KOZLODUY NPP REVIEW

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INSIDE

Unit 5 turns 20 years

On November 29, 2007 Kozloduy NPP celebrated the 20th anniversary of Unit 5's connection to the national power grid.

The raising demand for electrical power in the late 1970s called for new generating capacities. At that time, Kozloduy NPP already had Units 1 and 2 in operation, while Units 3 and 4 were under construction. Bulgaria was the first country in South Eastern Europe and only the 11th in the world to have implemented nuclear power generation.

On April 26, 1978 the Council of Ministers announced its decision for a third expansion of Kozloduy NPP. The project envisaged units of a new generation designed in line with the modern standards and safety principles. These were VVER - 1000 Units, model V-320 equipped with concrete containment and triple redundancy safety systems.

Units of a new generation designed in line with the modern standards

The construction of two new Units started in line with a contract signed between Bulgaria and the then-existing USSR. The design was created by a team of Toploelektroproekt, Moscow, and Energoproekt, Sofia. Coordinator-in-charge was the Bulgarian Ministry of Energy, and main contractor was Zavodski Stroezhi, Kozloduy. Equipment was supplied by Atomenergoexport (USSR) and Techno Import Export (Bulgaria).

Anniversary

Mounting the reactor vessel, April 11, 1985

Construction and Commissioning

July 9, 1980 is a milestone date in the history of Kozloduy NPP. It marks the beginning of the construction of the first 1,000 MW Unit outside the then-existing Union of Soviet Socialist Republics (USSR). The groundbreaking ceremony was opened by the Chairman of the Council of Ministers Stanko Todorov. He was accompanied by Grigor Stoichkov, Vice-Chairman of the Council of Ministers, and Nikola Todoriev, Minister of Energy.

The preparatory stage of the construction work lasted two years. In 1982-1984, the underground part of the entire infrastructure was completed. In the end of 1984, 10,000 people were employed in the construction works including specialists from the USSR, Poland, Vietnam, Cuba and Yugoslavia. The largest group was the one of the Soviet specialists: they were more than 3,000. The Soviet team was led by Izrail Sapir.

26 December 1985: Reactor of Unit 5 was mounted in its shaft

20 January 1986: The team of Gospodin Yordanov concluded mounting of reactor internals

17 March 1986: Commissioning activities started

17 August 1987: The team led by Ivan Ivanov and Boris Vershinin finished successfully the cold and hot tests of the primary circuit. This included 128 different tests of various components thus ensuring safe commissioning of the Unit.

On October 3, 1987, at 11:48 a.m., the first fuel assembly was inserted in the reactor of Unit 5. Shift B was on duty at that time: Yordan Kostadinov, Ivan Rupelski, Kosta Stoychev, Polina Mineva, etc. Ten dates later, all the fuel assemblies were inserted and the reactor core was loaded.

On November 5, 1987 a minimum controllable power level was achieved. This was the so called physical start up. At this time, shift A was on duty: Ivan Genov, Plamen Yordanov, Yavor Atanassov, Neli Gesheva.

After completing various tests, Unit 5 was connected to the national power grid on November 29, 1987. Nominal power was reached on June 21, 1988 at 3:07 p.m.

In the process of construction, commissioning and start-up tests the management team of Unit 5 included:

Georgi Dichev, CEO of Kozloduy NPP
Georgi Stefanov, Deputy CEO
Kiril Nikolov - Director of Operation, Units 1-6
Zahari Boyadzhiev, Director of Operation, Unit 5
Dimitar Kolev, Director of Maintenance, Unit 5
Ivan Ivanov, Chief of Operators and Chief Technologist

The construction and commissioning of Unit 5 as a state-of-the-art technology became possible thanks to the efforts of many scientists, designers, constructors, workers and highly qualified operators.

Meeting modern requirements

Right after the commissioning of Units 5 and 6, Kozloduy NPP began developing and implementing modifications and improvements that led to significant enhancement of safety. The idea of modernization emerged in the early 1990's based on the operational results and on the international experience. The upgrades were made under a large-scale Modernization Program for Units 5 and 6.

The Program included 212 measures whose implementation was carried out in two stages:

Engineering

It covered preparation and supply of input data, development of terms of references describing KNPP's requirements to the future systems, design projects, analyses and specifications of equipment under the Program.

Implementation

It covered preparation of detailed documents, manufacturing and supply of equipment, mounting and testing, licensing and commissioning.

The Program started in 1998 and was carried out only during annual outages from 2002 to 2007 without any extra planned unavailability time.

The so developed Modernization Program was reviewed for completeness and adequacy by the International Atomic Energy Agency between 1995 and 2000. In 1997, the Program was subject of independent assessment by Risk Audit, an organization that gathered specialists from France and Germany (IPSN and GRS Int.).

The Modernization Program is financed by KNPP's own funds and through credits by international financial institutions: Euratom, Roseksimbank, Citibank. The overall cost of the Program comes to EUR 491 million. Out of this, EUR 176.7 million are KNPP's own funds under the investment program of the company.

The Modernization Program is a unique project by its scope and ways of implementation. Through this project, the upgraded Units were brought in line with all the modern normative documents in the sphere of nuclear safety. Economic analyses show that all the investments will pay back in the long run. The improvement of operation, availability and effectiveness of work has already become reality. It allows for shorter outages and reduces expenses for maintenance.

The significant improvement of operation of Units 5 and 6 following the upgrades has been illustrated by our achievements: 7 years without a scram on Unit 5 and more than 10 years without scram on Unit 6. According to WANO's criteria, one trip per two cycles is an indicator of reliable and safe operation. According to these criteria, Kozloduy NPP holds one of the leading places worldwide.

Kozloduy NPP assured transparency in the whole modernization process during the implementation of the Program. The plant management took into account the recommendations of the best nuclear experts and got international recognition for achieving a high safety level.

In brief

Preparing for a Periodic Safety Review

From December 10 to 14, 2007 Kozloduy NPP hosted a support mission of the WANO Moscow Center, entitled "Studying the experience of other NPP's in carrying out Periodic Safety Reviews."

The mission had to present the experience of Paks NPP (Hungary), Dukovany NPP (Czech Republic) and AMEC (Great Britain), in carrying out Periodic Safety Reviews in order to renew licenses, extend lifetime and meet regulatory requirements.

The specialists reviewed deterministic and probabilistic methods for assessment of safety factors in all operational modes in line with the IAEA's recommendations and the modern standards.

The Bulgarian group included 37 experts from Kozloduy NPP who worked together with their international partners from WANO.

During discussions, the participants had the chance to exchange ideas regarding best practices in the nuclear industry.

Verification under Article 35

From November 26 to 28, 2007 Kozloduy NPP hosted a verification of the European Commission under Article 35 of the Euratom Treaty. The purpose of the verification was to carry out an independent assessment of operability, effectiveness and reliability of equipment for monitoring of radiation discharges. Also, the EU experts had to find if Kozloduy NPP's monitoring was in line with EU norms.

The preliminary report stated that the nuclear plant met the requirements of Article 35. Kozloduy NPP was given as a good example on a national level with regard to organizational and technological aspects of monitoring of liquid and gaseous discharges.

The report also said that Kozloduy NPP had a good quality assurance system which contributed to effective and reliable monitoring of effluents.

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