



Clean Energy

ANNUAL
REPORT

19



APPRECIATING THE ACHIEVEMENTS, WE LOOK AHEAD

In 2019, our team endeavours marked outstanding professional achievements that confirmed the role of Kozloduy NPP of a major electricity producer and reliable supplier of over a third of the national energy mix.

The production programme implementation set a record: while adhering to all applicable safety requirements, Units 5 and 6 generated the largest annual amount of electricity throughout their operational history. This resulted in a record amount of revenues for the Company; excellent financial indicators were reported; the financial stability and the maintenance of high safety level and operational reliability were ensured.

A milestone in 2019 is the renewal of the licence for operation of Unit 6 for another 10-year period. Thus, and after completion of the lifetime extension project for Unit 5 with a licence renewal obtained in 2017, Kozloduy NPP embarks with confidence upon the long-term operation of its nuclear facilities and sets the beginning of a new stage in the development of Bulgarian nuclear energy. The successful completion of the plant life extension project – ranking among the largest, national energy projects, guarantees the security of power supplies in the next decades.

We are truly proud of having recorded these achievements in this very year – 2019 when we celebrated the 45th anniversary of the official opening of the nuclear power plant. Over the entire operating period, thanks to the dedication, commitment and professional skills of the nuclear power engineers, over 634 million MWh of electricity have been produced while saving millions of tons of greenhouse gas emissions.

Today, we are delighted that our programmes focused on support of training and career orientation help a growing number of young people to choose Kozloduy NPP for their professional realisation and development. They are the next generation that, drawing upon a solid foundation of accumulated knowledge, experience and traditions, will continue to build the future of Bulgarian nuclear energy and attain new heights.

Nasko Mihov
Chief Executive Officer



ENERGY FOR THE PEOPLE

OPERATIONAL STATES

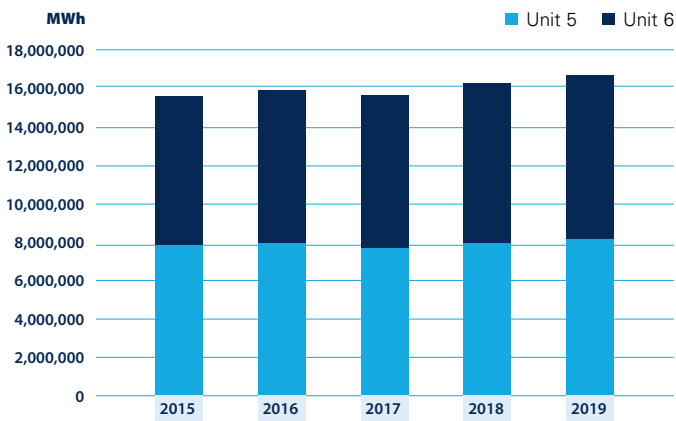
The gross electricity generated in 2019 by Kozloduy NPP EAD reached a record amount for the entire period of operation of Units 5 and 6 – 16,555,288 MWh, which provided 37.5% of the national electricity generation for the year. The conditions ensured for safe, reliable and efficient operation resulted in the nuclear power units running with optimal load, minimal unplanned downtime and without events affecting safety or the environment.

GENERATION AND SALES

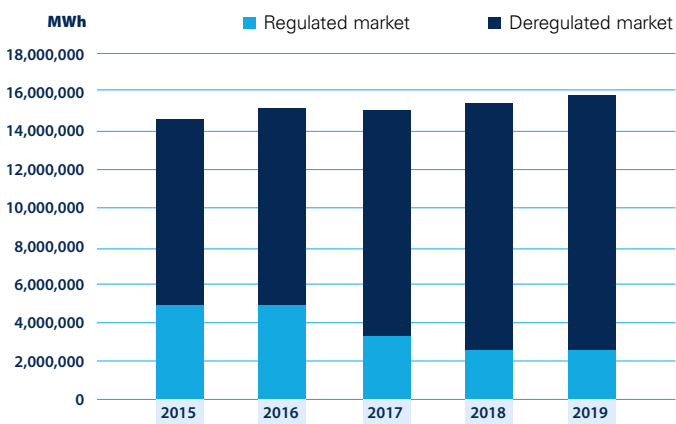
Since July 1974, when the first nuclear power unit was commissioned, until the end of 2019, Kozloduy NPP has generated 634,064,410 MWh of electricity in total, strictly conforming to all the safety requirements governing the operation of the nuclear facilities, and with no adverse impact on the environment.

Since the start of operation of Unit 5 (in 1987) and Unit 6 (in 1991) until the end of 2019, the two units have produced 186,479,971 MWh and 176,588,482 MWh of electricity, respectively.

GROSS ELECTRICITY PRODUCTION



ELECTRICITY SOLD BY KOZLODUY NPP ON THE MARKET SEGMENTS

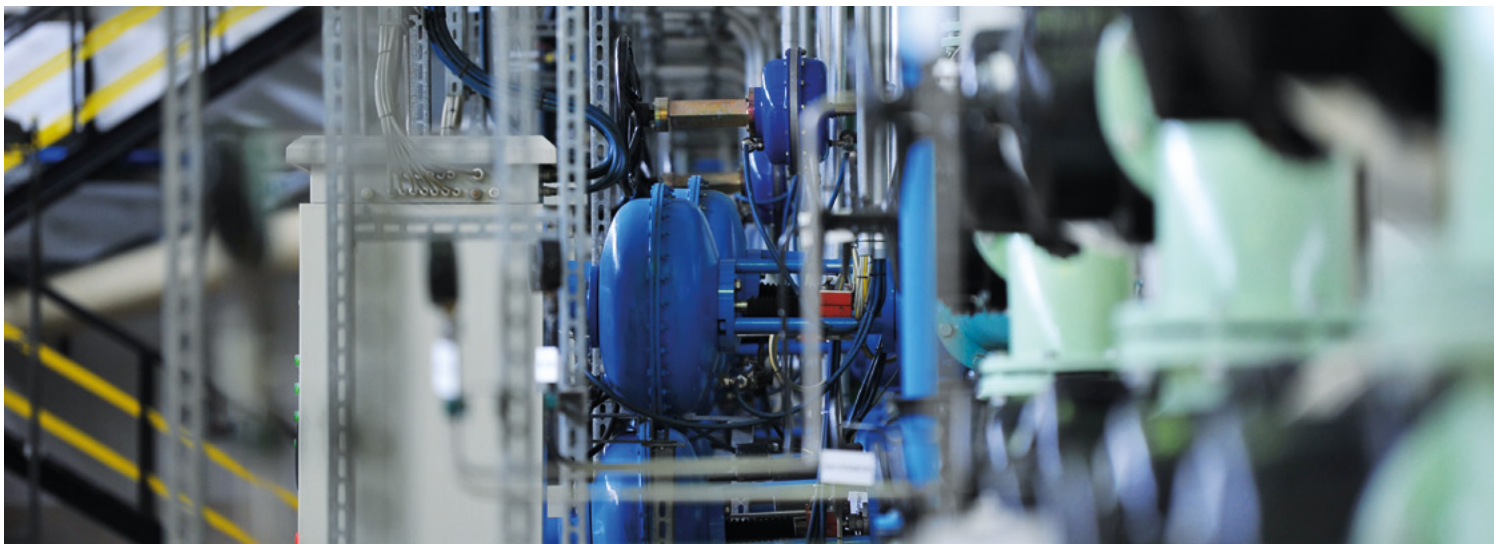


WITH THE GENERATED AMOUNT OF 16,555,288 MWh OF ELECTRICITY IN 2019, KOZLODUY NPP REPORTS THE HIGHEST ANNUAL PRODUCTION ACHIEVEMENT OF UNITS 5 AND 6 SO FAR.

The net active electricity supplied to the national grid by Kozloduy NPP and sold in compliance with the current regulations amounted to 15,712,446 MWh.

In view of the Bulgarian electricity market expanding trend, in 2019, Kozloduy NPP sold 15.5% of its net electricity generated on the regulated market. The remaining portion was successfully traded on the free market, where the company has retained its leading role of a major and secure electricity supplier.

For the heating of on-site main and auxiliary facilities, and for heat supply to the town of Kozloduy, 79 GWh of heating energy reached the end consumers (domestic or other).



VALUES OF SPECIFIC PERFORMANCE INDICATORS OF KOZLODUY NPP IN 2019

Indicator

■ Unit 5 ■ Unit 6 ■ KNPP

LF – Load Factor, %

91.45%

92.01%

91.73%

UCF – Unit Capability Factor, %

88.74%

90.59%

89.68%

UCLF – Unit Capability Loss Factor, %

0.25%

0.35%

0.30%

SPECIFIC PERFORMANCE INDICATORS

Specific indicators evaluating the safe and reliable operation of the nuclear power units have been adopted and widely used by the World Association of Nuclear Operators (WANO) and the International Atomic Energy Agency (IAEA). They permit monitoring the nuclear energy trends, and serve to draw a comprehensive evaluation of the achieved reliability and safety levels.

According to WANO criteria, UCF values exceeding 85% and UCLF up to 3% evidence a very good level of reliability and safety of nuclear power plants operation, and imply a high efficiency of the electricity generation process.

The excellent values of Kozloduy NPP performance indicators form a steady trend of high reliability and safety, with which the plant retains its position among the well-performing nuclear power plants in the world.

Throughout the year, no unplanned actuation of the reactor protection systems occurred, while the unplanned events registered (such as turbine generator trip, deviation from set power values) entailed minimum duration and underproduction.



THE EXCELLENT VALUES OF KOZLODUY NPP PERFORMANCE INDICATORS FORM A LASTING TREND TOWARDS HIGH RELIABILITY AND SAFETY LEVEL.





MAINTENANCE PROGRAMME

The annual maintenance programme of Kozloduy NPP comprises the necessary scope of preventive maintenance and repairs, functional tests and inspections, specialised inspections, diagnostics and non-destructive testing of structures, systems and components of the safety systems, systems important to safety, and the systems important to the production process.

To ensure the long-term operational capability of the nuclear installations and the common plant facilities, all the activities at the plant are carried out in compliance with the licensing obligations, the technological specifications requirements for safe operation, and plant-related requirements.

The main scope of the annual maintenance programme is performed while the units are shutdown for outage and refuelling. The efficient organisation of activities and good coordination of the workers teams permits the completion of the annually scheduled maintenance, repairs and modernisations within optimum timeframes. The 2019 outage of Unit 5 lasted 40 days – a period during which the turbine generator high pressure cylinder was rehabilitated. The Unit 6 outage lasted 32 days – a record short time in the operational history of both units.

Throughout the outages on the two units, in parallel with the necessary maintenance activities, a number of measures were completed in connection with the long-term operation of Units 5 and 6, safety enhancement, equipment lifetime management, and also measures to improve resilience against extreme external impacts.

The maintenance and upgrades planned for 2019 to ensure the safe, reliable and long-term operation of the facilities were performed up to the required quality and scope, and funded with own funds of the plant.



THE QUALITY PERFORMANCE OF THE SCHEDULED ANNUAL MAINTENANCE ACTIVITIES ENSURES THE OPERABILITY OF THE NUCLEAR FACILITIES IN THE LONG-TERM.



SAFETY FIRST



SAFETY IS A TOP PRIORITY AND A DOMINANT CORPORATE VALUE IN KOZLODUY NPP.

LICENSING REGIME

Kozloduy NPP EAD operates two nuclear power units - Units 5 and 6 with WWER-1000 reactors, and two storage facilities for spent nuclear fuel - a spent fuel storage facility with underwater storage technology, and a dry spent fuel storage facility.

The operation of nuclear facilities is subject to regulatory control on behalf of the Bulgarian Nuclear Regulatory Agency (NRA) at the Council of Ministers of the Republic of Bulgaria. Specialised oversight is exercised by the Ministry of Environment and Water, Ministry of Health, Ministry of Regional Development and Public Works, State Agency for Metrology and Technical Surveillance, and other government authorities.

The nuclear installations are operated according to the provisions of the operating licences issued by the NRA. The Company maintains licences to use ionising radiation sources, licences for transport of radioactive substances and licences to conduct specialised training.

In September 2019, the NRA renewed the licence for operation of Unit 6 with a validity for the maximum statutory time limit of ten years. The licence renewal application was submitted to the NRA in September 2018 together with a package of documents containing the results from the conducted periodic safety review of the power unit. The application documentation included also the project deliverables concerning Unit 6 plant life extension – results from safety analyses, calculations and quantitative assessment of the residual life of equipment, the measures and activities envisaged for performance during the long-term operation of the unit. The results from assessments and external examinations of the documents related to Unit 6 lifetime extension confirmed compliance with the applicable safety requirements and fulfilment of the main criteria for renewal of the operating licence.

In pursuance of the permitting regime for modifying structures, systems and components important to the safety of nuclear facilities as defined by the Safe Use of Nuclear Energy Act, 40 applications were submitted in 2019 seeking authorisation for implementing of engineering solutions on Units 5 and 6 and the spent fuel storage facility; a total of 37 permits were issued for introducing of modifications.

SAFETY CULTURE

Safety culture sustaining and enhancing is achieved through systematic and long-term actions that include periodic assessment, planning of enhancement measures, active involvement of all employees in these actions and fostering an attitude of personal responsibility. Special emphasis is placed on the development of a system of values, personal example of the leaders and contribution of each team member. These activities are coordinated by the Safety Culture Committee – an advisory body to the Safety and Quality Director, while their progress is reported both to the Kozloduy NPP management and the Nuclear Regulatory Agency.

Self-assessments are periodically conducted at the nuclear power plant. They form part of the tools for continuous safety improvement. In 2019, a combined self-assessment of both nuclear safety culture and security culture was conducted using the International Atomic Energy Agency methodology, compliant with the provisions of relevant international and national documents. The analysis of the self-assessment data highlighted positive aspects of the work process and enabled the identification of activities where continuing efforts can be put to produce even higher results. Based on these results a programme was drawn up to strengthen safety culture and security culture.

NUCLEAR SAFETY

The operation of Kozloduy NPP nuclear power units fulfils the conditions of the licences issued by the NRA, the requirements of the technical specifications and the operating instructions.

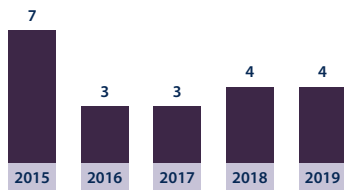


KOZLODUY NPP
NUCLEAR FACILITIES
ARE OPERATED IN
COMPLIANCE WITH
THE REGULATORY
REQUIREMENTS.





OPERATIONAL EVENTS AT KOZLODUY NPP FROM 2015 TO 2019



IN 2019, THERE WERE
NO BREACHES OF
THE OPERATIONAL
LIMITS AND
CONDITIONS FOR
SAFE OPERATION.

In 2019, no breaches occurred of the operational limits and conditions for safe operation. Four operating events were registered and reported to the NRA. All of them were rated level 0 as per the INES scale (events without safety significance). Based on the causes identified during the analyses, corrective measures were defined in order to avoid recurrence.

Monthly functional tests of the safety systems confirmed compliance of the test results with the technical specifications of the power units.

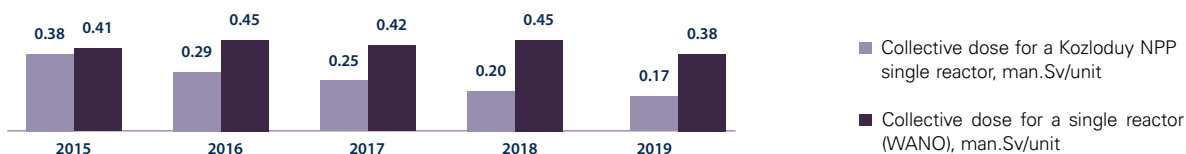
There were no reactor scrams at Units 5 or 6 during the reporting year.

RADIATION PROTECTION

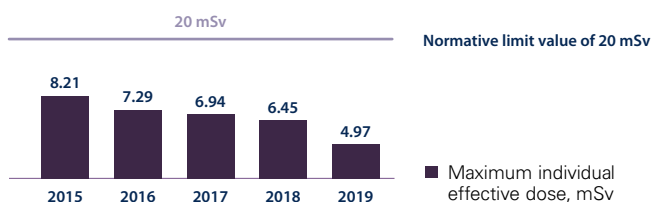
To ensure continuous enhancement of radiation protection effectiveness, Kozloduy NPP systematically implements the ALARA principle (as low as reasonably achievable). At the core of this principle lie adequate planning and preparation in advance of the annual outage activities, reliable and effective radiation monitoring, analysis of completed activities, staff training and motivation, use of good practices from plant own and international operating experience.

The annual values for individual and collective radiation exposure in 2019 match the best scores achieved across the world. The maximum individual dose in the last year was 4.97 mSv which constitutes 24.9% of the normative annual occupational exposure limit, and is lower than the previous year. The collective dose exposure of plant personnel in 2019 was also lower than in the last five years. In 2019, the total collective dose determined for the two WWER-1000 reactors of Units 5 and 6 was 0.33 man.Sv, or 0.17 man.Sv on average per each reactor. Data from the 2019 annual WANO – Moscow Centre report show that the median collective dose received during the operation of a WWER type of reactor was estimated at 0.38 man.Sv/unit. For another successive year, the trend for the average value of the collective dose for a Kozloduy NPP single reactor to be lower than the WANO indicator stayed unchanged.

COLLECTIVE DOSE FOR A SINGLE REACTOR OF KOZLODUY NPP COMPARED TO THE WANO INDICATOR, man.Sv/unit



MAXIMUM INDIVIDUAL EFFECTIVE DOSE IN THE CONTROLLED AREA OF KOZLODUY NPP, mSv



RADIATION MONITORING OF EFFLUENT DISCHARGES TO THE ENVIRONMENT

The strict high quality control over the technological processes in Kozloduy NPP is clearly confirmed by the results from the liquid and gaseous discharges radiation monitoring that is carried out in compliance with the highest international standards. The low values, maintained for years, are achieved through a number of measures such as ensuring the necessary good operational condition of the technological systems, strict compliance with the programmes when shutting down the units for scheduled annual outages, ensuring special water chemistry when opening the reactors for maintenance activities, etc.

At institutional level, discharges to the environment are monitored by the Nuclear Regulatory Agency, the Ministry of Environment and Water, and the National Centre of Radiobiology and Radiation Protection. In addition, Kozloduy NPP has specified reference levels for discharge activities which are significantly lower than the admissible limits. The information is reported to the European Commission on an annual basis.

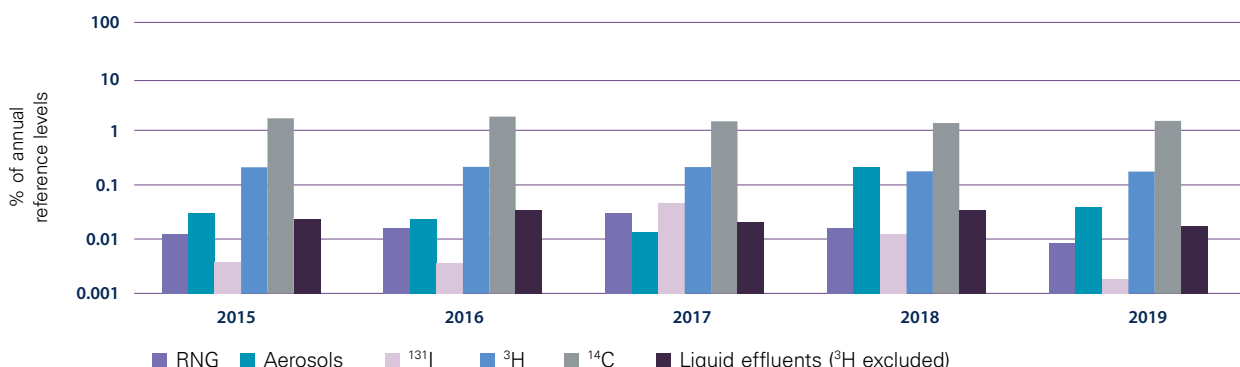
In 2019, the radioactive noble gases (RNG) emissions and radioactive aerosols remained significantly below the established limits – 0.01% and 0.02% of the reference levels, respectively. The emission of iodine-131 (^{131}I) was 0.001% the reference level.

The tritium levels (^3H) in the exhaust air formed about 0.2% of the reference limit. The results for liquid effluents were also multiple times lower than the reference levels – 0.11% of the reference limits for secondary circuit liquid effluents.

“ ALL THE TECHNOLOGICAL PROCESSES ARE SUBJECT TO STRICT CONTROL. ”



TOTAL ACTIVITY OF AIRBORNE (RNG, AEROSOLS, ¹³¹I, ³H, ¹⁴C) AND LIQUID EFFLUENT DISCHARGES, IN % OF THE REFERENCE ANNUAL LIMITS FOR THE PLANT.



RADIOACTIVE WASTE MANAGEMENT

The radioactive wastes (RAW) generated from the operation of the nuclear power plant did not exceed the quantities considered in the design. Evacuating the interim solid RAW storage facilities, in Auxiliary Building-3 (EP - 2), is in progress. All the RAW generated by Kozloduy NPP in 2019 have been transferred for processing to the State Enterprise “Radioactive Waste” (SE RAW) as per the adopted approach for transmitting the RAW arising from current production activities as well as the staged disposal of legacy radioactive wastes.

SPENT NUCLEAR FUEL MANAGEMENT

The spent nuclear fuel of Kozloduy NPP is stored in strict compliance with all applicable safety requirements. After being kept in spent fuel pools located at the reactors, the fuel is transferred for underwater storage in the dedicated wet spent fuel storage facility (WSFSF) which is common for all the units. The dry spent fuel storage facility (DSFSF) stores spent nuclear fuel from Units 1, 2, 3, and 4 after their being loaded in Constor 440/84 casks in the WSFSF.

During the annual outage on Unit 6, three shipments of spent fuel assemblies were performed from Unit 6 spent fuel pool to the WSFSF. No spent fuel assemblies were moved from Unit 5 spent fuel pool to the WSFSF. Two casks loaded with WWER-440 spent fuel assemblies were transported from WSFSF to the DSFSF.

In 2019, a total of 11 inspections were carried out of the spent nuclear fuel on behalf of the Nuclear Regulatory Agency, the International Atomic Energy Agency and the European Commission.

EMERGENCY PLANNING AND PREPAREDNESS



EMERGENCY DRILLS AND EXERCISES OF THE EMERGENCY RESPONSE TEAMS ARE REGULARLY CONDUCTED AT THE NUCLEAR POWER PLANT.

To sustain the high level of emergency preparedness of the response team at Kozloduy NPP, appropriate exercises, drills and training are planned and conducted annually.

In 2019, training on this subject was provided to employees of the plant, as well as SE RAW, Kozloduy NPP Regional Police Department, and Kozloduy NPP Fire Safety and Civil Protection Regional Service.

A number of emergency response drills were conducted on a variety of topics; two of them were performed jointly with the NRA emergency response teams, and another two with the SE RAW emergency response teams. Emergency preparedness training was delivered to school students in the Mizia municipality (located close to Kozloduy).

At the end of last year, Kozloduy NPP participated in the “Protection 2019” National Full-scale Exercise. The analysis made after the exercise confirmed the existence of good interaction among the plant organisational units of the Unified Rescue System, preparedness for strict adherence to the response procedures and adequate preparation for immediate and timely notification, analysing, assessment, and control of emergencies. The “Protection 2019” developments were tracked by inspectors and observers from the Ministry of Interior, Directorate General for Fire Safety and Civil Protection, Moscow Regional Crisis Centre of the World Association of Nuclear Operators, and the Embassy of Japan in Bulgaria.





PHYSICAL PROTECTION

The Kozloduy NPP concept of security – an important factor for the reliable operation of nuclear facilities, has been developed in compliance with all national and international requirements for effectiveness against potential threats.

The established modern system of physical protection has the aim of effectively preventing undue impacts and incorporates the necessary technical and organisational measures. The security systems undergo systematic upgrading and additional measures are undertaken if deemed necessary.

With a focus on prevention, in 2019, new rules were introduced for physical protection in the controlled access area surrounding Kozloduy NPP. The plant checkpoints modernisations planned for the year were finalised, and the access control regime was updated.

During the year, the activities intended for raising the nuclear safety culture awareness were carried as scheduled. The same applies to the planned specialised trainings and monthly drills of the employees engaged in ensuring the security of the nuclear power plant.

No violations of the Kozloduy NPP physical protection system were committed in 2019. The Bulgarian Nuclear Regulatory Agency and the Ministry of Interior confirmed the high level of the measures employed.

FIRE SAFETY

The fire safety of Kozloduy NPP is ensured in full compliance with relevant national and international requirements. This is achieved by the implementation of a set of technical and organisational measures, and the use of modern fire detection and fire suppression systems.

In order to ensure prevention, the necessary continuing training is performed per schedule for the operational staff and the designated officers directly involved in the control in the respective structural departments. Compliance with the fire safety rules and norms is systematically monitored, for the purpose of which over 600 inspections were carried out during the reporting year. Regarding fire safety, construction supervision is exercised throughout the implementation of projects of the Company's Investment Programme.



In 2019, no fires or ignitions occurred on the production facilities, while the control inspection on behalf of the Fire Safety and Public Protection Regional Directorate of Vratsa at the Ministry of Interior confirmed that the Company successfully adhered to the fire safety rules and norms.

RADIOECOLOGICAL MONITORING

The monitored area includes the plant industrial site of Kozloduy NPP, the 2-km precautionary action zone (PAZ), the Bulgarian section of the 30-km surveillance zone, and monitoring reference points within the 100-km radius of the Bulgarian territory surrounding the plant.

In 2019, more than 4,000 analyses of over 2,400 samples from different environmental areas and more than 1,200 gamma background measurements were performed. The obtained results fall within the range of background levels that are typical for this region. The registered values are multiple times below the admissible norms for the relevant indicators and assessed facilities, which confirms that the radiation conditions are unaffected by the operation of the nuclear power plant. Over the year, the gamma background levels at the on-site monitoring points and the measurement points within the 100-km zone were fully comparable with and did not deviate from the natural gamma background levels specific for the region.

To notify the public living in municipalities within the 30-km zone, there is an automated information system for radiological monitoring with a total of 14 local measuring stations installed in different populated areas. The data are displayed on information boards installed in public places, and are transmitted through wireless on-line connection to the central station at Kozloduy NPP, and thenceforth to the Executive Environment Agency. The background gamma radiation levels are typical for the natural background of the region.

In 2019, the atmospheric air human-induced activity had values close to the background ones ($2 \mu\text{Bq}/\text{m}^3$, on average) which is many times below the permissible limits. The radiation status of water from natural water bodies and of drinking water meets the health sanitary norms. No impact of the nuclear power plant was established on the radio-ecological status of soils in the area. The radioactivity of the staple foods produced in the region, such as milk, agricultural crops, etc., is within normal background radiation levels, much below the relevant permissible limits. The human-induced activity of fish in the Danube river, upstream and downstream from Kozloduy NPP site, is also examined. The results are consistent with the data from the period preceding the plant first start-up, which confirms the absence of adverse impact from Kozloduy NPP on the staple foods and ichthyofauna in the region. The environmental radiation parameters have remained stable, within normal limits, unaffected by the nuclear power plant operation.

The environmental radiological monitoring carried out by Kozloduy NPP fully complies with the national and European normative requirements in this field, and corresponds to the experience and good practice in the countries with developed nuclear energy. There is a full compliance with the requirements of Article 35 in the Euratom Treaty and Recommendation 2000/473/Euratom. The organisation and scope of monitoring includes main components which are significant for the protection of public health and environmental condition. The monitoring process employs accurate and practically recognised methods, high-tech equipment and adequately qualified personnel. The quality of the conducted analyses and measurements is ensured regularly by competency tests in the ALMERA network (of IAEA) and interlaboratory comparisons at national and international level.



THE GAMMA BACKGROUND VALUES IN THE AREA SURROUNDING KOZLODUY NPP REMAIN WITHIN THE NORMAL LIMITS FOR THE REGION.



RADIOECOLOGICAL MONITORING AT KOZLODUY NPP FULLY COMPLIES WITH NATIONAL AND EUROPEAN NORMATIVE REQUIREMENTS.



The results thereof are verified by independent studies of the national control and supervisory bodies - the National Centre of Radiobiology and Radiation Protection at the Ministry of Health, and the Executive Environment Agency at the Ministry of Environment and Water.

PUBLIC DOSE EXPOSURE EVALUATION

The maximum annual individual effective dose to the public in the supervised area, calculated as the total from gaseous and liquid discharges to the environment from Kozloduy NPP was conservatively calculated at 4.9 $\mu\text{Sv/a}$ for 2019, which is hundreds of times below the natural background exposure level in the country (2.33 mSv/a). This value is also about 30 times below the normative dose limit identified in the Regulation on Ensuring Safety of Nuclear Power Plants. In recent years, the values of the maximum annual individual effective dose for the public vary within the range of 4 – 7 $\mu\text{Sv/a}$. The results are comparable with those for the nuclear power plants both in the European Union, and worldwide.

The analytical process employed, verified and validated modelling codes for evaluation based on the CREAM methodology approved by the European Union, and the MODARIA platform of IAEA, both of which were adapted to the respective geographical and hydrological specificities of the Kozloduy NPP surrounding area. The results get verified through independent control on behalf of National Centre of Radiobiology and Radiation Protection, at the Ministry of Health, and compared with data of estimated doses to the public that are periodically published by the European Commission for the nuclear power plants of the EU member-states. The data are clearly consistent with those reported by other EU nuclear power plants.

ENSURING OCCUPATIONAL HEALTH AND SAFETY

Kozloduy NPP strictly adheres to all the requirements of the effective regulations on occupational health and safety in the Republic of Bulgaria, and the best international practices in this sphere.

The plant operates according to long-term industrial safety enhancement and risk evaluation programmes that have been harmonised with the national normative framework, the recommendations of the International Atomic Energy Agency, and relevant international practices. The programmes include all activities related to legal obligations and cover the protection and prevention of occupational hazards arising from work processes, work equipment and the working environment in all aspects of the nuclear power plant activities – operation, maintenance, repairs, etc.

Regarding health protection measures, priority is given to prevention and promoting of safety improvements at work. Workers periodically undergo training on safety at work, as well as the necessary briefings - pre-job, at the workplace, periodic, daily and extraordinary ones.

A scheduled approach is applied to organise laboratory measurements of working environment parameters and evaluation of their compliance with the normative requirements is performed.

The Occupational Health Service established at Kozloduy NPP has the objective to aid the employer in ensuring health and safety at work. The Service has a medical emergency team providing round-the-clock medical care, including urgent and emergency medical help, at the site of the nuclear power plant.

As a result of implementing comprehensive medical measures, in 2019 the industrial injury factor was 0.19. This value is significantly lower than the average for the industry – 1.11, and the average for the country – 0.65.

ENVIRONMENTAL PROTECTION

The motto of Kozloduy NPP – Clean Energy, clearly states the responsibility with which the biggest electricity producer in the country treats environmental protection. There is a periodic review of the non-radiation aspects of the environment associated with the activity of the nuclear power plant, and measures are implemented towards their management. The programme for the 2019 – 2021 period has its main objectives focused on preserving the purity of atmospheric air, rational and responsible use of water, safe management of waste, safe use of chemical substances, improving of energy efficiency, etc.

The Company has been issued all the necessary permits as required in the Environmental Preservation Act, the Act on Waters, and the Waste Management Act. The implementation of permits' provisions is monitored systematically. The results obtained are subject of analysis, while the information collected is distributed to the competent authorities.

In 2019, 2,188 tests were made to more than 600 samples from surface, underground and waste waters collected and analysed according to the Programme for in-plant monitoring of waters during the operation of Kozloduy NPP and Programme for monitoring of landfill for non-radioactive household and industrial waste. All the analyses were performed by accredited laboratories such as the Vratsa Regional Laboratory at the Executive Environment Agency, and the plant laboratories at the Engineering Chemistry Section, and the Radioecological Monitoring department. The data resulting from the mandatory plant-own radioecological monitoring confirmed the trend to full compliance with the specified individual emission limits. In 2019, 1,500 tons of waste subject to recycling were transferred for further utilisation. At the non-radioactive household and industrial waste facility of Kozloduy NPP an electronic weighbridge was commissioned for precise control of the incoming wastes. Throughout the year, six inspections were performed by the Vratsa Regional Inspectorate for Environment and Water, and by the Pleven Water Management Basin Directorate for the Danubian Region. They did not find any violations and issued no prescriptions.

During the year, the employees of the nuclear power plant once again confirmed their personal commitment to environmental protection by participating in a number of environmental initiatives, along with the increasing use of bicycles, separate waste collection and striving to reduce the personal carbon footprint.

EMISSIONS OF GREENHOUSE GASES SAVED IN 2019 BY KOZLODUY NPP COMPARED TO CONVENTIONAL THERMAL POWER PLANTS (IN THOUSAND TONS)

CO₂
19,553

SO₂
64

NO_x
14

Ash
1.7





LONG-TERM OPERATION

Successful completion of the activities as per the plant lifetime extension project for Kozloduy NPP Units 5 and 6 was achieved in 2019. The fact was celebrated on 1st October when the Bulgarian Nuclear Regulatory Agency officially handed over to Kozloduy NPP a 10-year licence for operation of Unit 6. The Unit 5 licence for 10-year operation was renewed in 2017. Ten years is the maximum term of licence validity as regulated by the national legislation, upon the expiry of which the plant shall apply for licence renewal.

The process of preparing the justifications for Units 5 and 6 operational lifetime extension in conformity with recognised international standards used in implementing lifetime extension projects included the completion of the required safety analyses and time-limited ageing analyses of the facilities related to the safe and reliable operation of the units. The results of the calculations confirm the absence of limitations to the safe operation of the units in the coming 30 years.

The plant lifetime extension project activities were conducted in parallel with a periodic safety review (PSR) which is a systematic re-assessment of all the safety factors of the nuclear facilities design and operation. Developing the PSR documents is a mandatory requirement for the licensing renewal preparations. The results of the periodic safety review confirm the safe operation of the units over the next licensing period as well as the high level of nuclear, radiation and technological safety corresponding to the level of the best nuclear power plants. The design and operational practice comply with the national legislation and international safety standards of the International Atomic Energy Agency and the Western European Nuclear Regulators Association (WENRA).



ON 1st OCTOBER, 2019, UNIT 6 OBTAINED A RENEWAL OF THE LICENCE FOR OPERATION FOR THE NEXT 10 YEARS.

Licence renewal comes as recognition for the high quality of a huge volume of complex activities performed within the Units 5 and 6 lifetime extension project, and the high professionalism and responsibility of the Kozloduy NPP team in the timely completion of this important project for the Bulgarian energy sector.

Over the years a lot of efforts have been focused on preparing and implementing of the measures scheduled for the long-term operation* period of the power units. Following the legal requirements, the necessary programmes have been developed for the long-term operation period, ensuring the safe and reliable operation of Units 5 and 6.

All the activities scheduled for 2019 were completed in full within the time specified.

COMPLETION OF ACTIVITIES RELATED TO UNIT 5 LONG-TERM OPERATION

In 2019, 14 measures were completed on Unit 5, such as recertification of the system for monitoring the reactor coolant system water chemistry; recertification of the primary circuit loose parts detection system; replacement of I&C test benches, small instrument lines of instrumentation and control sensors, cables and cable traces of equipment installed in the HELB environment area; rehabilitation of concrete in manholes for electrical trunking of diesel generator stations, etc.

COMPLETION OF ACTIVITIES RELATED TO UNIT 6 LONG-TERM OPERATION

In 2019, 6 measures were completed on Unit 6, such as replacement of control valves on the primary makeup system; recertification of the system monitoring the reactor coolant system water chemistry; recertification and lifetime assessment of the system limiting the thermal cyclic loading of the primary pipelines; replacement of indicator devices and light signalisation panels in the main control room, etc.



FOLOWING THE LEGAL REQUIREMENTS, THE NECESSARY PROGRAMMES HAVE BEEN DEVELOPED FOR THE LONG-TERM OPERATION PERIOD, ENSURING THE SAFE AND RELIABLE OPERATION OF UNITS 5 AND 6.

**Long-term operation is operation beyond an established timeframe set forth by the original design. The justification of the long-term operation is based on safety assessment with consideration given to ageing processes of structures, systems and components.*



FINANCIAL STABILITY AND SUSTAINABILITY

Kozloduy NPP EAD ended 2019 in a stable financial position, with excellent financial indicators. The record amount of produced electricity, the price trends on the electricity market, the increased collection of sales revenues, and the effective cost management were major contributors to these results. The Business and Financial Management Policy pursued in 2019 was focused on achieving economically efficient and competitive electricity generation while ensuring the highest level of safety, maintaining stability, and continually striving for improvement of the financial position.

In the reporting year, electricity sales ensured the maintenance of stable, rhythmic and sufficient revenues in annual terms, exceeding BGN 1.3 billion, which covered the necessary costs for the main activity and marked good levels of profitability. All current payables to the employees, budget, commercial contractors and other commitments were paid in a timely manner. The company funded of all the operating and investment activities entirely with its own financial resources.

In 2019, the plant reported a record total revenue of BGN 1,328 million, which exceeds that of the previous year by BGN 210 million. This growth results from the increased electrical power sales and higher electricity exchange prices.

The Company's operating costs in 2019 amounted to BGN 969 million. The difference compared to 2018 is negligible (3%).

Higher amount for contributions were paid to the Nuclear Facilities Decommissioning Fund (NFDF), Radioactive Waste Fund (RAWF) and Electricity System Security Fund (ESSF), as these are formed as a percentage of the electricity sales revenues. From the middle of 2019, a new regulatory obligation came into force, according to which the Company was charged BGN 17 million – costs of access price paid on the entire reported net production, including the energy regulated on a balancing market as surplus. Costs in the amount of BGN 40.8 million were billed as provision towards the obligation to transport spent nuclear fuel (SNF) from the WWER-1000 reactor for technological storage and processing, in connection with unperformed transport in 2019; thus, the company met its obligation as per the Management Strategy for Spent Nuclear Fuel and Radioactive Waste Management until 2030.

The Kozloduy NPP profit after taxes amounts to BGN 325 million compared to the profit of BGN 164 million, recognised for the year 2018.

Kozloduy NPP continues to pursue its effective policy of debt management. Regular payments went towards the loan taken in 2000, under the Modernisation Programme of Units 5 and 6, in accordance with the terms of the Loan Agreement with Euratom. In 2019, repayment instalments of principal and interest were paid in the amount of BGN 34 million. The third and fifth tranches of the Euratom loan were fully repaid. The nuclear power plant closed the year 2019 without any overdue payments.

Financing was provided of the Company's priority activities related to the safe operation of the nuclear facilities, increasing the production efficiency, implementation of the investment projects for Units 5 and 6 lifetime extension and their long-term operation in the coming 30 years. All due payments for securing the next fuel campaigns of Units 5 and 6, the obligatory insurance premiums, and payments to NFDF, RAWF, and ESSF, were effected in time. The commitments were fulfilled to the personnel and insurance institutions as well as the obligations under commercial contracts for the implementation of the maintenance and investment programmes. In 2019, BGN 529 million were paid to the state and municipal budgets. This included the contributions of BGN 137 million to the RAWF and NFDF, BGN 65 million to the ESSF, BGN 273 million for taxes and fees, and BGN 54 million for social security and health insurance payments.

As at 31.12.2019, Kozloduy NPP EAD ended with BGN 396 million cash liquidity, which exceeds by BGN 156 million the sum recognised in the end of 2018.

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IN 2019, KOZLODUY NPP CONTRIBUTED A TOTAL OF BGN 529 MILLION TO THE STATE BUDGET AND THE MUNICIPALITY BUDGET OF WHICH:

52% – TOWARDS TAXES AND FEES;
26% – PAYMENTS TO NFDF AND RAWF;
12% – PAYMENTS TO THE ESSF; AND
10% – PAYMENTS TO SOCIAL SECURITY AND HEALTH INSURANCE FUNDS.



The table below presents key indicators of the results from the company's activity and evaluation of the condition and performance of Kozloduy NPP in 2019 in comparison with the preceding year.

Indicators (BGN '000)		Statements 31.12.2019	Statements 31.12.2018	Change 2019/2018 (%)
c.1	c.2	c.3	c.4	c.5=(c.3/c.4)-1
1	Total operating income	1,327,799	1,117,840	18.78%
2	Total operating expense	-968,782	-939,828	3.08%
3	EBITDA ¹⁾	527,994	376,583	40.21%
4	EBIT ²⁾	359,017	178,012	101.68%
5	EBT ³⁾	360,906	181,032	99.36%
6	EBIT margin	27.04%	15.92%	69.85%
7	EBITDA margin	39.76%	33.69%	18.02%
8	Total assets	3,387,144	3,261,379	3.86%
9	Tangible fixed assets ⁴⁾	2,408,171	2,544,339	-5.35%
10	Working capital ⁵⁾	597,097	438,370	36.21%
11	Cash and cash equivalents	395,583	239,725	65.02%
12	Equity	2,681,323	2,611,209	2.69%
13	Return on equity ⁶⁾	13.46%	6.93%	94.23%
14	Return on assets ⁷⁾	10.66%	5.55%	92.07%

¹⁾ EBITDA – earnings before interest, taxes, depreciation and amortisation from continuing operations

²⁾ EBIT – earnings before interest and taxes from continuing activities

³⁾ EBT – earnings before taxes from continuing activities

⁴⁾ LTA – long-term tangible assets + expenses on LTA acquisition

⁵⁾ Working capital – current assets minus current liabilities

⁶⁾ Return on equity – EBT/Equity

⁷⁾ Return on assets – EBT/Total assets

SEPARATE STATEMENT OF FINANCIAL POSITION

	31 December 2019	31 December 2018
Assets	BGN '000	BGN '000
Non-current assets		
Property, plant, and equipment	2,408,171	2,544,339
Intangible assets	8,672	9,732
Investment property	4,120	4,100
Investments in subsidiaries	15,161	15,161
Loans granted to related parties	8,289	9,751
Receivables from related parties	-	7,529
Long-term trade and other receivables	3,818	3,261
Equity instruments at fair value through other comprehensive income (OCI)	457	466
Non-current assets	2,448,688	2,594,339
Current assets		
Nuclear fuel	303,607	213,962
Inventories	54,303	60,018
Trade and other receivables	70,624	43,192
Loans granted to related parties	2,374	2,334
Receivables from related parties	53,924	107,809
Income tax payments	764	-
Cash and cash equivalents	395,583	239,725
	881,179	667,040
Assets included in disposal groups classified as non-current assets, kept for distribution to owners	57,277	-
Current assets	938,456	667,040
Total assets	3,387,144	3,261,379

SEPARATE STATEMENT OF FINANCIAL POSITION

(continued)

	31 December 2019	31 December 2018
	BGN '000	BGN '000
Equity and liabilities		
Equity		
Share capital	244,585	244,585
Legal reserves	24,458	24,458
Revaluation reserve of non-financial assets	1,400,140	1,400,874
Reserve from remeasurements of defined benefit plans	(70,375)	(45,698)
Revaluation reserve of financial assets at fair value	203	211
Other reserves	676,667	826,667
Non-allocated profit	405,645	160,112
Total equity	2,681,323	2,611,209
Liabilities		
Non-current liabilities		
Loans	10,879	33,127
Deferred amounts under construction contracts	978	863
Financing	106,966	154,616
Payments under retirement obligations	84,707	50,665
Long-term trade and other liabilities	13,181	18,656
Deferred tax liabilities	147,751	163,573
Non-current liabilities	364,462	421,500
Current liabilities		
Trade and other payables	143,749	122,847
Related parties payables	5,424	1,589
Loans	22,833	33,890
Financing	4,340	4,435
Deferred amounts under construction contracts	3,210	4,971
Payments under retirement obligations	34,272	14,423
Provision for spent nuclear fuel, etc.	81,652	41,775
Income tax liabilities	-	4,740
	295,480	228,670
Liabilities included in disposal groups classified as non-current assets, held for distribution to owners	45,879	-
Current liabilities	341,359	228,670
Total liabilities	705,821	650,170
Total equity and liabilities	3,387,144	3,261,379

SEPARATE STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME FOR THE YEAR ENDED 31 DECEMBER

	2019	2018
	BGN '000	BGN '000
Revenue from sale of electricity	1,312,117	1,099,058
Revenue from thermal power sales	1,933	2,007
Revenue from sales of production	1,314,050	1,101,065
Income from financing	4,081	5,560
Other revenues and incomes	9,645	8,192
Gains from sale of non-current assets	3	3,017
Change in the fair value of investment properties	20	6
Cost of materials	(134,162)	(151,929)
Expenses on hired services	(134,489)	(131,497)
Costs for personnel	(234,521)	(211,892)
Provisions for post-employment benefit plans	(40,862)	(8,799)
Depreciation and amortisation costs, and revaluation of PPE	(168,977)	(198,571)
Provisions costs	(39,881)	(41,118)
Impairment costs/recovered impairment on financial assets (net)	477	(6,239)
Other costs	(210,138)	(187,177)
Cost of sold goods and other current assets	(670)	(555)
Changes in work in progress	(9,409)	(2,163)
Acquisition of self-constructed property, plant and equipment	3,850	112
Operating profit	359,017	178,012
Financial costs	(2,117)	(2,526)
Financial income	4,006	5,546
Profit before tax	360,906	181,032
Income tax expenses	(36,014)	(17,486)
Annual profit from continuing operations	324,892	163,546
Annual profit from discontinued operations	-	-
Profit for the year	324,892	163,546

SEPARATE STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME FOR THE YEAR ENDED 31 DECEMBER

(continued)

	2019	2018
	BGN '000	BGN '000
Other comprehensive income		
Items that will not be reclassified to profit or loss		
Remeasurement of defined benefit plans liabilities	(27,419)	(11,781)
Remeasurement of non-financial assets	-	18,969
Change in the fair value of financial instruments at fair value through other comprehensive income		
– losses for the current period	(9)	(59)
Income tax relating to items not reclassified into profit or loss	2,743	(713)
Other comprehensive income for the year, net of tax	(24,685)	6,416
Total comprehensive income for the year	300,207	169,962

SEPARATE CASH FLOW STATEMENT FOR THE YEAR ENDED 31 DECEMBER

	2019	2018
	BGN '000	BGN '000
Operating activities		
Proceeds from clients	1,558,261	1,305,614
Cash paid to suppliers	(339,827)	(297,655)
Payments to personnel and social security institutions	(242,092)	(208,289)
Cash paid for fees, commissions, etc.	(27)	(36)
Payments to the RAWF, NFDF, and ESSF funds	(202,330)	(168,138)
(Payments to)/receipts from income tax	(54,598)	(28,310)
Cash flows related to other tax and payments to the state budget	(185,840)	(162,987)
Cash flows related to insurance policies	(15,478)	(15,315)
Other cash flows from operating activities	(5,608)	33,193
Net cash flows from continuing operations	512,461	458,077
Net cash flows from operating activity	512,461	458,077
Investing activity		
Purchase of property, plant, and equipment	(94,865)	(85,091)
Proceeds from sale of property, plant, and equipment	4	3,227
Proceeds from loans	2,200	2,200
Interest received	308	364
Dividends received	869	991
Net cash flows from investing activity	(91,484)	(78,309)
Financing activity		
Repayments of borrowings	(33,005)	(38,872)
Leasing payments	(116)	-
Interest paid	(1,385)	(1,855)
Dividends paid	(230,056)	(276,613)
Net cash flows from financing activity	(264,562)	(317,340)
Net change in cash and cash equivalents	156,415	62,428
Cash and cash equivalents, beginning of year	239,725	178,211
Effect from expected credit losses under IFRS 9	(557)	(914)
Cash and cash equivalents at the year end	395,583	239,725



WE INVEST IN SAFETY AND RELIABILITY

The main priority of the Investment Programme of the company is the implementation of actions ensuing from the Act on the Safe Use of Nuclear Energy, the current operating licences of Units 5 and 6, measures listed in the Plant Lifetime Extension Programme for both units, maintaining and continuous enhancement of the level of safety and security of Kozloduy NPP. The implementation of the above results in ensuring nuclear safety, radiation protection and environmental protection throughout the period of the nuclear facilities operation and radioactive waste management at the nuclear power plant, in compliance with the requirements of the applicable regulatory norms.

The total amount spent as per the Investment Programme in 2019 is BGN 79,617 thousand, originating from own funds.

Over 78% of the recognised investment costs went towards measures related to the safety, reliability and efficiency of operation of Units 5 and 6. The rest of the investment expenses were for the measures from the energy efficiency programme, modernisation and safety improvement of the spent fuel storage facility and rehabilitation of the switchyard buildings and areas, measures enhancing the plant security and physical protection, and other auxiliary plant facilities and infrastructure.



SUCCESSFUL
IMPLEMENTATION
OF THE INVESTMENT
PROGRAMME
PROJECTS
CONTRIBUTES
TOWARDS THE
SUSTAINABLE
DEVELOPMENT OF
KOZLODUY NPP.

“

THE MAIN PORTION OF THE INVESTMENT COSTS WENT TOWARDS MEASURES RELATED TO THE SAFETY, RELIABILITY AND EFFICIENCY OF OPERATION OF UNITS 5 AND 6.

IMPLEMENTATION OF LICENSING CONDITIONS AND MEASURES ENSUING FROM OPERATING EXPERIENCE OR REGULATORY REQUIREMENTS CONCERNING SAFETY

The activities for safety maintaining and enhancement are implemented in compliance with the Safe Use of Nuclear Energy Act, and strict adherence to the terms and conditions of the licences and permits issued by the authorised oversight and regulatory bodies. To this purpose, Kozloduy NPP has developed a number of work programmes with activities to satisfy the normative requirements and instructions of the Nuclear Regulatory Agency. The more important of these include:

- Integrated Programme for Implementation of Safety Enhancements at Unit 5 in the 2017 – 2027 Period;
- Integrated Programme for Implementation of Safety Enhancements at Unit 6 in the 2019 – 2029 Period;
- Programme with safety enhancement measures for the Spent Fuel Storage Facility, which is part of the licensing conditions for operation of the facility.

The total amount of BGN 11,483 thousand was invested in 2019 in activities related to licensing conditions, regulatory documents requirements, and measures for safety improvement.





ACTIVITIES ENSURING UNITS 5 AND 6 LONG-TERM OPERATION

The activities performed during the 2019 outages of the two units were focused on finalising the measures derived from the comprehensive assessment and residual life evaluation (ageing management review) of structures, systems and components at Units 5 and 6, scheduled for their respective licensing period. The recognised investment costs in 2019 towards Investment Programme activities related to the Plant Lifetime Extension Project amounted to BGN 24,317 thousand.

INVESTMENT ACTIVITIES FOR ROUTINE MAINTENANCE OF THE NUCLEAR POWER UNITS, AUXILIARY FACILITIES AND INFRASTRUCTURE

In 2019, BGN 27,380 thousand was spent on activities of the plant Investment Programme involving maintenance of main and auxiliary facilities, ensuring normal operation of the common plant facilities supporting the production process. A considerable portion of the recognised funds went towards:

- Modernising of the existing equipment not covered by the measures of the major investment projects;
- Replacement of engineering equipment;
- Measures related to Kozloduy NPP sites' physical security;
- Replacement of amortised sections of the heat-supply system in the town of Kozloduy;
- Activities related to the maintenance and reconstruction of social-purpose facilities.

LONG-TERM ASSETS PUT INTO OPERATION IN 2019

In 2019, the number of acceptance commission meetings held was 43, of which 37 were at in-plant level and 6 - at government level. The result of these was signing of Protocol 16 and issuance of Utilisation Permits on behalf of the Directorate for National Construction Supervision.

The total value of the long-term assets commissioned last year was BGN 90,461 thousand. The more significant of these include:

- Reconstruction of a high-pressure cylinder at the Unit 5 steam turbine;
- Procurement of pneumatic cylinders for isolating pneumatic valves on Units 5 and 6;
- Reinforcing of the overhead bridges between Auxiliary Building-3 and the reactor buildings of Units 5 and 6;
- Upgrading of the computerised system of the water treatment installation and the Teleperm XP reagent facilities;
- Modernisation of the bridge cranes in Units 5 and 6 turbine halls - design activities on the electrical and the mechanical part, procurement and installation of new crane crabs and crane movement mechanisms;



- Upgrading of the full-scope simulator and mock-up of the main control room of Kozloduy NPP Unit 6 to the current version of the in-core monitoring system;
- Reconstruction and rehabilitation of the building of the hydrogen generating plant converting it into a maintenance and repair building – stage 2.

The implementation of the activities in the Kozloduy NPP investment programme is one of the prerequisites for ensuring the safe and reliable operation of the plant as a secure source of electricity and available power. Monitoring the progress of the measures included in the programmes is performed in the sequence regulated in the respective programmes. Quarterly, six-month and annual reports are prepared on the progress of implementing the measures and then issued to the Nuclear Regulatory Agency and the Ministry of Energy.



ALL THE ACTIVITIES PERFORMED UNDER THE PLANT INVESTMENT PROGRAMME ARE FINANCED WITH OWN RESOURCES OF KOZLODUY NPP.



INTERNATIONAL COOPERATION

Sharing good practices with the international professional community in nuclear energy is among the major tools supporting the steady enhancement and sustaining of high level of safety and reliability of the nuclear facilities. Successful partnership with established global organisations permits Kozloduy NPP to play an active role in the development, implementation and promoting of leading trends in nuclear energy, as well as enrich the experience, knowledge and qualification of its employees.

WORLD ASSOCIATION OF NUCLEAR OPERATORS (WANO)

In 2019, nearly 300 Kozloduy NPP experts joined a number of internationally held events conducted by WANO – Moscow Centre at the plant site and abroad.

Subject of the follow-up WANO-MC corporate peer review held 30 September – 4 October were the interactions between the nuclear power plant and the Bulgarian Energy Holding EAD. The aim of the review was to follow up on the implementation of the recommendations stated in the final report from the corporate peer review mission in 2016, and assess the progress made since then.

From 11 through to 15 November, WANO-MC conducted a follow-up peer review of the progress in the areas for improvement identified by the 2017 peer review, and of the effectiveness of the measures implemented by the plant in the wake of the support missions in the 2017 – 2019 period.

Experts of the Bulgarian nuclear power plant took part as reviewers in eight peer reviews organised abroad by different WANO centres, namely by the Moscow Centre in the Khmel'nitski Nuclear Power Plant (Ukraine), Balakovo NPP (Russia), Loviisa NPP (Finland), Temelin NPP (Czech Republic), Tianwan NPP (China); by the Tokyo Centre –

in Hanul NPP (South Korea), and Ikata NPP (Japan); by the Atlanta Centre – in Catawba Nuclear Power Station (USA). The inclusion of Bulgarian nuclear experts in international review teams is another proof of the high prestige they enjoy among the world professional community.

A well-established scheme for sharing good practices in the field of nuclear energy are the support missions for sharing positive experience (benchmarking) organised by WANO at the initiative of various countries. In 2019, six working meetings of this type were conducted at Kozloduy NPP during which the Bulgarian nuclear experts shared their experience in different areas. Among the subjects discussed were safety briefings before admission as per a permit-to-work, and prior to switch-over of equipment; water chemistry management in the secondary circuit, and in closed loop circulation systems of the spray pools; participation of Kozloduy NPP at the energy market; increase in the effectiveness of registration and investigation of low-level events; formation of a complex chemistry indicator and experience feedback from using it by other nuclear power plants, etc. In addition, representatives of the Company participated in 8 support missions hosted by Bushehr NPP (Iran), Kalinin NPP and Kola NPP (Russia), Rovno NPP (Ukraine), Tianwan NPP (China), Armenian NPP, and also the nuclear companies Atomenergoremont (Russia) and CGN Power Corp. (China).

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IN 2019, WANO-
MC CONDUCTED
AT KOZLODUY
NPP A FOLLOW-UP
CORPORATE PEER
REVIEW, A FOLLOW-
UP PEER REVIEW, AND
SIX BENCHMARKING
SUPPORT MISSIONS.

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

During the reporting year, 108 Kozloduy NPP specialists participated in IAEA organised events such as international conferences and forums, coordination and expert meetings, missions, project meetings, research visits, consultation groups meetings, working meetings for developing IAEA documents, training courses, workshops, etc. conducted both at home and in other countries. The topics considered included human resources, management of competence and knowledge for long-term operation in connection with the forthcoming SALTO'2020 mission at the plant, ageing management of nuclear systems and components, development of a training module for self-assessment of nuclear safety culture, and others.





THE BULGARIAN NUCLEAR POWER ENGINEERS CONTRIBUTE TO THE ESTABLISHMENT OF THE COMMON POSITIONS OF THE ENTIRE NUCLEAR INDUSTRY IN EUROPE AND THEIR PRESENTATION TO EUROPEAN INSTITUTIONS.

FORATOM

In 2019, Kozloduy NPP representatives joined the ENISS EP&R working group, the communications consultancy group, the groups for supply chain optimisation and modernisation, and also workshops and meetings of the organisation.

WORKING GROUPS AND COMMITTEES AT EU INSTITUTIONS

Plant experts participated in meetings of the security of supplies working group and the Euratom Advisory Committee at the European Supply Agency (ESA), also in the Fifth European Nuclear Safety Conference organised under the auspices of the European Nuclear Safety Regulators Group (ENSREG). Company representatives joined the evaluation of research projects in the Euratom Work Programme 2019 – 2020. In the reporting year, experts from Belarus paid a scientific visit to the plant in connection with the European Commission project entitled: “Getting acquainted with regulatory control in the field of radiation protection at NPPs”.

NUCLEAR ENERGY AGENCY AT OECD

In 2019, the Bulgarian nuclear power plant hosted an official visit of William D. Magwood IV, Director-General of the Nuclear Energy Agency (NEA) at the Organisation for Economic Co-operation and Development, in connection with Bulgaria's application for full membership in the organisation. Bulgaria received encouragement to apply for membership in view of the fact that the country has been developing its nuclear energy for more than 45 years, while the main objective of the NEA is to assist cooperation among the countries with developed nuclear energy in the process of enhancing different aspects such as nuclear safety, technologies, science, environment and law.

COOPERATION WITH OTHER PARTNERS AND ORGANISATIONS

Kozloduy NPP has had a long standing tradition of cooperation with many national and international organisations and partners such as the ENISS initiative



of FORATOM, the National Committee of Bulgaria for the World Energy Council (WEC), the UN Global Compact Network Bulgaria (UNGC), the Centre for Energy Research of WWER-1000, Budapest (Hungary), the European Nuclear Society (ENS), Women in Nuclear (WiN) and others. The active partnership with these organisations has been focused on creating conditions for practical actions for research, development, improvement and implementation of the latest methods, approaches and good practices in nuclear industry.

FOCUSING ON THE YOUNG GENERATION

A number of international events have been focused on the next generation of nuclear power engineers. Among these were the General Assembly of the WANO-MC Youth Movement, the 32nd edition of Dysnai – the International Nuclear Festival of the Nuclear Energy Young Generation, the annual International Youth Camp organised by Rosatom for talented children of employees at nuclear power plants, the 8th International Scientific and Applied Conference – Komanda 2019 organised by the youth society of the Russian company Atomproekt. Representatives of the youth society visited Kozloduy NPP in November with the aim of establishing professional cooperation between young specialists from the two companies.





WE TAKE PRIDE IN OUR TEAM OF EMPLOYEES



65% OF THE
NEWCOMERS TO THE
NUCLEAR POWER
PLANT IN 2019 HAVE
HIGHER EDUCATION.



A TOTAL OF 228
SPECIALISTS TOOK
NEW AND MORE
RESPONSIBLE
POSITIONS WITHIN
THE NUCLEAR POWER
PLANT.

At the heart of the human resources management policy of Kozloduy NPP lies the understanding and respect for the individual contribution to the safe and reliable electricity generation. Long-term programmes have been drawn up with a focus on sustaining and further developing of an excellently prepared professional team which will ensure high quality of all activities delivered throughout the period of the nuclear facilities long-term operation in the coming decades.

PERSONNEL PROFILE

Good education of the specialists at the plant is an important precondition for safe operation. The predominant number of the Kozloduy NPP employees hold a higher education degree, while about one third of the total number have completed vocational training.

In 2019, more than 200 newcomer specialists, 65% of which hold higher educational degree, joined the Company team taking positions such as operators, physicists, chemical engineers, power engineers, maintenance and mechanical engineers, NDT engineers, IT specialists, and other in the major production departments. As regards the dismissed employees, 71% left on account of having fulfilled retirement conditions.

A growing share of young people among the newcomers was noted during last year – almost a third of them were below 30 years of age.

The average age of the plant employees is 46, and the average length of working experience in Kozloduy NPP – 16 years and 9 months.

Last year, 228 of the plant employees moved to another position as a result of career developing based on outstanding knowledge, skills and experience. Almost 80 workers and employees were permitted to use paid annual leave to attend classes or take exams to raise their educational level in priority subjects for the plant.

TRAINING AND QUALIFICATION

The training and qualification process at Kozloduy NPP aims at supporting of licensed, competent and motivated personnel, enforcing and maintaining of high level safety culture, effective use and management of personal and corporate knowledge, encouraging the mastering of the necessary knowledge and skills, development of positive attitude to work. The training is based on a systematic approach – an internationally recognized methodology applied by most nuclear power plants around the world, recommended by the International Atomic Energy Agency and relevant national supervisory authorities, including the Nuclear Regulatory Agency. The plant holds the licence issued by the NRA and required to perform specialised training for activities at nuclear facilities, and activities with sources of ionising radiation.

Training is performed by the excellently prepared team of the Training Centre (TC) where the necessary material and technical facilities for theoretical, practical and simulator training are provided. The centre has a full scope simulator (FSS-1000) for WWER-1000 reactor units – a high-tech facility for specialised initial and continuing training of shift operating personnel performing functions related to



THE TOTAL NUMBER OF TRAINING EVENTS CONDUCTED DURING THE REPORTING YEAR WAS 6,423.

EDUCATIONAL STRUCTURE OF PLANT PERSONNEL

Higher education

58%

Secondary vocational education

29%

General secondary education

12%

Other education

1%





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PERSONAL
MOTIVATION IS
CRUCIAL FOR THE
SUCCESS OF THE
NUCLEAR POWER
PLANT.

“
KOZLODUY NPP HAS
BEEN SUCCESSFUL
IN DEVELOPING
SCHOLARSHIP
AND INTERNSHIP
PROGRAMMES. SINCE
2019, THE PLANT
HAS ESTABLISHED
AND ANNOUNCED A
SCHOLARSHIP FOR
FRESHMEN.

ensuring and control of nuclear safety. The simulator is upgraded in compliance with the current state of the reference Unit 6 at Kozloduy NPP. To this end, in 2019, 47 modifications were introduced to the FSS configuration in conformity with the engineering solutions identified to reflect the design changes to the power unit. The FSS-1000 facility was used for conducting initial simulator training for various job positions, continuing training for the main control room crews on both power units, training of trainers at FSS-1000, and a general emergency response exercise. Successful training was delivered to 21 WWER-1000 operator trainers, and 5 trainers on operation of conventional plant. Specialised training in various forms is conducted at the workplaces, and also through the ESTRA on-line training platform.

In 2019, a total of 1,523 training events were conducted for personnel of external organisations and 2,879 – for plant personnel. The types of training included initial, continuing and extraordinary training through the ESTRA platform. Training sessions on the workplaces of Kozloduy NPP personnel numbered 2,021. Forty-one individual licences for work at nuclear facilities, and 15 – for work with sources of ionising radiation were issued.

The licensed personnel take training as per individual programmes, while for the rest of workers approved curricula are used. Specialised training programmes are drawn up for initial and continuing training. The same requirements apply to the personnel preparation of both the plant and external organisations performing activities on the site.

The Kozloduy NPP Training Centre arranges training, internship and professional practice terms for students and teachers in technical subjects of Bulgarian and foreign universities. In 2019, these activities were attended by 21 students and 5 teachers from the Technical University of Sofia and the St. Kliment Ohridski Sofia University, as well as 25 students and 4 teachers from three Byelorussian universities with which the nuclear power plant has had a long-term cooperation.

PERSONNEL MOTIVATION SURVEY

A psychological study of the plant employees' motivation is conducted annually at the nuclear power plant. The aim is to determine the influence of 24 factors of the work environment on the level of personnel motivation. The results of the statistical analysis show that the motivation assessed as per 23 factors of the work environment exceeds 50%. The level of motivation for 2019 reached one of the highest values for the period since the start of such surveys in 2007.

CAREER IN NUCLEAR ENERGY

In the context of long-term operation of Units 5 and 6, the issue of ensuring succession is particularly important. This puts to Kozloduy NPP the ambitious task to present clear perspectives to young people, to guide them in choosing a profession, and encourage them to study STEM-related disciplines – science, technology, engineering, mathematics. The objective is to enhance the interest of young generations in engineering education subjects, in general, and nuclear energy, in particular.

A number of programmes and dedicated initiatives support the young in their journey from studies to business and at the same time help the formation of subsequent generations of power engineers.

Since June 2019, permanent acceptance of documents of applicants for work at the nuclear power plant has been announced on the Company's website regarding 31 of

the higher education subjects considered priority ones for the plant. This approach shortens the recruitment time and uses the opportunity to attract trained people from all over the country.

As at the end of 2019, contracts were signed with 16 scholarship-holders per the programme that has been used by Kozloduy NPP for the past two years to offer scholarships to students at the Technical University of Sofia and the St. Kliment Ohridski Sofia University taking a degree in “Nuclear Energy” and “Nuclear Engineering and Nuclear Energy”.

To stimulate the interest of students in technical subjects, since 2019, a scholarship has been announced for first-year students who have enrolled in specified subjects, with an average annual score of over 5.00 from secondary school education. The nuclear power plant signed contracts with three young people who have met these requirements.

The plant has entered partnerships with academic circles nation-wide, and has been keeping contacts with the Bulgarian Academy of Science, Technical Universities in Sofia, Gabrovo, Ruse and their branches, as well as St. Kliment Ohridski Sofia University.

Kozloduy NPP regularly participates in career forums and profession bazaar events organised by technical universities where opportunities are presented for work at the plant and further professional and career development. Systematic support is provided for school students’ thematic competitions, which promotes interest in technical sciences and assists students' performance.

Kozloduy NPP has extended its proactive assistance in the launching of a procedure for dual training in “Nuclear Energy” and “Thermal Power Engineering” at the Igor Kurchatov Nuclear Energy Vocational School, in the town of Kozloduy. The cooperation with the specialised vocational school also includes support for the teaching process, within which student internships and work practices are conducted and the training facilities get upgraded and improved.



KNOWLEDGE MANAGEMENT AND STORAGE

The plant takes a number of actions to store and transfer to the subsequent generations of nuclear power workers the unique Bulgarian resources of valuable operating experience, specific professional knowledge and good practices.

Following an analysis, the needs have been determined of employees with relevant competencies for the period of long-term operation. A pool has been created of specialists who are trained as per individual curricula, which provides trained deputies for key positions. The “Tacit Knowledge Monitoring” Information System is periodically updated based on the feedback and the results of the training process.

In 2019, upon the initiative of the Bulgarian Nuclear Society an inter-departmental expert committee was set up with participants from different institutions and with the aim of working towards the preservation of Bulgarian nuclear knowledge.





PARTNERSHIP, SUPPORT, TRANSPARENCY



THE YEAR 2019 WAS
MARKED BY THE 45th
ANNIVERSARY OF
KOZLODUY NPP.

CORPORATE SOCIAL RESPONSIBILITY

Responsible business practices in the field of human rights, labour standards, environmental protection and the fight against corruption are consistently applied at Kozloduy NPP. A number of specific activities are focused on improvement of employees' human capital, ensuring health and safety at work, the future development of the administrative region and protection of the environment. Thus, the nuclear power plant being an active member of the Bulgarian Network of the UN Global Compact strongly supports the values raised as main principles of the Global Compact.

RESPONSIBLE EMPLOYER

Kozloduy NPP is a responsible employer in respect of its employees and in this capacity it strives to foster a positive work environment and realistic opportunities for development. Motivating work conditions have been provided – from health and safety at work in workplaces with up-to-date equipment to various leisure opportunities such as cultural programme, creative events, sports activities. The professional recruitment system used ensures equal opportunities for work and career growth. The only assessment criteria are professional qualification, experience possessed, personal qualities and performance results achieved. Women at Kozloduy NPP account for about one third of the staff. They participate in all plant processes and are represented at various positions including

responsible operator and management levels. There is an established practice for work teams to welcome their newcomer colleagues with care and respect, and a system is in place for sharing and transfer of experience accumulated in the nuclear power plant.

SUPPORT FOR THE SUSTAINABLE DEVELOPMENT OF THE REGION

The corporate social responsibility of the company is also manifested in the long-standing tradition of supporting the sustainable development of the Municipality of Kozloduy and the nearby towns and villages. The nuclear power plant has been assisting cultural, educational, sports, youth and social activities in the region for years. To ensure lasting benefits for the community, numerous initiatives related to public works, infrastructure and healthcare are implemented, and with the personal commitment of the employees, volunteer activities are organised to help those in need.

COMMON EFFORTS TOWARDS POSITIVE CHANGES

The nuclear power plant is an active member of the Bulgarian Network of the UN Global Compact. It prepares and issues an annual Communication on Progress, and regularly participates in initiatives organised by the Network. In 2019, representatives of Kozloduy NPP took part in various events held in towns across the country. The plant hosted the regional forum entitled “Business as a force for doing good” conducted jointly with the Bulgarian Network of the UN Global Compact, and the Vratsa Chamber of Commerce and Industry. The forum brought together companies from the region and the rest of the country, and local authorities representatives from Vratsa and Kozloduy. The main objective of the meeting was sharing of good practices in the field of corporate social responsibility in an attempt of finding the successful formula for a positive change in society.

CLEAN ENVIRONMENT

In the environmental policy of Kozloduy NPP whose motto is Clean Energy, the priority is given to the systematic organisation of green initiatives focused on environment conservation. Company employees are regular participants in campaigns such as “Let's clean the Kozloduy municipality together”, and “Let's clean Bulgaria together”, the cleaning of the Danube River bank on the occasion of the Day of the River – 29 June, and others. The World Environment Day, celebrated on 5th June, is marked every year through different events, and a successive planting of a tree in the dedicated Ecology Alley in Kozloduy.

On account of its systematic efforts towards making the world safer and cleaner, the nuclear power plant was declared one of Bulgaria's greenest companies in 2019, within a competition of the same name organised for the ninth time in a row by b2b Media. Kozloduy NPP was awarded the third prize in the “Green Initiative” category for its role in ecology and consistent policy for environmental protection and sensible use of natural resources in view of protecting and conserving ecosystems and public health. In April, the Electric Vehicles Industrial Cluster awarded Kozloduy NPP the



KOZLODUY NPP HAS ESTABLISHED A LONG-TERM TRADITION OF ACTIVE SUPPORT FOR THE LOCAL COMMUNITY.





“Kubrat Sword” (in the “Business Achievement” category) for its contribution to the development of electric mobility in Bulgaria. The award was presented for the transport model realised with three electric cars and infrastructure of four charging stations – made in Bulgaria. Thus, one of the country's largest zero-carbon power plants has reaffirmed its continued commitment to seeking sustainable environmental solutions and supporting efforts to address the global climate change that modern world is struggling with.

TRANSPARENCY AND DIALOGUE

Kozloduy NPP has a long-standing tradition in transparently demonstrating the nuclear power plant's operation. In parallel with the regular publication of information on all major achievements and important events, the leading focus in public communications in 2019 was the 45th anniversary of Kozloduy NPP. Throughout the year, a series of initiatives dedicated to the landmark event were implemented.

A special column in the “Parva Atomna” newsletter presented to the readers employees of the same age as the plant. On the pages of the publication, 10 specialists, representatives of different professions, told about how they had grown as part of the team of nuclear power engineers.

Two creative competitions among the employees were dedicated to the plant's anniversary – one for an anniversary motto, and one for an essay on the topic of “My Words on the Nuclear Power Plant”. The proposals received demonstrated how the plant specialists regard the nuclear power plant: environmentally friendly, safe, reliable, efficient, possessing a successful history and future, and manifested a clear sense of belonging to the nuclear professional community.

The “Safety First” collective contribution award established in 2019 had a strong focus on the values that have been shared over the whole 45-year history of the nuclear power plant. The award was named after the long-time former Safety and Quality director, Mitko Yankov, and highlights the importance of strong safety culture, teamwork and leadership at the workplace.

The 45th anniversary celebrations culminated in the corporate festivity on 4th September – an event that brought together several generations of nuclear power engineers and many guests. The presentation of a number of awards for significant contribution to the achievements of the nuclear power plant took place in an atmosphere of strong personal excitement. Veterans, managers, chief engineers and executive directors responsible for the nuclear facilities operation over the years received diplomas as a token of gratitude for their dedicated work, enthusiasm and professionalism. A specially prepared photo exhibition displayed pictures taken by photo reporters of the Bulgarian News Agency capturing unique moments of important milestones in the construction and development of Kozloduy NPP. Following the celebration, this exhibition was moved in front of the Training Centre building thus attracting the attention of numerous employees attending training courses there.

All the visitors to the nuclear power plant in 2019 had the opportunity to be personally involved in the significant anniversary celebrations. Nearly 2,250 Bulgarian citizens and foreigners received information and, thus, became familiar with the nuclear power engineers' achievements over the past 45 years, and the key role of Kozloduy NPP for the national energy.





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