



KOZLODUY NPP REVIEW

The English language bulletin of Kozloduy Nuclear Power Plant

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INSIDE

50 years NRA

see p. 3

Probabilistic Safety Analysis

see p. 4

KIDSF's Assembly of Contributors gathers again

On July 5, 2007 in London was held the 13th Assembly of Contributors of the Kozloduy International Decommissioning Support Fund (KIDSF) administered by the European Bank for Reconstruction and Development (EBRD). Kozloduy NPP was represented by Mr Ivan Genov, Executive Director, and Mr Valentin Ribarski, Head of Decommissioning Department.

During the forum, several agreements were discussed and approved for financing of which EUR 70.8 million were allocated in the sphere of nuclear industry. For projects of the so called non-nuclear segment the approved funds came to EUR 55 million. This will be spent for measures related to consequences of early closure and decommissioning of Units 1-4 of Kozloduy NPP, and measures related to

energy effectiveness, etc.

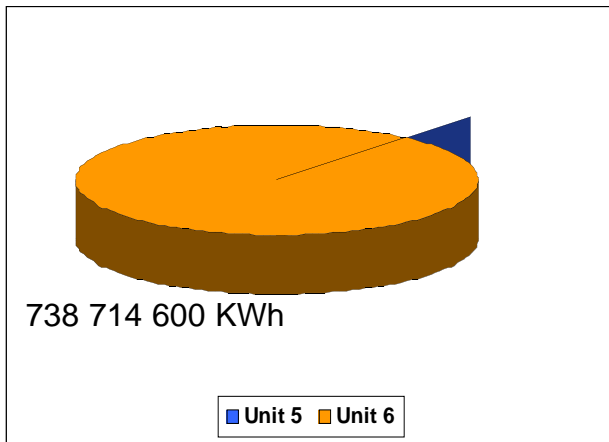
In the sphere of nuclear industry, the KIDSF money will be used for financing investment projects and activities related to preparation for decommissioning of the 440 MW Units. Investment projects at the amount of EUR 150 million cover the following spheres:

- Spent fuel management, mainly spent fuel storage
- Rad waste management
- Supply and construction of several RAW reprocessing installations which will complement the existing installations of Radioactive Waste State Enterprise.
- Decontamination of materials
- Radiation monitoring
- Bringing the KNPP's infrastructure in line with the new conditions after the shut-

Continued on page 2

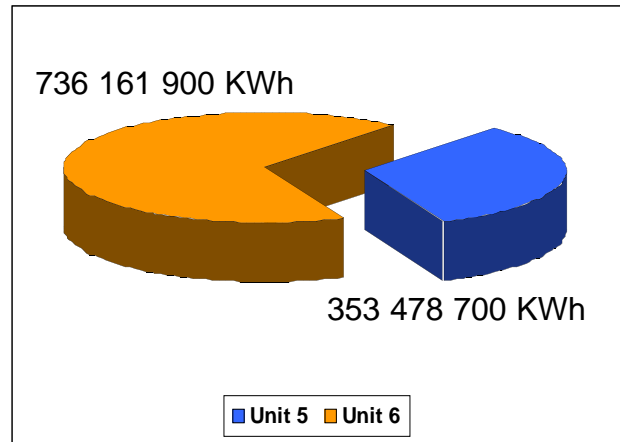
Generation

July



*Unit 5 in annual outage.

August



*Unit 5 in annual outage until August 16.

☞ From page 1

KIDSF's Assembly of Contributors gathers again

down of Units 1-4.

The money coming from the Fund will also be used for financing the preparatory activities before the Nuclear Regulatory Agency had issued decommissioning permits.

British Nuclear Group provides consultancy services regarding use of KIDSF money for activities of Kozloduy NPP. This is carried out by the so called Project Management Unit on the KNPP site. So far, about EUR 35 million from the KIDSF were spent under various projects related to the nuclear plant.

The Kozloduy International Decommissioning Support Fund was established in 2001 after a financial memorandum was signed between Bulgaria and the European Union.

Ten European countries and the

European Commission are the donors in the Fund. The collected funds are managed by the European Bank for Reconstruction and Development. According to the regulations of the KIDSF and the Framework Agreement, the EBRD

The sum was increased to EUR 550 million



finances and co-finances various projects once they were approved by the Assembly of Contributors.

The European Commission has the decisive vote in it being the major contributor. The initially approved sum to be collected in the Fund was EUR 200 million. Later, following the agreements in the EU Accession Treaty of Bulgaria, the sum was increased to EUR 550 million. It is envisaged that the money will be provided in four installments between 2000 and 2009. About 40 percent of the sum will go for projects on improving the energy efficiency.

Contribution to safety

Successful cooperation between Kozloduy NPP and the Nuclear Regulatory Agency

By Maria Krasteva, PR, NRA

This year we celebrate the 50th anniversary of the Nuclear Regulatory Agency (NRA) and the International Atomic Energy Agency (IAEA). The beginning was set in 1957 when Bulgaria ratified the IAEA's Statute together with 80 other countries. By doing this, Bulgaria became one of the founding members of the organization. The IAEA's membership called for the establishment of a national body that had to coordinate activities related to nuclear power uses in Bulgaria. Therefore, on June 4, 1957 the Council of Ministers issued an ordinance No. 603 to establish the Committee for Peaceful Use of Nuclear Power (CPUNP).

After the commissioning of the first two units of Kozloduy NPP, in 1975 the CPUNP became a state-run organization which was also in charge with the safe operation of the nuclear plant.

Ten years later, in 1985, the National Assembly passed the first Peaceful Use of Atomic Energy Act. This document not only established the Committee on Use of Atomic Energy for Peaceful Purposes (CUAEPP) but also outlined its functions and goals. The Committee was in charge with carrying out the state policy with regard to safe use of nuclear power; it also dealt with the implementation and management of nuclear technology and with safety control. Additionally, a special Inspectorate on Safe Use of Atomic Energy was created to the CUAEPP.

The act was amended several times until 2002 when it was entirely repealed and replaced by the new Safe Use of Nuclear Energy Act. This act took into account contemporary trends in nuclear legislation

including EU legislation. In the process of preparation of the act, Bulgarian experts accepted recommendations by the IAEA's experts. The Nuclear Regulatory Agency was established, a new politically and financially independent body.

As for safety, the act takes into account the world standards and the newest requirements of the IAEA. Article 3 reads: "In the use of nuclear energy and ionizing radiation, and in radioactive waste management and spent fuel management nuclear safety and radiation protection shall enjoy a priority overriding all other aspects of this activity."

This guiding principle is also applied in 20 ordinances issued by the NRA under the Act between 2002 and 2004. Following the requirements of the normative acts guarantees that Kozloduy NPP applies international practices in this sphere. According to the act, one of the regulatory mechanisms of the NRA is the issuing of licenses and permits for various activities. The Kozloduy NPP's units are operated in line with long-term licenses issued by the NRA, and within the conditions and limits for safe operation. Other mechanisms of control are the on-site inspections carried out by the Agency. The NRA exercises control over maintenance, refueling, operability of safety systems, implementation of corrective measures following events, the level of in-house plant control and quality assurance for all the activities listed here.

The Operational Control Department of the NRA on the plant site carries out daily control with regard to nuclear safety and radiation protection of the nuclear facilities. The daily status is reported and discussed at special meetings at the NRA.

Experience

Probabilistic safety analysis: modern approach to risk management

By Emil Kichev, Ph.D.
Head of Risk Management Sector



The nuclear industry has always provoked debate on the reasonable balance between benefit and risk. The benefit is in assuring cheap and ecologically clean electric

power, and assuring security of energy supply in a time of growing power deficit. Limiting the risks is done through regulation and management which aim at preventing negative impact on human health, the public and the environment through constructing and maintaining effective barriers against radiological hazards.

Each industry has its own definition of risk which reflects its specificity. However, to a certain degree, they all take into account two quantitative aspects of risk: frequency of undesirable events and scope of their consequences. Risk-significant industry is the chemical industry, waste management (conventional and radioactive waste), construction of buildings, dams and sea platforms; aviation and space technology, motor and railway transportation; food and drugs manufacturing; nuclear industry, etc.

From a technological point of view, risk is defined as "the probability that a certain undesirable event might happen over a period of time or might arise as a result of a

certain situation" (The Tolerability of Risk from Nuclear Power Stations, HSE Books, 1992). In order to manage risk adequately, it needs to be analyzed thoroughly. The analysis includes precise definition of the undesirable event, finding a way to make a quantitative assessment of the probability (probability/frequency) for the occurrence of this event under given circumstances as well as for the consequences of that occurrence.

Mathematically, the risk is calculated as the product of probability/ frequency of occurrence of a given event and the scope of its consequences. It is in fact practical to present this as the ratio between the source of real danger and the safety measures which were taken to prevent it from happening.

$$\text{Risk} = \frac{\text{Source of danger}}{\text{Safety measures}}$$

This brings one's attention to questions such as: What is the source of danger? What safety measures could be undertaken? Which measures assure the highest protection? How will level of risk change should certain measure is carried out? Seeking answers to these questions is the major part of risk management.

Ensuring safety in the nuclear industry is based on a set of safety principles which are determined for each stage of implementation. In terms of technology, safety of nuclear plants is ensured through the so called defense-in-depth which means:

- Providing a system of physical barriers to stop ionizing radiation and radioactive

Probabilistic safety analysis: modern approach to risk management

elements during normal operation while anticipating operational, design basis accident and beyond the design basis accidents;

- Establishing levels of protection for equipment and establishing activities to maintain integrity of physical barriers;

- Warranty that protective functions are being performed in a reliable way and there is a sufficient resource to compensate equipment failures and human errors.

Methods of risk analysis

In order to prove the design basis and the efficiency of the defense-in-depth, safety of nuclear plants is mandatory assessed through deterministic and probabilistic methods.

Deterministic methods include: confirmation of correspondence of operational limits and conditions with design assumptions for normal operation; determining certain accident initiators including those typical for the site, which should be used in the design basis; analysis of scenarios as a result of certain initial events; analysis of the consequences and verification to assure that acceptability criteria are fulfilled.

Probabilistic methods complement the deterministic ones with regard to the so called "remaining risk" (risk that exists regardless of all the technical and organizational measures). The probabilistic approach presents an opportunity to better assess the major factors contributing to that risk.

The probabilistic safety analysis/ risk analysis is an analytical method which seeks systematically an answer to the ques-

tions:

- What event might occur? (determining accident scenarios)

- What would be the consequences of certain event? (determining their magnitude)

- What is the probability/ the frequency of this event? (assessment of probability/ frequency of events and of their consequences)

Levels of Probabilistic Safety Analysis

The Probabilistic Safety Analysis has three levels:

Level 1: Analysis of scenarios that might lead to a damage of the core, and assessment of their frequency;

Level 2: Determining scenarios which influence the integrity of reactor's containment; analysis of containment's behavior in case of various scenarios; assessment of the size of radioactive sources. The result is an assessment of frequency of core damages and assessment of large radioactive discharges;

Level 3: Analysis of radiological consequences (assessment of ways of dissemination of isotopes in the environment, scope of contamination and radiological effects). The result is an assessment of late effects on human health and assessment of the scope of contaminated areas.

The results from each level provide input data for the next level. It is required that analyses cover all the possible operational conditions in the plant. Therefore, Level 1 and Level 2 of the probabilistic safety analysis are carried out for full power operation as well as for low power operation and for shut-down reactor.

(with abbreviations)

Focus

Debate on public procurement procedures



Ivan Genov (in the middle) explains issues related to public procurements

“Public procurements in the energy sector – practices, issues and challenges.” This was the title of a discussion organized by the Bulgarian Nuclear Forum (BULATOM) and the non-governmental organization Center for Public Procurements.

The seminar was held on July 12 and 13 in the city of Stara Zagora. It was attended by managers and experts from all the leading utility companies in Bulgaria.

The goal of the seminar was to provide an opportunity for sharing good practices in the sphere of public procurement award procedures. A special emphasis was put on the Public Procurement Act and its application in practice in the light of the EU legislation.

Reporters attended the discussion as well. There was a huge interest in the debate as the companies in the energy sector are in fact major contracting authorities in Bulgaria.

Mr Ivan Genov, Executive Director of Kozloduy NPP, presented to the participants the trends related to the current financial situation in the company. He paid special attention to managerial approaches to mitigating the negative financial conse-

quences of the early closure of Units 3 and 4. Mr Genov said the company tried to compensate the loss of 880 megawatts and the low state-regulated purchasing price by offering more electric power on the deregulated market.

Thus, the company tries to sustain its financial stability while providing a large share of electricity for the domestic customers. Therefore, Kozloduy NPP will continue to play a significant social role in the future, said Mr Genov.

Mr Bogdan Dimitrov, Head of Commercial Division, presented statistical data for public procurements that were awarded by Kozloduy NPP between 2004 and 2007. A two-step system is implemented at Kozloduy NPP for public procurements awarding. First, the procedure is discussed at the Economy Council (an advisory body to the Executive Director), regarding legal aspects and appropriateness; then, the procedures are also reviewed by the Board of Directors.

We consider the establishment of a special Public Procurements Department at Kozloduy NPP to be a good practice. This happens to be the only specialized department of its kind among the energy companies. It was established back in 2000. As a part of the quality assurance system, we have developed and put into practice instructions that determine the whole process of public procurement award procedures: beginning with the terms of reference and ending with control over performance.

Since 2006, a special Profile of the Customer was published on the company web-site which presents additional information to prospective participants in the public procurement tenders of Kozloduy NPP.

Advanced professional qualification for operators



On July 4, 2007 a celebration was held at the Training Center to mark the end of advanced professional qualification. Seven specialists got Master's degrees in Nuclear Engineering and qualified as senior reactor operators at the 1,000 MW Units. The training was organized in cooperation with the Nuclear Regulatory Agency and the Technical University of Sofia.

The celebration started with a speech of Mr Lyubomir Pironkov, head of the

Training Center, who said this training brought the cooperation between these three organizations to a whole new level.

Mr Mitko Yankov, Director of Safety and Quality, thanked the graduates for their efforts and congratulated them for their achievements. The graduates were: Blagoy Nikolov, Boris Ivanov, Dimitar Tsvetkov, Nikolay Barekov, Rangel Tsvetkov, Stanimir Kamburov and Yavor Yordanov. Associate Professor Boncho Bonev from the Technical University handed the diplomas to the graduates.

"Thank you for the presented opportunity to complete this course which broadened our knowledge in the sphere of nuclear plant's operation. Let me wish my colleagues years of flawless work as operators, good health, happiness and successful career," said Stanimir Kamburov on behalf of the graduates.

International recognition for KNPP's radiation monitoring

Kozloduy NPP received a special certificate in August in recognition of its high-quality radiation monitoring.

The document was issued by ALMERA (Analytical Laboratories for Measurement of Environmental Radioactivity). This organization was founded by the International Atomic Energy Agency in 1995 and gathers 106 analytical labs from 60 countries. They provide reliable and prompt sample analyses of environment in case of accidents and in case of planned discharges with possible trans-boundary con-

tamination. The Environmental Monitoring Department of Kozloduy NPP was nominated for ALMERA membership by the Bulgarian government in 2005. In 2006, the department took part for the first time in the inter-laboratory research organized by ALMERA. Results were released last summer that confirmed the high quality of environmental monitoring and the successful laboratory practices of Kozloduy NPP in comparison with other ALMERA members.



In brief



The 50th anniversary of the Nuclear Regulatory Agency and the International Atomic Energy Agency was celebrated at a special conference on July 10, 2007 in Sofia.

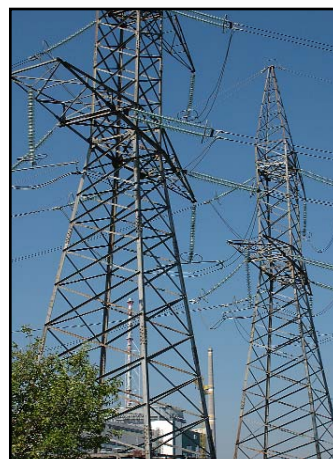
Mr Tomihiro Taniguchi, Deputy Director General of the IAEA, attended the conference. Among the guests were Mr Ramadan Atalay, Chairman of the Parliamentary Committee on Energy, Mr Ivaylo Kalfin, Deputy Prime Minister and Minister of Foreign Affairs, and Mr Rumen Ovcharov, Minister of Economy and Energy at that time. Representatives from European regulatory bodies took part in the conference as well as representatives from the U.S. Nuclear Regulatory Commission, Rostehnadzor, Bulgarian and foreign scientific and engineering organizations.

On the second day, a technical tour was organized to Kozloduy NPP. The guests had a meeting with the top management of the plant at the Information Center. The visitors were particularly interested in the so called social program of Kozloduy NPP regarding human resources management in a time of change. Then, they had a walk-down to the 440 MW Units as well to Unit 6 of 1,000 MW.

Kozloduy NPP started the hydro power plant project

A new hydroelectric power plant is under construction on the Kozloduy NPP's site. It is situated near the Bank Pumping Station and will be supplied with water from the cooling systems of Units 5 and 6.

The idea for constructing a hydroelectric power plant emerged long ago. Design preparation for the project began in the early 1990s. It was proved that such a plant will assure a return on the investment after five years. The final version of the design was available in 2003-2004. Construction work started on August 10, 2006. In just one year, significant amount of work was completed and the founda-



tions were prepared below the Danube level. Due to site particularities, it is protected by special reinforced walls so as to assure appropriate conditions for the construction of the plant.

Last August, a two-meter-thick concrete slab was cast.

The plant will be equipped with two 5 MW turbines. They will be rotated by water falling from 7.5 meters. Commissioning is scheduled for the middle of 2008.

Kozloduy NPP will be the sole owner of the hydroelectric plant.