievable in accordance with the principle of optimization. The dose rate of the professionally exposed persons is below the normative limits in situations of planned exposure.

II. ACTIVITIES WITH SOURCES OF IONIZING RADIATION

The activities with sources of ionizing radiation (SIR) are carried out on the basis of a license, permit, registration or notification.

ASUNE licenses are required for:

- use of SIR for economic, medical, veterinary and scientific purposes or for performing control functions;
- production of sources of ionizing radiation;
- production of consumer products by adding radioactive substances;
- transport of radioactive substances;
- operation and technical liquidation of sites for extraction and processing of ore containing natural uranium or thorium.

ASUNE permits are required for:

- construction, installation and preliminary testing of a site with SIR;
- making changes in the constructions, systems and components envisaged by the design, related to the radiation protection in sites with SIR;
- import and export of SIR;
- one-time transport of radioactive substances;
- transit transport of radioactive substances;
- temporary storage of radioactive substances.

Certificates of registration are required for:

- work with sources of ionizing radiation for the purpose of maintenance, installation, dismantling, measurements, construction and repair activities and other services for persons who use or produce sources of ionizing radiation;
- use of sources of ionizing radiation for non-medical imaging studies.

Notifications are required for:

- activities with materials with increased content of natural radionuclides;
- activities for management of materials originating from sites for extraction and processing of ore containing natural uranium or thorium, when the exposure cannot be neglected from the point of view of radiation protection;
- activities in which radon exposure at workplaces cannot be neglected in terms of radiation protection;
- activities in which the probability of damage to health is insignificant.

The procedure for application of the permit regime envisaged by the ASUNE is determined by the Regulation on the procedure for issuing licenses and permits for safe use of nuclear energy. In order to establish compliance with the legislative requirements for radiation protection, an analysis and assessment of the documents submitted to the BNRA is performed, which are required for a specific activity with SIR, specified in the ASUNE.

The BNRA maintains public registers of the issued licenses, permits and certificates for registration for activities with SIR and of the submitted notifications.

At the end of 2021, the licenses in force for activities with SIR are 1251, distributed as follows:

- licenses for use of SIR - a total of 1150 (1011 - for medical and veterinary purposes, 100 - for economic purposes, 14 - for scientific purposes, 25 - for control functions);
- licenses for transport of radioactive substances - 37;
- licenses for work with SIR for the purpose of services - 62;
- licenses for production of SIR - 2.

At the end of 2021, the permits in force for construction, installation and preliminary testing of SIR sites and for temporary storage of radioactive substances are 259. The current registration certificates are 61.

The BNRA maintains a register of SIR in the country, which contains data on the type, activity, radionuclide composition, technical characteristics and location of sealed sources of categories 1 to 5, open source sites, ionizing radiation generators, as well as identification data for all licensees and holders of permits. The country uses 45 charged particle accelerators, 7 gamma-ray irradiators for medical purposes, 2 gamma-ray irradiators for commercial and scientific purposes, 6 gamma-ray irradiators for metrological control, 102 gamma-flaw detectors, 104 X-ray flaw detectors, 6 systems for high-dose brachytherapy and over 2500 X-ray systems for diagnostics and therapy (excluding dental X-ray machines for sector graphs).

The total number of registered SIRs, including open sources, technological control devices and others, which are subject to the permissible activities under the ASUNE, is over 6000.

The permitted activities with SIR are carried out in accordance with the requirements and norms for radiation protection and the conditions of the issued administrative acts under the ASUNE. In 2021, there were no deviations from the dose limits and dose restraints for occupationally exposed persons and members from the population.

III. ADMINISTRATIVE CAPACITY

The ensuring and maintaining of the necessary human resources with adequate education and qualification in the field of nuclear safety and radiation protection is one of the basic requirements embedded in the national legislation as well as in the international conventions and the legislation of the European Union (Acquis Communutaire)

According to the international requirements (conventions and legislation of the European Union) Bulgaria must provide and maintain the necessary human resources with adequate education and qualifications in the field of nuclear safety and radiation protection.

The BNRA works purposefully and consistently to strengthen and develop its administrative capacity.

In the framework of the national project of the IAEA Technical Cooperation Program, BUL0012 - "Implementation of an integrated approach to capacity building in the Bulgarian Nuclear Regulatory Agency", in the period 15 - 26 February 2021 in the BNRA was held a virtual IAEA expert mission for assessment of the current system for building professional capacity in the agency in order to prepare recommendations and proposals for improvement, as well as to identify areas of good practice and results. According to the mission report, the most significant challenges facing the BNRA are the lack of qualified human resources for nuclear safety and security as a result of the small number of graduates in these fields, as well as the lack of a comprehensive organizational strategy for professional capacity building on the four pillars - education and training, human resources development, knowledge management and participation in knowledge exchange networks.

In pursuance of the proposals and recommendations of the mission by order of the Prime Minister of Bulgaria, an Interdepartmental Working Group was established under the leadership of the BNRA Chairman, which developed a draft strategic document - National Strategy for Formation and Development of Human Resources in the Nuclear Sector 2022 – 2032.

1. HUMAN RESOURCES

1.1. Training and qualification

The Agency applies a systematic approach to training based on an internationally recognized methodology. Specialized training is provided to maintain and improve the qualification of employees, including the acquisition of additional knowledge and skills for quality performance of their duties.

In order to improve the training process (initial and supportive) the Procedure for training of BNRA employees has been revised, taking into account the recommendations and proposals of the IAEA expert mission conducted during the year. It is envisaged to include in the training process e-courses of the IAEA and the Kozloduy NPP, as well as those specially developed for the needs of the BNRA.

The learning process includes three main areas:

- Training from the Institute of Public Administration (IPA)

In 2021, 21 employees have refreshed and enriched their knowledge by participating in courses organized by IPA in the field of digital competence; public policies; electronic management; drafting legislation and law enforcement; management and personal effectiveness.

- Specialized training

In 2021, 7 trainings were conducted according to the approved Annual Plan for Specialized Training (APST), 3 of which were conducted by external lecturers. The trainings were conducted in video format, which allowed their recording.

- Training conducted by international organizations (IAEA, bilateral cooperation agreements), as well as participation in international meetings, projects, seminars, conferences, etc.

During the past year, representatives of the BNRA participated in over 50 events, most of which were held virtually.

1.2. Human resources

At the end of 2021, the number of BNRA staff is 103. Over 90% of all employees in the agency have higher education. The average professional experience in the specialized administration is over 20 years.

In 2021, the BNRA held 9 competitions for civil servants and appointed 7 employees. Four employees have been reassigned to higher positions through competitive selection.

Evaluation of the employees in the agency for the performance of their positions is carried out in compliance with the requirements set out in the Regulation on the terms and conditions for evaluation of the performance of employees in the state administration.

More than half of the BNRA employees have a rank higher than the minimum required for holding the position.

1.3. Knowledge management

Maintaining the required level of qualification and experience of the employees of the specialized administration of the agency prioritizes the activities related to knowledge management, which include preserving the accumulated expert experience and passing it on to younger experts. In this regard, the expansion of the existing database containing reports, presentations, training courses and other materials from various national and international events has continued in the past period, providing free access to all employees. In addition, all trainings conducted according to the annual plan are generally available in the form of video materials.

1.4. Knowledge exchange networks

The BNRA is an organization that is an active participant in international peer reviews, various knowledge networks maintained by the IAEA, as well as those at European level, and from 2021 in the initiatives of the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD).

The BNRA Chairman continued his participation in the ENSREG Board for Stress Tests in Third Countries. BNRA staff were part of the teams of three peer reviews (one IRRS and two IPPAS missions) organized by the IAEA.

Experts from the BNRA participated in projects funded under the Eu Nuclear Sofety Cooperation Instrument 2014 - 2020.

Traditionally, in 2021 the BNRA supported the activities of non-governmental organizations in the sector, as BNRA representatives took part in virtual events, including the annual conference of the Bulgarian Nuclear Society.

2 FINANCIAL RESOURCES

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

For 2021 revenues in the amount of BGN 8,603,800 and expenses in the amount of BGN 7,496,100 have been determined. By Decrees of the Council of Ministers No. 113/29.032021, No. 177/29.04.2021 and No. 474/30.12.2021 the approved expenditures under the budget of the Bulgarian Nuclear Regulatory Agency have been reduced by a total of BGN 1,016,100 in order to finance activities related to prevention of the spread of COVID-19, treatment of infected persons or limiting the consequences of the pandemic. After the changes in the budget of the BNRA as of 31.12.2021, according to the updated specified plan, the total amount of the expenditures is BGN 6,480,000.

The revenues in the state budget, which the BNRA realizes, are revenues from fees for issuing licenses and permits under the Act on the Safe Use of Nuclear Energy.

In 2021, the BNRA budget received revenues from fees in the amount of BGN 9,532,652, revenues from interest, fines and sanctions in the amount of BGN 3,204 and other revenues, incl. from the participation of the BNRA as a contractor of projects financed by the European Commission in the amount of BGN 88,389.

The overfulfillment of the revenues from state fees is a result of collected fees for issued permits, which cannot be foreseen, for modification of the design in order to increase the safety of Kozloduy NPP Plc and State Enterprise "Radioactive Waste".

Expenditures for 2021 are for the maintenance of the institution, staff salaries, social and health insurance,

membership fees in international organizations, acquisition of tangible fixed assets and more. The total amount of expenses incurred for 2021 amounts to BGN 6,005,700.

3. PUBLIC RELATIONS

In its work, the Agency follows the principles of independence, substantiation, credibility and open dialogue. In 2021, news, current information and drafts of legislative documents were published on the BNRA website (http://www.bnra.bg). Important events related to the nuclear and radiation safety of activities and facilities and the work of the regulatory body are covered.

In 2021, the Agency registered three applications for access to public information, on which the required information was provided within the statutory period.

Two of the applications for access to public information registered with the Agency are letters on paper from individuals. The application from a non-governmental organization was sent by e-mail. Two of the applicants were provided with information by e-mail, and one of the applicants was issued a Decision on access to information and it was provided

IV. NRA ACTIVITIES

1. Development of the regulatory framework

In 2021, the BNRA Rules of Procedure were amended and supplemented in order to update the activities in accordance with the amendments made in 2020 to the ASUNE. The joint work of the responsible institutions on the proposed drafts of two new regulations continued - Regulation on emergency planning and emergency preparedness in case of nuclear and radiation accident; Regulation on the standards for radiation protection in case of technical liquidation of the consequences of the extraction and processing of uranium ore.

Five regulatory guides were developed and approved:

- Guide on the qualification of structures, systems and components important for the safety of nuclear power plants.
- Guide for safe management of highly active sources during operation and decommissioning of sites with gamma-ray irradiation systems;
- Guide for determining the importance of operational events in terms of nuclear safety and radiation protection / INES scale level /.
- Guide for safe management of materials originating from uranium ore mining and processing sites;
- Guide for a realistic assessment of the radiation impact of gaseous and liquid emissions in the environment during the operation of nuclear facilities.

2. Inspections of nuclear facilities and operational control on the site

In accordance with the plan for inspection activities of the BNRA, a total of 26 inspections were conducted in the nuclear facilities in 2021. A list of inspections is contained in Annex № 2.

Results of the more significant inspections conducted at Kozloduy NPP:

Management of organizational changes in Kozloduy NPP

The subject of the inspection is the application of a consistent and systematic approach in the implementation of organizational changes in Kozloduy NPP. In this regard, a review of the regulations for the organization and activities of structural units, quality rules governing the activities for the introduction of organizational changes, and reporting documents on the implementation of changes. The whole process was followed, which includes: justification of the need for change; performing a review and assessment, including the defined criteria for safety impact assessment; planning the implementation and informing the affected organizational units and staff; introduction of change, including monitoring for early signs of problems, as well as subsequent evaluation to achieve the goal of organizational change. The scope of the inspection also includes the change in the organizational structure of the company implemented in 2020. As a result of the inspection, recommendations were made aimed at eliminating the weaknesses identified as a result of the NPP's analysis of the effectiveness of the implemented change.

The general conclusion is that the Kozloduy NPP applies a systematic and consistent approach to the introduction of organizational changes, in line with the requirements of the management system documents.

Preparedness of units 5 and 6 for startup and operation after planned annual outages

In accordance with the requirements of the license conditions, the inspections for the preparedness of the units for safe start-up and operation after the planned annual outages have been performed. The main activities falling within the scope of these inspections are the performed repair operations of the equipment, the changes in the SSC, the implementation of measures from the integrated safety improvement programs, the results of the performed metal inspection of the equipment, etc. The operational condition of the equipment is checked, as well as the readiness of the systems for startup of the units.

As a result of the inspections it was established that: the operational condition of the equipment is good; the planned repair activities and operational control of the metal are performed in volume and quality, which ensure the operability of the equipment; the activities related to the implementation of changes in the design performed in the required volume and quality, effective radiation protection of the plant staff and external contractors is provided.

Implementation of corrective measures from events related to the human factor

The purpose of the inspection is the activities related to the analysis and assessment of operational events related to the human factor, the scope of the identified corrective measures to prevent their recurrence. In this regard, a review of the documents regulating the activities, the distribution of functions and responsibilities in the analysis of events related to the human factor, as well as the criteria for determining the causes of the event was carried out

The analysis of events that occurred due to human error for the period from 2018 to 2021 was considered, and it was found that corrective measures have been identified related to: more frequent walk downs by senior and second level management staff, as well as line managers; steps towards the introduction of video recording of the actions when performing switching by the operational staff; conducting seminars on "Leadership and safety culture in nuclear energy" and "Mentoring". The analysis identifies the need for a common program, including both processes and activities aimed at improving human performance.

As a result of the inspection, recommendations were made aimed at improving the process of analysis of events and the definition and implementation of the identified corrective measures.

Localization safety systems

The scope of the inspection includes the actual condition, operability and reliability of the containment and the systems performing localization safety functions of Units 5 and 6 of the Kozloduy NPP. As a result of the inspection it was established that the maintenance, testing and management of ageing are carried out within the specified time limits and in accordance with the adopted programs for monitoring and management of ageing. Inspections, analyzes, tests and measurements shall be documented and stored in accordance with working procedures. No tendencies for deterioration of the working capacity and availability of SSCs performing localization functions have been identified.

Measures to ensure fire protection

The purpose of the inspection is to establish the actual condition of structures, systems and components providing fire protection on the site. The scope of the inspection also includes the topicality of the deterministic and probabilistic analyzes of the fire hazard for units 5 and 6. It has been established that fire safety is maintained in accordance with regulatory requirements, independent control and coordination of fire safety activities. Fire alarm and fire extinguishing systems shall be operated, tested and maintained in accordance with the established internal rules and regulatory requirements in this field.

Operational control on the Kozloduy NPP site

The operational control on the Kozloduy NPP site and of the specialized divisions of the State Enterprise "Radioactive Waste" - SD "Decommissioning of Units 1 - 4", SD "Radioactive Waste - Kozloduy" and SD "National Repository for Radioactive Waste" is carried out by BNRA inspectors permanently working at the Kozloduy NPP site.

The main duties of the inspectors consists in conducting direct monitoring of the condition of the nuclear facilities and control for compliance by the licensees with the regulatory requirements and conditions of the licenses and permits issued by the BNRA. The control activities are performed according to an annual plan, as the daily activities take into account the current state of the nuclear facilities and the peculiarities of the modes of their operation. If necessary, extraordinary or additional control is performed, according to the instructions of the BNRA management or at the discretion of the inspectors. The main part of the control is related to obtaining information about specific activities performed, which in most cases are related to repair operations, implementation of work programs, monitoring of operating parameters and others. The inspectors monitor daily the activities related to the elimination of the identified deviations and defects of the components, part of the safety systems, as well as the radiation situation, the dose rate of the NPP personnel, gaseous and liquid discharges and the operability of the radiation control systems. The scope of control also includes the implementation of corrective measures arising from the analysis of operational events and foreign experience. Special attention is paid to the periodic tests of the safety systems and the implementation of the maintenance and repair activities performed by both NPP personnel and external organizations.

The activities for the dismantling of the facilities of Units 1 - 4, performed by SE RAW, are also subject to control. The observance of the normative requirements, the fulfillment of the conditions of the licenses, the orders of the Chairman of the BNRA, as well as the requirements of the internal documents during the performance of the decommissioning activities are monitored. Similar control is exercised with regard to the activities related to the construction of the NRRAW. The results of the control are presented in the form of daily written and oral reports.

State Enterprise "Radioactive Waste" (SE RAW)

The planned inspections in nuclear facilities are carried out according to an annual plan approved by the BNRA Chairman. The inspections in the specialized divisions of SE RAW are related to control over the observance of the normative requirements for safe implementation of the permitted activities and control over the fulfillment of the conditions of the issued licenses and permits. In 2021, 8 inspections were conducted on the following topics:

- organization of the activities of SD "Decommissioning - Units 1 - 4" for dismantling in the controlled area of Units 1 - 4;
- fulfillment of the conditions of the permit for putting into operation of a plasma incineration plant;
- providing physical protection in SD "PRRAW - Novi Han";
- implementation of a program for management of RAW from nuclear applications in SD "PRRAW - Novi Han";
- fulfillment of the conditions of the license for operation of a facility for radioactive waste management through SD "PRRAW - Novi Han";
- emergency planning and maintenance of emergency preparedness in the SD "RAW - Kozloduy";
- planning of modernization activities in RAW management by SD "RAW - Kozloduy";
- management of the project for the construction of the NRRAW.

3. Inspections at sites with sources of ionizing radiation

The inspections in sites with SIR have been carried out according to an annual plan approved by the BNRA Chairman. A graded approach is applied, as the scope and frequency of inspections are determined depending on the type and category of the respective SIRs and the degree of radiation risk in carrying out activities with them.

According to the ASUNE, the inspectors, authorized by an order of the BNRA Chairman, carry out preventive, current and subsequent control over compliance with the requirements and norms for radiation protection and compliance with the conditions of issued licenses and permits for SIR activities. The control is carried out through document checks and/or on-site inspections in the inspected sites with SIR.

The inspections are carried out in accordance with the approved by the BNRA Chairman "Procedure for the inspection activity in sites with SIR", checking the following, namely:

- compliance with the conditions of the issued licenses and permits and the requirements for radiation protection when working with SIR, as well as the implementation of the instructions;
- the operational order, the organization of the radiation monitoring and the individual dosimetry control, the keeping of the documentation;
- the radiation situation in the site, the availability of means for radiation protection, the readiness to react in case of a radiation accident;
- the legal capacity and qualification of the occupationally exposed persons.

In 2021, 59 planned inspections were carried out in sites with SIR. In addition, inspections were carried out for commissioning of SIR facilities in:

- "University Multidisciplinary Hospital for Active Treatment" St. Marina " Plc;
- "University Multidisciplinary Hospital for Active Treatment "St. George" Plc;
- Multidisciplinary hospital for active treatment - Medical Complex "St. Ivan Rilski" Ltd. - Stara Zagora branch.

Inspections were carried out in "Ecoengineering-RM" Ltd. and "Agropolichim" Plc for compliance with the regulatory requirements for radiation protection in the management of materials with high content of natural radionuclides.

For the results of the performed inspections in the inspected sites with SIR, protocols of findings have been drawn up. Six prescriptions were given for eliminating the identified irregularities and taking corrective measures. An act of administrative violation was served.

In 2021, the BNRA received a report on a deviation when working with a gamma flaw detector (incorrect positioning of the source used), and in this case there were no consequences for the professionally exposed persons at the site.

On the basis of signals submitted by citizens, inspections were carried out to clarify the circumstances and facts regarding the use of X-ray systems for dental purposes and for veterinary purposes. Instructions and recommendations to the respective licensees have been given for elimination of the established irregularities.

In 2021 an inspection of the state of physical protection of the telegamatherapy unit "Terabalt 80 ACS" at the Complex Oncological Centre-Ruse Ltd. was performed. As a result of the inspection it was established that the physical protection system is in compliance with the requirements and is able to perform its main functions.

4. Licenses and permits for carrying out activities in nuclear facilities

Kozloduy NPP

Permits issued - 45, distributed as follows:

- to make changes under Art. 15, para. 4, item 5 of ASUNE - 37, of which:
  - 21 for unit 5;
  - 12 for unit 6;
  - 1 for both units 5 and 6;
  - 3 for making changes in documents included in Annex 2 of the licenses for operation of the units:
    - ✓ Instruction for radiation monitoring of the industrial site during operation of Kozloduy NPP;
    - ✓ Instruction for radiation monitoring of the environment during operation of Kozloduy NPP;
    - ✓ "Instruction for radiation protection at Kozloduy NPP -power production-2".
- for import of nuclear material - 2;
- for export of nuclear material – 2;
- for transport of nuclear material – 4.

The more significant activities, subject to the issued permits, refer to:

- implementation of measures related to the long-term operation of the units, such as the gradual replacement of components of systems important for safety and basic equipment of the primary circuit (replacement of valves, electric motors and pump seals, replacement of the excitation system of diesel generators and others);

- improving the reliability and maintainability of the facilities and equipment (implementation of an independent system for management of localized pneumatic fittings for cooling the spent fuel pools (SFP) in case of design failures, replacement of pneumatic fittings, part of the containment, increasing reliability systems for automatic water fire extinguishing, installation of a system for measuring the concentration of gases in the containment, etc.).

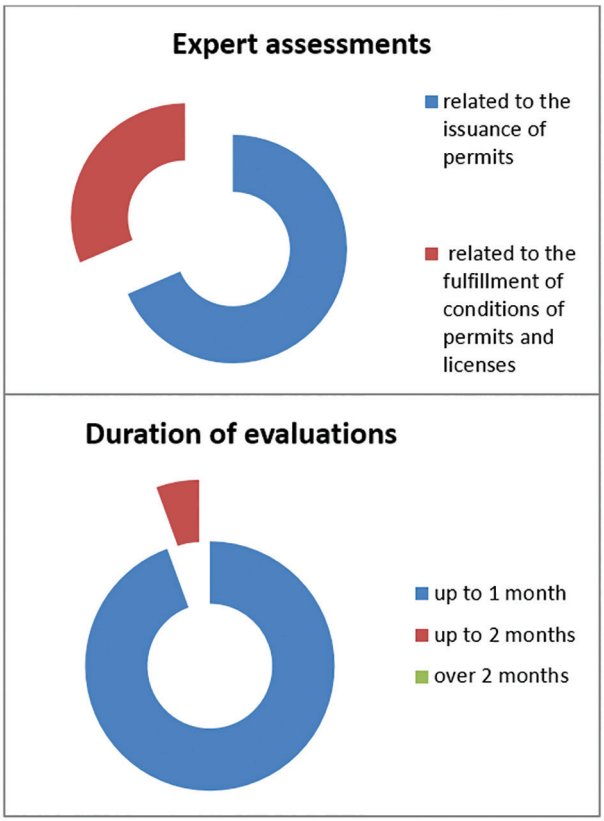
In addition to the assessments related to the issuance of the above-mentioned permits, the BNRA also assessed 36 technical decisions (34 for Units 5 and 6 and 2 for the SFSF) for changes in the SSC. These activities are determined not to have a significant impact on safety and fall outside of the permit regime.

A basic element in the permissible and licensing process in the BNRA are the review and assessment for compliance with the legislative requirements of the documents, accompanying the applications for the issuing of permits and licenses. In the review and assessment of the submitted information are taken into account the provisions of the legislative acts as well as the instructions in the regulatory guides of the BNRA and the safety standards of the International Atomic Energy Agency (IAEA).

The reviews and assessments carried out in 2021 relate mainly to applications for issuing of permits for carrying out of modifications related to the following, namely:

- implementation of measures to improve safety and changes in structures, systems and components important for the safety of nuclear facilities;
- proposed changes in the limits and conditions for operation of nuclear facilities, on the basis of which an operating license has been issued;
- amendments to internal rules for the implementation of activities, including regulations, instructions and programs attached to the licenses for operation of the facilities.

Although there are cases of requesting additional information from the applicant, all assessments have been completed and permits have been issued before the statutory deadline of 6 months.



Licenses for specialized training and certificates of competency

The total number of issued licenses for specialized training at the end of 2021 is 8, and during the past period three of them have been renewed - Kozloduy NPP, NA "N.Y. Vaptsarov "and MU" Prof. Dr. Paraskev Stoyanov "- Varna.

At the proposal of the Qualification Examination Commission, the BNRA Chairman issued a total of 42 certificates of competency, as follows:

- 27 certificates of competency of persons carrying out activities in nuclear facilities - operational personnel;
- 13 certificates of competency of persons carrying out activities in nuclear facilities - management staff;
- 2 certificates of competency of qualified experts in radiation protection.

Information on the certificates of competency issued by the BNRA Chairman is published in a public register maintained by the BNRA.

As part of the regulatory control over the past period, three inspections of the following license holders were conducted:

- RAD Protect - Sofia;
- Kozloduy NPP;
- NA "N. J. Vaptsarov ".

As a result of the performed inspections it was established that the activities carried out by the licensees are in accordance with the normative requirements and the conditions of the issued licenses.

In the past year, the number of certificates of competency for initial and supportive specialized training of persons carrying out activities in nuclear facilities or with SIR is 2659. In this regard, since the beginning of the year through the BNRA electronic services system, licensees can enter the necessary information on the certificates issued by them, as well as to submit to the BNRA the respective certificates electronically.

State Enterprise "Radioactive Waste"

In 2021, 4 permits were issued to SE RAW for making changes related to:

- storage of waste with a very low level of radioactive contamination in the SD RAW - Kozloduy;
- commissioning of a closed site for temporary storage of radioactive materials;
- amendments to the program for increasing the safety of the facility for RAW management by Kozloduy NPP;
- modernization of facility for processing of RAW

5. Licenses and permits for activities with sources of ionizing radiation

In 2021, 136 licenses for activities with SIR were issued, as follows:

- 107 for medical and veterinary purposes;
- 15 for economic and scientific purposes and for control functions;
- 14 for the transport of radioactive substances.

By orders of the BNRA Chairman, 115 licenses for activities with SIR were amended. In 2021, an order was issued for the release of radioactive substances from regulation and 30 licenses for activities with SIR were revoked.

In 2021, a total of 296 permits for activities with SIR were issued, as follows:

- temporary storage of radioactive substances - 11;
- site construction, installation and preliminary testing of SIR - 207;
- one-time transport of radioactive substances - 4;
- transit transport of radioactive substances - 2;
- for import and export of SIR - 70;
- decommissioning of a site with radioactive substances - 2.

Twelve permits for activities with SIR were amended.

In 2021, 17 certificates for registration under Art. 56, para. 3 of ASUNE for work with SIR for the purpose of maintenance, installation, dismantling, measurements, construction and repair activities and other services for persons who use or produce sources of ionizing radiation were issued

In 2021 in the public register under Art. 27, para. 2 of the ASUNE, 126 notifications for performing activities with insignificant radiation risk have been entered.

73 declarations for delivery of sealed sources have been certified, according to *Council Regulation (Euratom) 1493/93 of 8 June 1993 on the supply of radioactive substances between Member States.*

The total number of administrative acts for SIR activities issued in 2021 under the ASUNE is 806.

6. Accounting and control of nuclear material

The application of the safeguards system under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in the Republic of Bulgaria is carried out in accordance with the signed Agreement on Safeguards Implementation between the Euratom countries, the International Atomic Energy Agency and the Republic of Bulgaria. Based on the information sent in implementation of the Agreement and the Additional Protocol thereto and on the basis of inspections, assessments and analyzes, the IAEA concludes that the Republic of Bulgaria has complied with the NPT.

According to the Agreement, the Republic of Bulgaria provides information on the control and reporting of nuclear materials to the European Commission, which in turn, after review and verification, submits it to the IAEA. The material balance areas for which reports are sent include Kozloduy NPP, SD Decommissioning - Units 1 - 4 at SE RAW on the site of Kozloduy NPP, SD PRRAW - Novi Han, regeneration and treatment line of ion exchange resins (LROYS) - Eleshnitsa village, INRNE, as well as one zone of material balance, separated for the whole territory of the country, for sites with small quantities of nuclear material.

In 2021, the BNRA fulfills on time its obligations under the Agreement to prepare and send to the EC monthly and annual reports on the quantities of nuclear material in the material balance area for which it is directly responsible, including sites with small quantities of nuclear material throughout the country. The relevant declarations under the Additional Protocol were sent to the IAEA and the European Commission within the deadline.

In 2021, the BNRA organized the receipt of the necessary information from the licensees, its processing and the preparation of updated declarations under the Additional Protocol of the material balance area, including sites with small quantities of nuclear material. An inspection was conducted by the BNRA to verify the compliance of the data declared by the obligated persons with the actual condition of the Kozloduy NPP site. Based on the findings of the inspection, it was concluded that the organization of the declaration of information under the Additional Protocol and the provision of access to buildings and premises is good.

Together with IAEA and EC inspectors in 2021, 6 inspections were carried out in connection with compliance with the Safeguards and the Additional Protocol: 5 inspections at Kozloduy NPP and 1 inspection at IRT-2000 of the Institute for Nuclear Research and Nuclear Energy (INRNE). The inspections confirm the correspondence between the facilities declared in the reporting documents and the available nuclear material in terms of quantity, enrichment, shape, isotopic composition and the actual purpose of buildings and premises.

A comprehensive documentary inspection was carried out by IAEA and Euratom inspectors of all sites in

the material balance area, including sites with small amounts of nuclear material. Eight joint inspections were also conducted at sites in Sofia by IAEA, EURATOM and BNRA inspectors. The main conclusion from the performed inspections is that the physically available small quantities of nuclear material on the spot correspond to the declared ones and the system for their control and reporting is functioning.

7. Emergency preparedness

In accordance with the ASUNE, the BNRA Chairman performs the functions of a central body and contact point for emergency notification 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, the BNRA is part of the Unified Rescue System (URS). In case of a nuclear or radiation accident, the BNRA Chairman participates in the National headquarters (NH) at the Ministry of Interior (MI) and maintains an emergency team as part of the specialized BNRA administration.

In 2021, the BNRA participated in all ConvEx exercises organized by the IAEA. The purpose of these exercises is to check the channels of communication and international exchange of information in the event of a nuclear or radiation accident. The BNRA emergency team participates in 3 joint exercises with the Kozloduy NPP. During the exercises, the actions of the BNRA Emergency Team were checked in practice, as well as the exchange of information with the Kozloduy NPP Emergency Team.

In 2021, the BNRA registered about 60 cases of passing goods through the border checkpoints or at the entrance of large metallurgical companies of materials with high content of radioactive isotopes. In the majority of cases the increased value of the activity of the cargoes is due to the presence in them of natural radioactive isotopes, such as K-40, Ra-226, Th-232. Depending on the specific case, approved inter-institutional response procedures are applied. There were no radiation consequences or danger for the population and the environment in any of the registered cases.

8. Interaction and coordination with other state bodies for specialized control

The BNRA interacts and coordinates with the specialized control bodies pursuant to the ASUNE - the Ministry of Health (MH), the Ministry of Interior (MI), the State Agency for National Security (SANS) and the Ministry of Environment and Water (MEW). This includes:

- preventive, current and subsequent control in nuclear facilities and sites with SIR;
- issuance of licenses, permits and certificates for registration of activities pursuant to the ASUNE;
- effective control over SIR in the country;
- analyzes and assessments of the state of radiation protection in the country;
- maintaining emergency preparedness and response to incidents and accidents with SIR;
- informing the population on issues related to ensuring radiation protection in the country.

Licenses and permits for activities in sites with highly active sources and radioactive substances are issued by the BNRA Chairman after coordination with the Ministry of Interior regarding physical protection.

In cases related to the detection of orphan sources on the territory of the country or in case of illegal trafficking of radioactive materials, the approved interinstitutional procedures shall be applied:

- Procedure for reacting to the detection of illegal transfer/transportation of nuclear material, radioactive substances or radioactive sources in the areas of international airports, ports and border control checkpoints of the Republic of Bulgaria;
- Procedure for action in case of detection of illegal transfer / transportation of nuclear material or radioactive substances and incident with orphan sources;

The BNRA regularly provides information to the Ministry of Health, the Ministry of Interior and the State Agency for National Security on the issued licenses and permits for activities with SIR and on the licensees and permit holders who perform activities under the ASUNE.

The BNRA publishes daily on its website information about the registered gamma background in the country in accordance with the procedure agreed with the specialized control bodies. The natural radiation background in the country is not affected by the operation of nuclear facilities and sites with SIR.

In 2021 there are no deviations from the regulatory requirements for radiation protection in situations of planned exposure.

9. International cooperation

International Atomic Energy Agency

Bulgaria is a co-founding member of the International Atomic Energy Agency (IAEA). It has been a full member since the establishment of the agency and monitors the implementation of our country's obligations under the conventions to which the IAEA is the depositary.

Representatives of the NRA participate in the sessions of the five IAEA Safety Standards Committees: the Nuclear Safety Standards Committee (NUSSC), the Radiation Safety Standards Committee (RASSC), the Waste Safety Standards Committee (WASSC), the Transport of Radioactive Materials Safety Standards Committee (TRANSSC) and the Emergency Preparedness and Response Standards Committee (EPReSC).

The responsibilities of the BNRA as a national coordinator are being implemented regularly with regard to the IAEA Safeguards System and the INIS (International Nuclear Information System), INES (International Nuclear Event Scale), IRS (Incident Reporting System), INFCIS (Integrated Nuclear Fuel Cycle Information System), ITDB (Incident and Trafficking Database) and USIE (Unified System for Information Exchange in Incidents and Emergencies.

The BNRA actively participates in the Organizational Meeting for Preparation of the 8th and 9th Review of the Implementation of the Obligations of the States under the Convention on Nuclear Safety, held in 2021, as the representative of the Agency was elected as coordinator of one of the review groups.

The BNRA representative in Vienna actively participated in the consultations on the organization of the 7th review of the Joint Convention on the Safe Management of Spent Fuel and Safe Management of Radioactive Waste, as well as in the preparation of the 4th Extraordinary Meeting of the Parties to the Convention which will take place in 2022.

Representatives of the BNRA were active members of the Preparatory Committee of the Conference of the Parties to the Amended Convention on Physical Protection and in the consultations our participants had key role in the preparation of various issues of the event.

BNRA experts participate in the IAEA-organized IRRS mission (for integrated regulatory infrastructure assessment) in Switzerland and two IPPAS missions (for testing the physical protection of nuclear facilities) in Belarus and Turkey, the second of which was headed by the BNRA representative.

In 2021, BNRA experts took part in over 50 events organized by the IAEA - symposia, technical meetings, seminars, most of which were held in virtual format.

65th Session of the IAEA General Conference

The Chairman of the BNRA participated as the head of the delegation of the Republic of Bulgaria in the 65th session of the IAEA General Conference, held from 20 to 24 September 2021 in Vienna.

In his speech to the delegates in the plenary hall, he stressed the full support of our country to the internationally recognized principles and standards for safety and security in the nuclear sector, developed and approved within the IAEA, the need for strict compliance with the Treaty on the Non-Proliferation and the IAEA Safeguards system. Bulgaria is a responsible and constructive partner of the international community in the field of peaceful uses of nuclear energy and supports the IAEA efforts to find a harmonized approach to regulating new technological solutions in the sector.

The BNRA Chairman also held bilateral meetings with the IAEA Deputy Director General and Director of the Department of Nuclear Safety and Security, Ms. Lidie Evrard, the Deputy Director General of the International Atomic Energy Agency and the Director of the Technical Cooperation Department Mr. Hua Liu.

The main topics of the talks were building and maintaining the capacity of organizations in the nuclear field, regulatory approaches to new technologies in nuclear energy, Bulgaria's support, including financial resources to the IAEA ZODIAC initiative and others.

Outside the plenary session, the BNRA Chairman met with the Director General of the OECD Nuclear Energy Agency (NEA), Mr. William Magwood IV. During the talks, information was exchanged about the participation of the Bulgarian representatives in the working bodies of the NEA, in which our country has been an effective member since January 1, 2021.

The BNRA Chairman also met with the President of the Turkish Nuclear Regulatory Agency, Dr. Zafer Demircan, and with representatives of the Federal Service for Environmental, Technological and Atomic Supervision of the Russian Federation.

At the meeting with the President of the Turkish nuclear regulator, the two sides stressed the need for more

active contacts between the two regulators and agreed to take steps to sign a Memorandum of Understanding to lay the groundwork for future co-operation.

In parallel with the session, the BNRA Chairman participated in the meeting of the Regulatory Co-operation Forum and in the Meeting of the Senior Representatives of the Regulators for Nuclear Safety and Security.

Technical cooperation

In 2021 the implementation of the current cycle of the IAEA Technical Cooperation Program for 2020-2021 continued with three national projects for Bulgaria:

- Implementing an integrated approach to building administrative capacity in the Bulgarian Nuclear Regulatory Agency with a beneficiary the Bulgarian Nuclear Regulatory Agency and a budget for the entire cycle of 120,000 euros;
- Improving the productivity and quality of economically important crops through mutational cultivation and biotechnology. Beneficiaries are the Institute of Vegetable Crops - Maritsa - Plovdiv, the Institute of Canned Food in Plovdiv and AgroBioinstitute - Sofia, with a budget of 379,000 euros;
- Improving national diagnostic capabilities for the detection of hepatitis E virus in pigs and pig products. The beneficiary is the Center for Risk Assessment in the Food Chain with a budget of 205,000 euros.

Within this cycle, our country participates in over 30 regional and interregional projects of the program, which are in the field of nuclear energy, nuclear safety and radiation protection, radioactive waste management, healthcare and agriculture.

At the end of the year, the IAEA Technical Cooperation Program for the 2022/23 cycle was approved, in which Bulgaria again participates with 3 projects:

- Personalization of the existing national infrastructure for building nuclear capacity in support of human resources development and aspects of nuclear knowledge management, the beneficiary of which is the College of Electronics and Energy at the Technical University in Sofia with a budget of 220,080 euros.
- Hemigation for improved management of orchards and environmental protection with a beneficiary, the Institute of Fruit Growing in Plovdiv with a budget of 239,772 euros
- Increasing the national capacity to provide radiation protection to patients undergoing high-dose medical exposure procedures. The beneficiary of the project is UMHAT "Alexandrovska" with a budget of 343,290 euros.

INIS National Center

The IAEA International Nuclear Information System (INIS) maintains the world's most complete collection of published documents in the field of nuclear science and technology since 1970. Bulgaria is among the founding members of INIS, as the BNRA supports the national INIS center for Bulgaria.

The Center collects, prepares and sends the processed data from Bulgaria to the INIS Secretariat in the IAEA for further processing and inclusion in the INIS Repository. As of December 31, 2021, the repository contains over 4.3 million bibliographic records, incl. 13,777 documents received from Bulgaria, 3,316 of which are in full text.

In 2021, the regular meeting of the INIS member states was held, with the participation of the Bulgarian liaison officer. The activity for the period 2019 - 2021 was reported at the meeting and the main guidelines for the activity of INIS for 2022 - 2023 were adopted.

At the initiative and with the assistance of the Bulgarian INIS Center, the interface of the INIS repository is now available in Bulgarian. The Bulgarian translation of the instructions for use and search in the repository is forthcoming, which will undoubtedly be another convenience for the users from Bulgaria.

Detailed information on the INIS system and the services provided by the National Center is also available to users through the BNRA website.

Access to documents in the INIS repository is free and unrestricted via the Internet at: https://www.iaea.org/inis

Interaction with the structures of the European Union

The BNRA continued to successfully fulfill its commitments in the framework of the interaction with the European Commission, other European institutions and the working groups under the Euratom Treaty in the exchange of information and formulation of Bulgarian positions on various topics of national interest.

The National Report of the Republic of Bulgaria prepared by the Agency for implementation of the requirements of Directive 2011/70 / EURATOM for the establishment of a Community framework for responsible and safe management of spent fuel and radioactive waste was submitted on time.

European Nuclear Safety Regulators Group – ENSREG

The BNRA was an active partner in the European Nuclear Safety Regulators Group – ENSREG

Last year, the BNRA Chairman participated in the 42nd / March /, 43rd / July / and 44th / November / plenary sessions of ENSREG, held in virtual format.

As a member of the ENSREG Board for Stress Tests in Third Countries, the BNRA Chairman contributed to the successful conduct of the peer review in Belarus and to the organization of the upcoming similar review in Turkey. The purpose of the inspections is to oversee the reviews of "stress tests" carried out at nuclear power plants in non-EU countries for compliance with the methodology and standard practices of ENSREG, as well as national action plans to implement the recommendations of these tests. A representative of the BNRA was part of the peer review team in Belarus.

The updated National Plan for Post-Fukushima Stress Tests and the updated National Action Plan for Topical Peer Review I “Ageing Management” were presented to ENSREG within the set deadlines. The Agency was also an active participant in the activities for the preparation of Topical Peer Review II "Fire Protection".

EU Nuclear Safety Cooperation Instrument 2014-2020

During the year, the BNRA continued its participation as a partner with its experts in several projects funded by the EU Instrument for Nuclear Safety Cooperation 2014-2020.

Under the project "Support to the Regulatory Authority of Turkey" in October and November 2021, two consecutive trainings of 8 Turkish specialists from the Turkish nuclear regulator in the field of integrated management system and inspections of WWER nuclear facilities were held

The implementation of the project "Support and assistance to strengthen the capabilities of the Belarusian Nuclear Regulatory Authority" continued with the participation of BNRA experts. The commitments of the BNRA specialists under the project "Strengthening the State Nuclear Regulatory Inspectorate of Ukraine (CSNRIU) capabilities relevant for regulation of nu8clear activities and in licensing and severe accident management of nuclear installations" were completed.

West European Nuclear Regulators Association - WENRA

The BNRA Chairman participated virtually in the spring and autumn sessions of WENRA.

The Agency was actively involved in the work of the Reactor Harmonization Working Group at WENRA, which held 3 meetings during the year. The BNRA was designated to host the meeting of the Working Group in the autumn of 2021, but due to the pandemic situation, the event was held in a virtual format.

A representative of the Agency also participated in the virtual meetings of the Working Group on Waste and Decommissioning.

Heads of European Radiological Protection Competent Authorities (HERCA)

In 2021, the annual meeting of the Board of Heads of HERCA was held, a member of which is a representative of the BNRA.

Forum of WWER regulators

Representatives of the BNRA, led by the Chairman of the Agency, took part in the 27th annual meeting of the regulatory authorities of the countries operating WWER reactors, from November 30 to December 2, 2021, organized by the Hungarian Atomic Energy Agency and held in virtual format.

At the meeting, the heads of the regulatory bodies of 14 countries made presentations on the current state of nuclear energy in their countries and discussed a number of topics related to the operation of WWER technologies.

Nuclear Energy Agency (NEA) to the Organization for Economic Cooperation and Development (OECD).

Bulgaria was elected as a full member of the Nuclear Energy Agency on January 1, 2021.

The BNRA represents our country in the following working bodies of the NEA: Committee on Nuclear Regulatory Activities, Nuclear Law Committee, Regulators Forum and the Working Groups on Safety Culture, Inspection Practices and Regulation of New Reactors. A representative of the Agency has also been appointed as a contact person in the NEA Data Bank.

During the first year of membership, the representatives of the BNRA actively participated in all meetings of the working bodies of the NEA, which due to the pandemic situation were held in virtual format.

The representatives of the BNRA also participated in the activities of the permanent Interdepartmental Coordination Mechanism for the Accession of the Republic of Bulgaria to the Organization for Economic Cooperation and Development (OECD).

Cooperation with the Joint Institute for Nuclear Research

In 2021, Bulgaria's participation in the research activities carried out at the Joint Institute for Nuclear Research (JINR) was expected to be carried out according to the approved Thematic Plan, but due to the spread of COVID-19 most of the planned short-term and long-term business trips and some scientific events and initiatives were postponed for next year.

Despite the complicated situation with the spread of coronavirus infection, the BNRA, whose Chairman, Mr. Tsanko Bachiyski is the Plenipotentiary Representative of Bulgaria at the Institute, managed to implement several major initiatives dedicated to the 65th anniversary of JINR and the Year of Bulgaria at the Institute for such that was declared the year 2021. In September, the first part of the events dedicated to the two important dates took place, namely the opening of the JINR Information Center at the Faculty of Physics of Sofia University "St. Kliment Ohridski", publication of a special edition "65 years of Bulgaria in JINR", holding a Scientific Session dedicated to the Bulgarian contribution to the work of the Institute, as well as organizing a "green initiative" in the South Park in Sofia.

The JINR Information Center aims to present opportunities for training and development in the field of natural sciences, up-to-date information on research, major projects and laboratories at the Institute, as well as to organize and conduct scientific and educational events to promote achievements, prospects and the challenges in the field of physics.

During the official opening of the center, an Agreement on Cooperation in Research and Training of Scientific Staff was signed between JINR and Sofia University.

The main event in 2021 in the framework of our cooperation with JINR was the hosting of the session of the Committee of Plenipotentiaries (CPC) of the Governments of the JINR member states and the meeting of the JINR Finance Committee (FC). The two events took place in Bansko and Sofia in mid-November. The solemn finale of the event was the final session of the CPC, held on November 23, at which the President of Bulgaria Mr. Rumen Radev was the guest of honor. The Sofia Declaration on the Value of International Integration in Science and Technology was adopted at the event. In the Declaration, the Member States agree that they will strengthen the further development of JINR as an international intergovernmental scientific organization, disseminate and exchange JINR's experience in organizing multilateral research that ensures a high level and competitiveness of scientific results and integration with the world science.

As part of the celebrations of the Year of Bulgaria at JINR, a Bulgarian film crew visited Dubna, which prepared and broadcast interviews and information about the institute in specialized electronic media and social platforms aimed at young audiences.

Representatives of the BNRA and the Ministry of Education and Science (MES) also participated in meetings of the JINR CPC and FC, held in March in a virtual format.

Last year, 2 seminars on "JINR Expertise for Member States and Partner Countries" were held, which were attended by representatives of the BNRA, as well as deans and senior representatives of some of the Bulgarian scientific institutions, BAS and MES.

In 2021 the BNRA also organized 3 virtual meetings of the Expert Commission of the Plenipotentiary Representative of Bulgaria for Cooperation with JINR, which includes representatives of the institutes of BAS, Bulgarian universities and the Ministry of Education and Science.

ANNEX 1

List of operational events reported at the NRA in nuclear facilities in 2021.

№	Date	Site	Description	INES
1	22.01	Unit 5	Activation of the reactor scram of Unit 5	0
2	25.05	Unit 6	Reduction of power up to 50% of the nominal power of unit 6	0
3	17.08	Unit 5	Failure of valves in routine second channel routine safety tests of Unit 5	0
4	11.09	unit 5	Reduction of the power of unit 5 to 45% of the nominal	0
5	30.10	unit 6	Activation of the reactor scram of Unit 6	0

ANNEX 2

Inspections of nuclear facilities in 2021

№	Objective	Period	Subject of the inspection
1.	Kozloduy NPP	12 – 14.04.2021	Verification of the sites declared under the Additional Protocol - compliance of the declared data with the actual situation
2.	Kozloduy NPP	13 – 16.04.2021	Control over the transport of spent nuclear fuel
3.	SD NRRAW	21 – 23.04.2021	Project management for the construction of the NRRAW
4.	INRNE-BAS	23.04.2021	Application of Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons - together with the IAEA and EC inspectors
5.	Kozloduy NPP	22 – 26.05.2021	Preparedness of unit 5 for startup and operation after planned annual outage
6.	SD RAW-Kozloduy	02 – 04.06.2021	Emergency planning and response
7.	SD RAW-Kozloduy	07 – 09.06.2021	Planning of RAW management activities in the period of modernization of SD RAW - Kozloduy
8.	Kozloduy NPP	15 – 18.06.2021	Control over the transport of spent nuclear fuel
9.	SD "PRRAW-Novi Han"	25.06.2021	Ensuring the physical protection of SD "PRRAW-Novi Han"
10.	Kozloduy NPP	24 – 26.08.2021	Implementation of corrective measures from operational events related to the human factor
11.	Kozloduy NPP	30.08 – 01.09.2021	Management of organizational changes in Kozloduy NPP Plc
12.	Kozloduy NPP	30.08 – 01.09.2021	Preparedness of the Kozloduy NPP for renewal of the license for specialized training and issuance of certificates for legal capacity for activities in the NF and with SIR
13.	Kozloduy NPP	28 – 30.09.2021	Emergency preparedness and response
14.	Kozloduy NPP	30.09 – 01.10.2021	Application of Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons - together with the IAEA and EC inspectors
15.	Kozloduy NPP	12 – 14.10.2021	Spent fuel management
16.	SD "Decommissioning Units 1 - 4"	25 – 27.10.2021	Organization of dismantling activities in the controlled area of Units 1 - 4. Fulfillment of the conditions of the authorization series MO, reg. № 5021, 5146 and 5182
17.	Kozloduy NPP	25 – 27.10.2021	Application of Safeguards under the Treaty on the Non-Proliferation of Nuclear Weapons - together with the IAEA and EC inspectors (Unit 6, SFSF, DSFSF)
18.	Kozloduy NPP	26 – 30.10.2021	Preparedness of unit 6 for startup and operation after planned annual repairs
19.	Kozloduy NPP	03.11.2021	Control of transportation of fresh nuclear fuel

№	Objective	Period	Subject of the inspection
20.	SD "Decommissioning Units 1 - 4"	08 – 12.11.2021	Fulfillment of the conditions for authorization for commissioning of a plasma incineration plant
21.	Kozloduy NPP	08 – 11.11.2021	Radiation protection of occupationally exposed persons and members from the population during the operation of Kozloduy NPP
22.	SD "PRRAW-Novi Han"	09 – 10.12.2021	Implementation of a program for management of radioactive waste from nuclear applications
23.	Kozloduy NPP	13 – 17.12.2021	Fulfillment of the conditions of the licenses for operation of units 5 and 6 - scope, form and content of the submitted information
24.	Kozloduy NPP	13 – 17.12.2021 г.	Implementation of measures related to maintaining and improving safety
25.	Kozloduy NPP	13 – 15.12.2021	Measures to ensure fire protection
26.	Kozloduy NPP	15 – 17.12.2021	Localization safety systems

ABBREVIATIONS

NPP	Nuclear Power Plant
UNAP	Updated National Action Plan
NEA	Nuclear Energy Agency
NRA	Nuclear Regulatory Agency
BAS	Bulgarian Academy of Sciences
SFP	Spent Fuel Pool
PSA	Probabilistic Safety Analysis
WWER	Water-Water Energy Reactor
NA	Naval Academy
MMA	Military Medical Academy
NA	Naval Academy
WCR	Water Chemistry Regime
GD FSCP	General Department on Fire Safety and Civil Protection
SANS	State Agency for National Security
NPT	Non-Proliferation Treaty
SE RAW	State Enterprise Radioactive Waste
EC	European Commission
EU	European Union
ASUNE	Act on the Safe Use of Nuclear Energy
CSA	Civil Servants Act
EEA	Executive Environment Agency
SIR	Sources of Ionizing Radiation
IRT-2000	Research Reactor at INRNE- BAS
IPA	Institute of Public Administration
INRNE	Institute for Nuclear Researches and Nuclear Energy
SSC	Structures, Systems, and Components
CCI	Complex Chemical indicator
CNS	Convention on Nuclear Safety
IAEA	International Atomic Energy Agency
MDHAT	Multidisciplinary Hospital for Active Treatment
MI	Ministry of Interior
MH	Ministry of Health
MEW	Ministry of Environment and Water
CM	Council of Ministers
NEC	National Electricity Company

NRSIR	National Register of SIR
NCRRP	National Centre of Radiobiology and Radiation Protection
NRRAW	National Repository for RAW
JINR	Joint Institute for Nuclear Research- Dubna
PAO	Planned Annual Outage
PRRAW	Permanent Repository for RAW
TPR	Topical Peer Review
SNF	Spent Nuclear Fuel
SD RAW	Specialized Division RAW
CI	Chemical Index
DSFSF	Dry Spent Fuel Storage Facility
SFSF	Spent Fuel Storage Facility
PIP	Plasma Incineration Plant
SS	Safety Systems
NF	Nuclear Fuel
ALARA	As Low As Reasonably Achievable
ENSREG	European Nuclear Safety Regulators Group
INES	International Nuclear Event Scale
INIS	International Nuclear Information System
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators' Association

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