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## NUCLEAR ENERGY IN ARMENIA

*Stephan Gevorgyan and Vahe Kharazyan,*

Students of Armenian State Engineering University

This summary represents an overview of the energy situation in Armenia and, in particular, the nuclear energy development during the last period of time.

The energy sector of Armenia is one of the most developed economy branches of the country. The main sources of energy are oil products, natural gas, nuclear energy, hydropower, and coal. In the period of 1985-1988 the consumption of these energy resources varied between 12-13 million tons per year of oil equivalent. Imported energy sources accounted for 96% of the consumption. During the period 1993-1995 the consumption dropped to 3 million tons per year.

Electricity in Armenia is produced by three thermal, one nuclear, and two major hydroelectric cascades together with a number of small hydro units. The total installed capacity is 3558 MW.

Nuclear energy in Armenia began its development during the late 1960's. Since the republic was not rich in natural reserves of primary energy sources and the only domestic source of energy was hydro resource, it was decided to build a nuclear power plant in Armenia. The Armenian Nuclear Power Plant (ANPP) Unit 1 was commissioned in 1996 and Unit 2 in 1980. The design of the ANPP was developed in 1968-1969 and was based on the project of Units 3 and 4 of the Novovoronezh NPP. Both units of the plant are equipped with reactors WWER-440 (V-270) type, which are also in use in some power stations in Russian Federation, Bulgaria, and Slovakia.

Currently in Armenia, 36% of the total electricity production is nuclear power electricity. For the new constructed ANPP was necessary to have well educated scientists and technical experts. So at the State Engineering University of Armenia the new specialty, Nuclear Energy, was established. At that time the Scientific-Research Institute of Nuclear Power Plants Operation Study was also opened, as well as several montage-installing and adjusting institutions were created. After the ANPP was commissioned and connected to the National Grid, a surplus quantity of electric energy appeared in Armenia, which was transmitted to the neighbor countries. In 1988, the annual electricity production was about 15 billion kWh. The consumption within the republic was about 12 billion kWh, with 3 billion being exported.

The destructive Spitak earthquake of December 1988 was the crucial factor for the Government to make the decision to shut-down ANPP, since the industrial plant site was located within the seismic active area, and the rate of risk of its further operation was high. So, the Council of Ministers of the former Soviet Union decreed to stop the operation of the ANPP. Unit 1 was shut down on 25 of February 1989, Unit 2 on 18 of March 1989. The ANPP outage had a very negative effect on the energy sector and on the country's economy as a whole.

Bad times came when the republic regained its independence in 1991 and found itself in an energy blockade, which was damaging not only the republic's

economy, but also its ecology. To provide the population of Armenia with electric energy, even for two or three hours a day, the hydropower plants of the Sevan-Hrazdan cascade had to operate at their higher level of capacity. Another crucial factor which contributed to the crisis was the almost complete dried-up of the lake Sevan. The drying-up of the lake could lead to forest mining, extermination of flora and fauna, as well as to climate change. During the severe winters of 1992-1995, Armenia was suffering from the absence of forest, which was an important element used by the people to heat their houses. Throughout the energy crisis, the economy of Armenia was in deep decline; almost all the industrial enterprises were closed. The only way out from the crisis for Armenia was to find primary sources of energy. In April 1993, the Government of the Republic of Armenia decided to reopen the ANPP Unit 2. After 5 years and 6 months of outage, the technical and financial assistance of the Russian Federation, over two years and five months of period, make it possible to prepare and restart Unit 2 of the ANPP in November 1995. The considerable methodical assistance was rendered by the IAEA and the French firm FRAMATOM. Armenian specialists have developed the program of Unit 2 safety upgraded. That program considered the experience of countries with the same reactors, and included the suggestions of various international organizations as IAEA and WANO. For that program realization, the financial assistance was rendered by the Russian Federation, USA, FRANCE, and EC in the frame of TACIS program. The items of this program have been constantly observed and elaborated year by year. The international assistance of the ANPP was not limited by the financial support. However, the only time when this happened was when the Unit 2 safety upgrading measures were being implemented. Many Armenian specialists attended the training courses on the special simulators in foreign countries and participated in many international seminars organized by the IAEA.

Annually, the ANPP is producing about 30 % of the total energy generated in the country. Since its recommissioning on January 1, 2000, the plant has already produced about 7.4 billion kWh of electric energy. Well-organized operation of the nuclear station has become possible mostly due to many good specialists graduating from the SEU of Armenia and most of the them had expertise in "Nuclear Energy."

Currently, Armenia has the whole spectrum of infrastructure for nuclear energy developed. Several laws of great importance, concerning the use of nuclear energy, have been adopted during the past years. In 1993 the Armenian Nuclear Regulatory Authority was created. Its functions included the IAEA requirements related with the ANPP safe operation.

We are sure that the peaceful atom will yet serve much for the boon of mankind. We think that the future of energy all over the world is tightly bound with the safe use of nuclear energy for peaceful purposes.