ARMENIA

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1. GENERAL ENERGY, ECONOMIC AND ELECTRICITY INFORMATION

1.1. General Overview

The Republic of Armenia, the smallest of the three Transcaucasian republics, is a landlocked mountainous country bounded on the north by the Republic of Georgia, on the east and southwest by Azerbaijan, on the south by Iran and on the west by Turkey. The northern border is 196 km long, the border with Azerbaijan is 913 km, the southern border has a length of 42 km and the western 280 km. The land area of the republic is 28 400 km^2. The terrain is defined by the high Armenian Plateau with mountains, little forest and fast flowing rivers. The average height above sea level is about 1 800 meters.

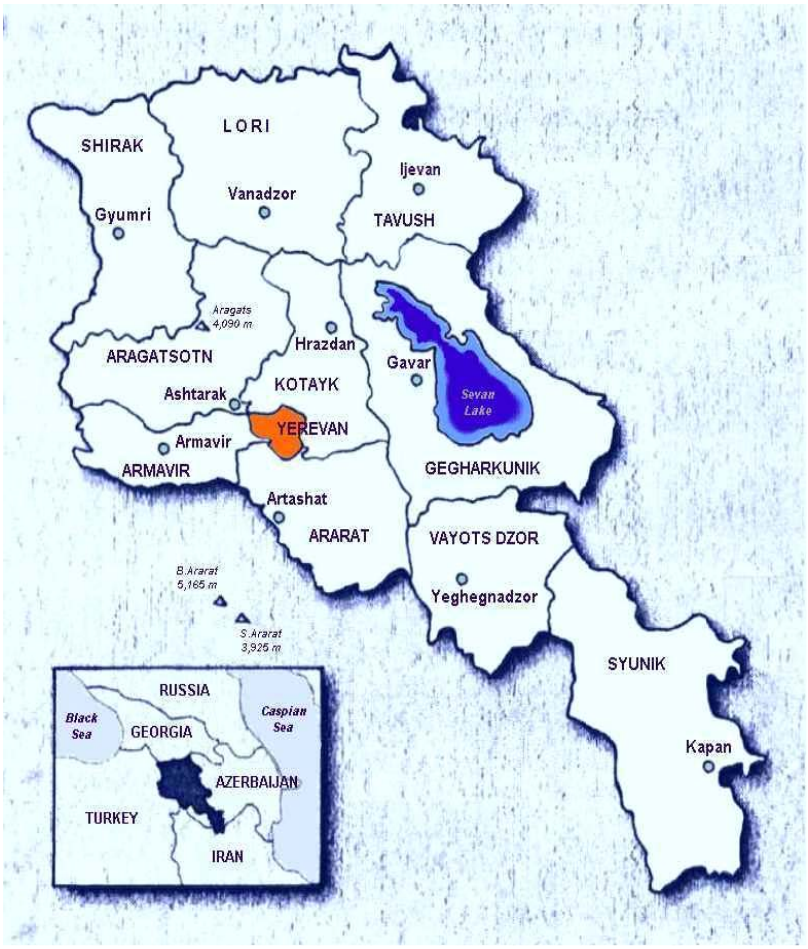

FIG. 2. Map of the Republic of Armenia

The climate is highland continental with hot and dry summers and cold winters. Annual average temperature varies from -2.7°C to 13.8°C. The coldest month is January (from 1.2°C to -12.8°C) and the hottest months are July and August (from 25.8°C to 8.7°C). Summer temperatures may rise up to 42°C, winter cold has maximum of 46°C below zero. Summer relative wetness is 32-45% (July-August), winter relative wetness is 80-90%. Annual rainfall varies from 220 mm (in winter) to 900 mm (May- June). The annual maximum sunshine is 2 780 hours (Lake Sevan area), and minimum 1 930 hours (Idgevan). The average intensity of solar radiation on the aclinic plane on a cloudless day is 700 kkal/m^2. The annual average wind velocity varies from 7.7 m/sec to 1.0 m/sec.

The population of Armenia, according to the 2001census of population, is about 3.21 million, of which 70% lives in urban areas. Armenia is a densely populated country with a density of 113 person/km^2. The historical population information is shown in Table 3.

TABLE 3. POPULATION INFORMATION

	1970[a]	1979[a]	1989[a]	1990	1998[b]	1999[b]	2000[b]	2001[a]	2002	**Average annual** growth rate (%) 1979 to 2002
Population (millions)	2.49	3.03	3.52	3.58	3.75	3.81	3.8	3.21	3.21	0.24
Population density (inhabitants/km²)	88	107	121	126	132	134	134	113	113	0.24
Urban population as percent of total	59	65	67	67	69	69	70	70	70	1.03
Area (1000 km²) 28.4										

[a] Formal data of the census of population. [b] Data & Statistics/The World Bank

Source: IAEA Energy and Economic Database; Data & Statistics/The World Bank; Country Information.

The population average growth from 1979 to 2002 is about 0.24% . The concentration of population is not equal in different areas of the republic. The Ararat Valley is the most populated territory of the country with the density of 245 person/km^2. Its area makes about 26.7% of the total territory and its population reach to 58.8% of the total population. Yerevan, the capital of the Republic of Armenia, lays in the Ararat Valley and is home to 1.2 million people, which is about one third of the total population. The highland areas have much less population with the density of 35 person/km^2.

1.1.1. Economic Indicators

After the disintegration of the Soviet Union, an economic crisis broke out, and Armenia suffered from sharp decline in production during the period 1990-1994. The country undertook great efforts to overcome it. Since then, the situation has been gradually stabilized, and the republic is coming out of the crisis following the transition to a market economy. During the period 1995-2002, the Gross Domestic Product (GDP) has increased on 83 %, and the average growth rate was 9.1 % per year. The historical GDP information is shown in Table 4.

TABLE 4. GROSS DOMESTIC PRODUCT (GDP)

	1990	1991	1992	1993	1994	1995	1996[c]	1997[c]	1998[c]	1999[c]	2000	2001	2002	**Average annual** growth rate (%) 1990 to 2002
GDP[(a)]	4098.0	3077.0	323.7	492.2	643.3	1286.5	1620	1670	1790	1850	1960	2100	2365	-4.48
GDP[(b)] per capita	1144.7	N/A	87.8	131.9	171.7	342.2	424	433	472	487	515	558	786	-3.1
GDP by sector (%) :														
-Agriculture	17	25	31	51	45	43	37	32	34	29	25	28	26	
-Industry	52	49	39	27	37	36	33	33	31	33	36	34	33	
-Services	31	26	30	22	18	21	31	35	35	39	39	38	41	

[(a)] Millions of current US$ at market prices [(c)] Data & Statistics/The World Bank

[(b)] Current US$ per capita at market prices

Source: IAEA Energy and Economic Data Base; Data & Statistics/The World Bank; Country Information.

Armenia is not rich in mineral raw materials. There are only a few items of considerable industrial value: copper, bauxite, molybdenum, precious metals, perlite, diatomite and coal. This

factor mainly determines the economic structure of the republic. There has traditionally been very little heavy industry. The manufacturing sector has a prevailing share in GDP.

1.1.2. Energy Situation

The main sources of energy, traditionally used in Armenia, are: oil products, natural gas, nuclear energy, hydropower and coal. Hydro and a small amount of brown coal are the only domestic sources of energy, which are exploited. The republic has no oil and some gas reserves (not exploited). There are no uranium resources either. The energy reserves are shown in Table 5. Primary energy sources, in thousand tonnes of oil equivalent, are summarized in Table 6. To meet its energy requirements, Armenia has to import gas, oil products and nuclear fuel.

TABLE 5. ESTIMATED ENERGY RESERVES

Exajoule

	Solid	Liquid	Gas	Uranium [(a)]	Hydro [(b)]	Total
Total amount in place	N/A	N/A	6.48	N/A	2.12	8.60

[(a)] This total represents essentially recoverable reserves.
[(b)] For comparison purposes a rough attempt is made to convert hydro capacity to energy by multiplying the gross theoretical annual capability (World Energy Council - 1998) by a factor of 10.
Source: IAEA Energy and Economic Data Base.

TABLE 6. PRIMARY ENERGY SOURCES

ktoe

Year	Coal and Wood	Petroleum Products	Gas (Natural + LPG)	Nuclear	Hydro	Electricity (Imp-Exp.)	Total
1996	22	411	900	606	135	N/A	2.074
1997	16	437	1.137	418	119	-5	2.122
1998	17	477	1.220	415	132	-32	2.229
1999	8	380	1053	542	103	-21	2.065
2000	2	322	1247	521	108	-40	2160
2001[a)]	-	-	-	-	-	-	-
2002[a)]	-	-	-	-	-	-	-

Source: Country Information.
[a)] information is not available

Hydropower is based on the water resources of the republic, including Lake Sevan, one of the largest highland fresh-water lakes in the world (1 900 m above sea level), and the rivers: Arax, Arpa, Hrazdan, Debet and Vorotan. During the last period of time, several small hydro power plants with the total capacity of 15 MW have been built. Hydro power plants of the Sevan-Hrazdan cascade are operating at a low level capacity, because, after the intense use of the lake water during the last crisis, the Government of Armenia decided to reduce releases from Lake Sevan to restore its potential. At the same time, Armenia has still an unused hydraulic potential of about 300 MW (or 1248 millions kWh of electric energy) that can be developed economically. The detailed information on all the power plants in Armenia is given in Appendix 2.

Natural gas is the most important source of energy covering up to 80% of the total energy supply. It is imported from Russia and used to operate two thermal power plants; a third thermal power plant is not operating, because it was built to supply thermal energy to an industrial factory, which is no longer in operation. However, the plans have been under discussion to restart this thermal power plant together with that industrial factory. The designed capacity of the high-pressure gas transportation network of Armenia is 17 billions m^3/year. In 1980, the maximum demand for natural gas in Armenia was above 5-6 billions m^3/year. There have been five main gas pipelines built, which ensured the gas delivery from three sides: Georgia, North and West Azerbaijan. Today, only the first one is operating. In 2002, the natural gas demand was 1.1 billions m^3, but the expected demand by the year 2015 will be 5.5 – 6.2 billions m^3/year depending on the ANPP status (closed or in operation). There are underground storage facilities for natural gas with a maximal gas storage volume of 180

million m^3. Gas distribution in Armenia is performed through high, medium and low-pressure distribution networks.

Oil products are imported from the neighbouring countries, mostly utilized for transport, industry, residential sector (heating) and as secondary fuel (mazut) in thermal power plants. During the last several years, mazut was not imported into the republic. As to the renewable sources of energy (geothermal, wind, solar and waste burning), they are under study and not yet available.

Armenia has a considerable potential of geothermal energy, but a programme has to be developed to explore the geothermal resources and to carry out drilling activities. Wind power projects (the construction of power stations) are still under discussion. The most worth-while regions suitable for the construction are: Vanadzor, Aragats, Lake Sevan basin and Sisian, where the wind velocity reaches 7 m/s. Armenia is a sunny republic with a high level of solar radiation. Nevertheless, it is too expensive to utilize the solar energy, and the republic, which appears to have very good solar radiation potential, cannot afford using it. A waste burning facility project (the construction of a station with a capacity of 10 MW in Yerevan) is under discussion as well.

Nuclear energy played a crucial role during the period of recovery from the economical crisis. There is one nuclear power plant in Armenia – Armenian Nuclear Power Plant (ANPP), which has two reactor units. Unit 1 is out of operation, and Unit 2 was re-commissioned in 1995, after 6.5 years of outage. The nuclear fuel necessary for the ANPP operation is supplied by the Russian Federation.

In Armenia, the primary energy per capita is around 0.65 toe/capita (2000). Energy statistics are shown in Table 7. The country total energy consumption shows a steady increase at a rate, which is significantly greater than the increase of GDP.

TABLE 7. ENERGY STATISTICS

Exajoule

	1995	1996	1997	1998	1999	2000	2001(4)	2002(4)
Energy consumption								
- Total (1)	0.08	0.09	0.09	0.09	0.09	0.09	-	-
- Solids (2)	N/A	0.001	0.001	0.001	0.00	0.00	-	-
- Liquids	0.02	0.02	0.02	0.02	0.013	0.016	-	-
- Gases	0.04	0.04	0.05	0.05	0.052	0.044	-	-
- Primary electricity (3)	0.02	0.03	0.02	0.02	0.026	0.027	-	-
Energy production							-	-
- Total	0.02	0.03	0.02	0.02	0.026	0.027	-	-
- Solids	N/A	0.001	0.001	0.001	0.00	0.00	-	-
- Liquids	-	-	-	-	-	-	-	-
- Gases	N/A	N/A	N/A	N/A	0.00	0.00	-	-
- Primary electricity (3)	N/A	0.03	0.02	0.02	0.026	0.027	-	-
Net import (import - export)							-	-
- Total	0.06	0.06	0.07	0.07	0.064	0.06	-	-
- Solids	0.00	0.00	0.00	0.00	0.00	0.00	-	-
- Liquids	0.02	0.02	0.02	0.02	0.013	0.016	-	-
- Gases	0.04	0.04	0.05	0.05	0.051	0.043	-	-

(1) Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.
(2) Solid fuels include coal, lignite and commercial wood.
(3) Primary electricity = Hydro + Geothermal + Nuclear + Wind.
(4) Information is not available
Source: IAEA Energy and Economic Database and Country Information.

Table 8 shows the energy consumption data during the years.

TABLE 8. TOTAL FINAL ENERGY CONSUMPTION

		1996	1997	1998	1999	2000	2001(1)	2002(1)
Total final consumption	ktoe	984	1 087	1 186	1 009	1122	-	-
Consumption increase	%		10.6	9.0	-14.9	11.2	-	-
GDP increase	%	5.8	3.1	7.2%	3.3	6.0	9.6	12.9

Source: Country Information.
(1) Information is not available

The data on energy consumption by sector (Table 9) do not show the major changes during the years. The energy consumption of Yerevan city is about 50% of the total energy consumption in Armenia.

TABLE 9. ENERGY CONSUMPTION BY ECONOMY SECTOR

ktoe

Economy Sector	1996	1997	1998	1999	2000	2001(1)	2002(1)
Industry	240	295	291	203	276	-	-
Transport	310	350	379	319	280	-	-
Agriculture	59	62	65	77	74	-	-
Commerce and public service	84	84	118	132	216	-	-
Residential	261	250	295	229	223	-	-
Non–specified	-	-	10	-	-	-	-
Non-energy use	30	45	29	49	54	-	-
Total energy consumption	984	1 087	1 186	1009	1123	-	-

Source: Country Information.
(1) Information is not available

1.2. Energy Policy.

Before the disintegration of the USSR, Armenia, as a part of the Soviet Union, was under the All-Union energy policy. The electricity generated by Armenian power plants was supplied into the Unified Transcaucasien Energy System. After becoming an independent state, Armenia had to meet the open market requirements in all the sectors of the industry including the energy sector. It was in need of reorganization and de-regulation too.

In March 2001, the National Assembly adopted a new edition of Law "On Energy of the Republic of Armenia". According to this Law, the main principle of the Government policy in the Energy sector is the separation of functions of economic activity, State management and regulation. According to that regulating principle, the inequality of conditions between the licensee and consumer was excluded.

According to the Law "On Energy of the Republic of Armenia", the functions of regulation are performed by the Energy Regulatory Commission which was established in 1997. Its general duty is to establish the proper electricity tariffs in the Energy sector. The Commission was renamed, and now it is called the Commission on Regulation of Natural Monopolies. The level of electricity average tariff was increased from 12 drams in 1995 to 21.6 drams, and the residential tariff to 25 drams (US $1= 540 Dram) that is in use by nowadays. The energy sector cost analysis has shown that in short-term perspective it is possible to stabilize the level of costs and restrain the increase of tariffs through promotion of the efficiency of power generation and improvement of transmission and distribution of electric energy, as well as by extension of the electricity market, loss reduction and

other measures.

In March 2000, the National Assembly adopted the Law "On Amendments and Additions to the Law On safe Use of Nuclear Energy for Peaceful Purposes". In particular, one of the amendments reads: "Those objects which are of safety importance shall be constructed and decommissioned by the relevant law".

Armenia ratified the Convention on Climate change on 8 of May 1993, and the Kyoto Protocol on 26 of December 2002.

A programme for improvement of metering, billing and collection of payments for electricity, heat and natural gas is being implemented, together with the transfer of accounting to international norms and standards and annual auditing of the company's financial reports by independent auditors. A programme has been implemented to organize collections through banks. Though there are difficulties in the whole economy of the country, the Government gives priority to budget payments for the electricity provided to budget organizations as well as compensation for the electricity consumed by irrigation, drinking water, industry and electrical transport companies.

In the district heating sector, a number of problems concerning physical wear of heating network equipment, lack of industrial heat consumption and low level of payment collection in the residential sector exists. The Government of the Republic of Armenia, together with the WB, developed the Strategy on district heating rehabilitation that was endorsed by the Government decree "On Reforming the District Heating System in Armenia" N 1384, 05.09.2002.

The results of asset revaluation show that the sector's main assets resources have already expired. The equipment is worn out and requires major overhaul, 38% of installed capacities are already over 30 years old. It is necessary to take all due measures to renew the energy sector of Armenia. In order to attract the investments into the Energy Sector of the Republic of Armenia, the following laws were adopted:

- the Law on Foreign Investment;
- the Law on Enterprises and Entrepreneurial Activities;
- the Law on Privatization and De-monopolization;
- the Law on Real Estate;
- the Law on Taxes (enables more favourable treatment for foreign investors);

1.3. The Electricity System

1.3.1. Structure of the Electricity Sector

The structure of the Energy Sector in Armenia is shown in Figure 3.

The Ministry of Energy is responsible for the sustainable electric energy supply to the consumers. Its responsibility is also to define the policy for the whole Energy sector development.

The ANRA duties are: to perform State nuclear energy regulation and supervision over the nuclear power objects and to license those objects. Its main objective is to secure the protection of the population, the personnel involved into the nuclear industry, and environment**.**

The Commission on Regulation of Natural Monopolies is responsible for the antimonopoly regulation. The key functions of the antimonopoly regulation are tariff regulation and licensing the entities in the energy sector.

"Armenergo" is a wholesale buyer-reseller of generated electricity and is responsible for dispatching and efficient electricity delivery.

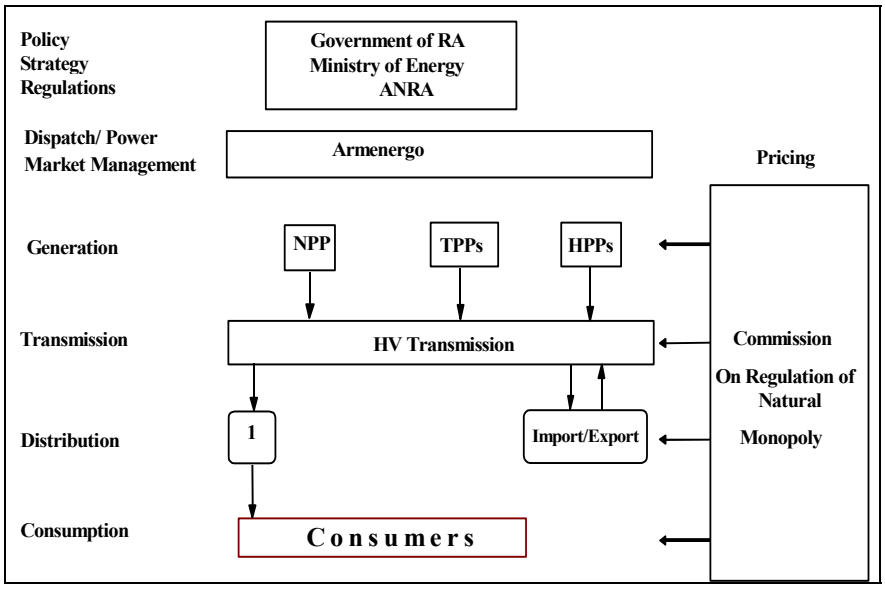

FIG. 3. Structure of the Energy Sector

1.3.2. Electricity Sector Decision Making Process

In 1998, a new energy policy was developed by the Government of Armenia, with the evaluation of the National Energy Balance as a main factor and a starting point for the National Energy Strategic Plan elaboration. The plan was further developed when, in the frame of the IAEA TC project - ARM 0/004, the document " Energy and Nuclear Power Planning Study for Armenia, covering the period up to 2020 " was accomplished (2002). The document includes the future energy demand forecast for Armenia and the capacities which will be needed to cover that demand.

A special attention was addressed by the Government to restructuring the energy sector. A number of laws in energy were adopted to achieve that target. Several small HPPs have been privatized. The implementation of a stabilization policy with the crucial role of restarted ANPP allowed the country to overcome the energy crisis of the post-Soviet period. Now Armenia is covering its electricity demand completely and can ensure the export of electric power to neighbouring countries. In the nearest future, however, additional energy sources may be required as the economy of the republic is recovering, and the living standard is increasing steadily.

Also, the item of great importance which must be taken into consideration during the decision making process is the insurance of the provision that the electrical system expansion, economic management and regulation should not be harmful for the environment.

1.3.3. Main Electricity Indicators

In 2002, the total installed capacity of the generating stations in Armenia was 3 050 MW. The annual electricity production was 5.48 billion kWh. Table 2 shows the statistics of the electricity production balance, and Table 10 - the energy related ratios. In addition, Figures 5 to 8 show the total electricity production, the electrical energy balance, the annual electric energy consumption per capita, and the share of electricity in the total energy consumption.

TABLE 10. ENERGY RELATED RATIOS

	1995	1996	1997	1998	1999	2000	2001	2002
Energy consumption per capita (GJ/capita)	22.17	27.6	23.6	24.9	22.9	24.2	-	-
Electricity per capita (MW·h/capita)	1.46	1.62	1.62	1.64	1.53	1.58	1.51	1.71
Electricity production/Energy production (%)	-	82	111	108	75	81	-	-
Nuclear/total electricity (%)	0.0	36.4	26.5	25.7	36.4	33.7	34.5	42
Ratio of external dependency (%) [(1)]	76.9	63.9	74.5	75.6	67	68	-	-
Load factor of electricity plants								
- Total (%)	23	23.6	22.6	22.6	20.8	22.3	21.4	20,4
- Thermal	21.8	16.0	20.8	20.0	15.9	18.4	19.1	11
- Hydro	21.6	17.7	15.9	17.4	13.6	14.3	11.0	18
- Nuclear	N/A	63.6	48.5	48.2	63	61	60	69

[(1)] Net import / Total energy consumption.

Source: IAEA Energy and Economic Database; Country Information.

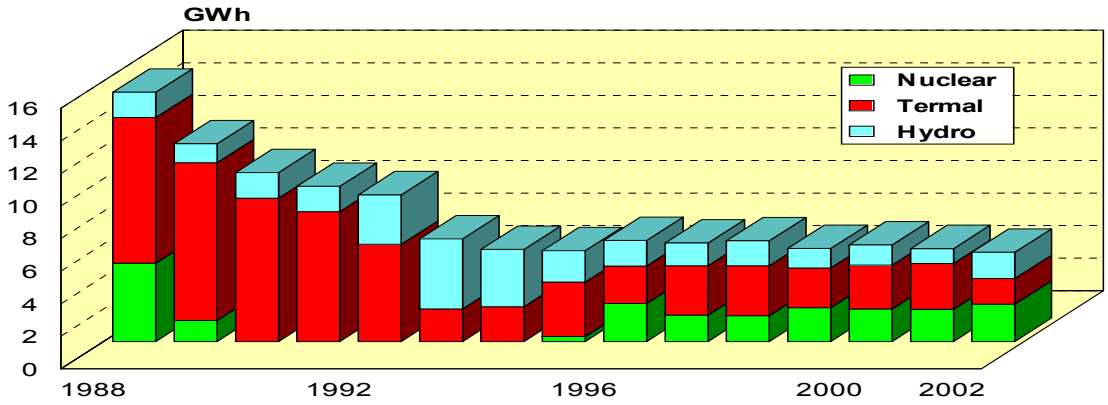

FIG. 5. Total Electricity Production

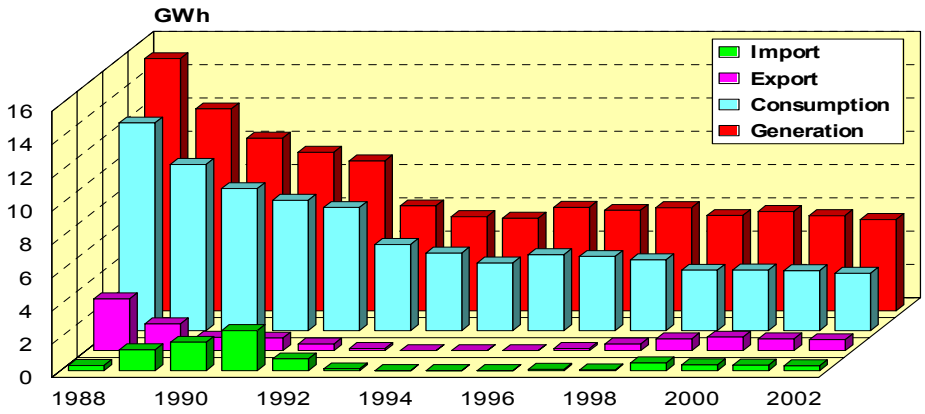

FIG. 6. Electrical Energy Balance

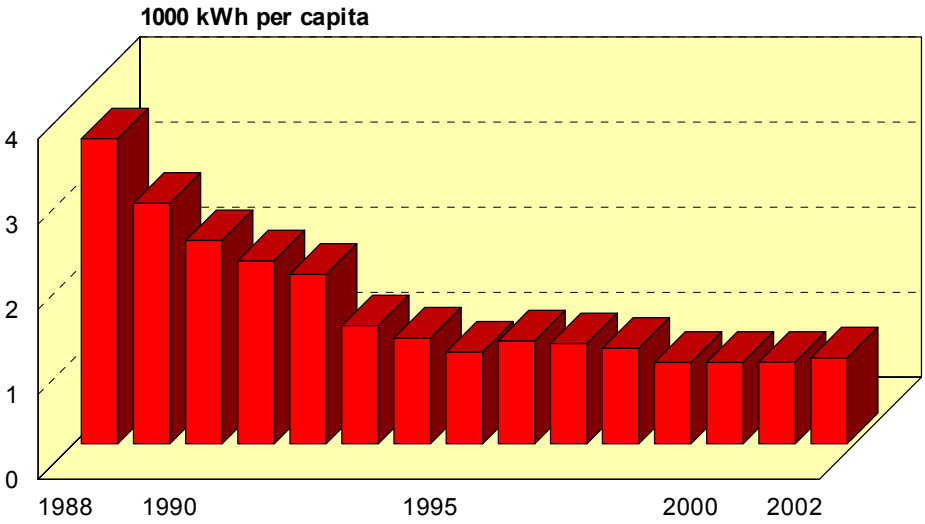

FIG. 7. Electrical Energy Consumption

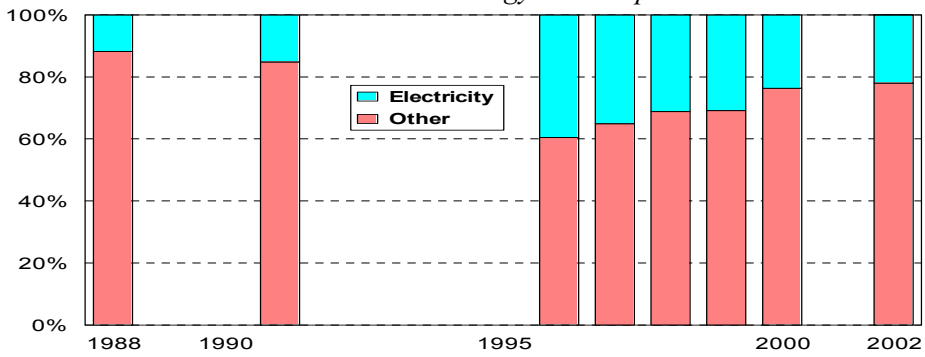

FIG. 8. Share of Electricity in Total Energy Consumption

2. NUCLEAR POWER INDUSTRY

2.1. Historical Development and current nuclear power organizational structure

2.1.1. Overview

A decision to construct a nuclear power plant in Armenia was made by the former USSR Council of Ministers, and the appropriate decree was issued in September 1966. In 1968, the Armenian Branch of ''Electrosetproject'' institute completed the pre-feasibility study for constructing the Armenian NPP (ANPP) under the project "The Scheme of NPP Contribution to Power Grid". That document included a schedule to commission Unit 1 in 1973, and Unit 2 – in 1974.

The technical specification to design the ANPP was developed by "Teploelectroproject" in 1968 and approved in August 1969 under decree No. 1624 R.C. of the USSR Ministry of Energy.

More than 20 potential sites were considered for the ANPP construction, and finally a site was selected in the western part of Ararat valley, 16km far from Turkish border, 10km to the north-east of region centre – Hoktemberyan (Armavir), and 28 km far (to the west) from Yerevan. Location of ANPP is shown in Figure 1.

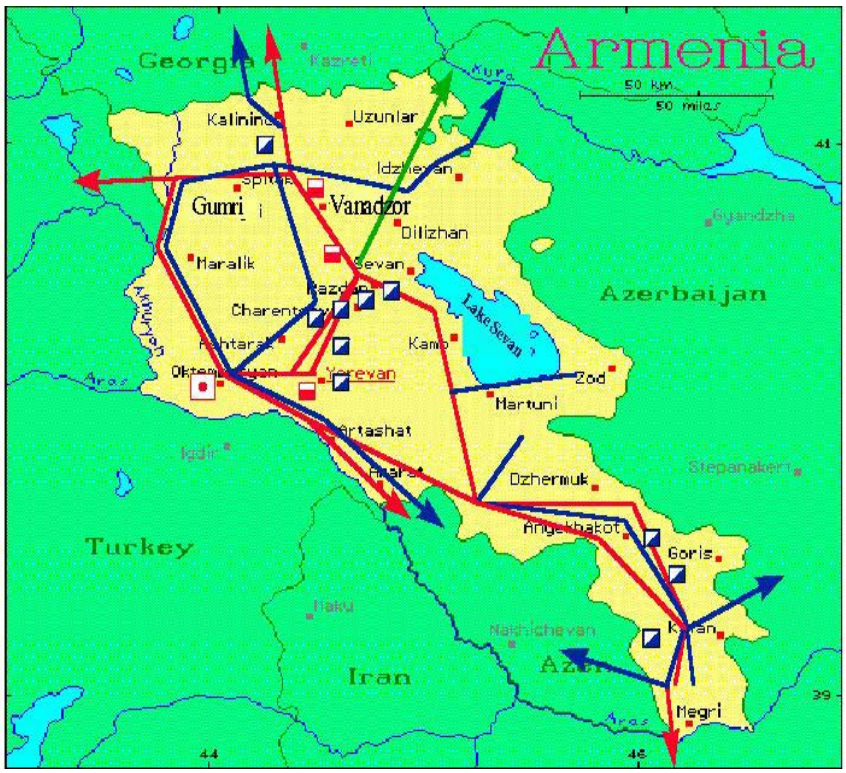

FIG. 1. Map of locations of all electricity generating power plants and main high voltage interconnections with the neighbouring countries

In accordance with that specification, the capacity of the ANPP (first stage of construction) with WWER-440 type reactors was to be 815,0 MW, each unit - 407.5 MW. The ANPP design life-time was specified to be 30 years.

The comprehensive studies and analyses showed that seismic conditions of the ANPP site were characterized by the level that corresponded to the eight-point intensity according to MSK-64 scale. That was the first nuclear power plant in the USSR intended to be constructed in the region of high seismicity.

The specific nature of the ANPP site - its seismicity - caused significant changes in WWER-440/230 design, not only in construction but also in design of reactor facility in the whole, and the reactor was assigned with the new identification – V-270. It was based on the project of Unit 3 of the Novovoronezh NPP.

The reactor building, auxiliary building, air chimney, as well as the buildings and structures containing equipment and instrumentation of safety systems or safety-related on-line systems and communications connecting these structures were assigned with category of High Importance. They were considered to have one point more seismic resistance than that of the ANPP site.

The Armenian Nuclear Power Plant was commissioned in 1976, with achieving the initial criticality for Unit 1 on 22 December 1976, and for Unit 2 - on 5 January 1980. The units were put into commercial operation on 6 October 1977 and on 3 May 1980, respectively.

In 1981, the technical-economic background was developed for the further expansion of the ANPP (the second stage of the plant) taking into consideration the needs of Yerevan city in a central

heating. The technical-economic background was approved and co-ordinated with all the relevant organizations. In 1985, the Gorky Department of "Atomteploelectroproect" Institute prepared a project: "Armenian NPP. Its expansion, taking into consideration Yerevan city central heating". The excavation work was started. The foundation pits for two new units (Unit 3, Unit 4) were dug through. But it was the Chernobil disaster of 1986 that served a reason for the Government of the Republic to make a decision to refuse further expansion of the ANPP. The work was stopped.

After the 1988 earthquake, though the Power Plant was not damaged, the Council of Ministers of the USSR decreed to shut down the ANPP as a precautionary measure. Unit 1 was shut down on 25 February 1989 and Unit 2 on 18 March 1989. The units were not decommissioned but kept in prolonged shut down condition.

In April 1993, the Government of Armenia decided to restart Unit 2 of the ANPP in order to overcome the severe economic crisis, taking into account the lack in national energy resources. After 6.5 years of outage, with the technical and financial help of the Russian Federation, Unit 2 of the ANPP was restarted in November 5, 1995. Unit 1 remained in a stand-still regime.

After the ANPP restart, 14billion 170mln kWh electric power has been generated by January 1, 2003, keeping the loads schedule of Armenian power system.

Apart from the short period of regaining independence (1988-1989), there have been no strong antinuclear movements in Armenia. The current sentiment of the public can be explained not by lack of awareness of the risks involved by the utilization of nuclear energy, but, in the face of the difficult economic conditions, by the considerably lower price of "nuclear electricity" which outweighs its possible risks

2.1.2. Current Organizational Chart

When in 1993 the decision was made to restart the ANPP, several new organisations were established.

On 27 of August 1993, the Department of the ANPP Operation (Armatomenergo) under the Ministry of Energy was established by the Governmental decree N 435. Armatomenergo was authorised with the functions of Operator of the ANPP.

On 16 of November 1993, the Armenian Nuclear Regulatory Authority (ANRA) at the Government of RA was established by the Governmental decree N573. The ANRA was authorized to be a regulation body in the area of nuclear and radiation safety, to perform inspection activity and issue the licenses for the appropriate applications.

On 4 of April 1996, the Government of Armenia decided (decree N 98) to liquidate the "Armatomenergo" Department and transfer the functions of Operator to the CJSC "Armenian NPP". At the same time, the Department of Atomic Energy was established at the Ministry of Energy.

The ANPP is operating in close cooperation with such organizations as CJSC "Armatom", CJSC "Atomservice" and CJSC "Atomenergoseismoproject".

The "Armatom" institute was created in 1973. It has been rendering the engineering support to the ANPP since its date of creation. The institute activity included: implementation of diagnostic systems; implementation of Safety Parameters Display System (SPDS), creation of a compact simulator, and then of a multi-functional one. Now "Armatom" is participating in development of "Deterministic Analysis of ANPP Unit 2" and "Probabilistic Safety Analysis of ANPP Unit 2".

CJSC "Atomservice" was created in 1987. The company took active part in the ANPP

systems adjusting and testing programs implementation during the period of preparation for the ANPP Unit 2 restart. It continues to perform the same activity nowadays.

CJSC "Atomenergoseismoproject" was created in 1983. During the period of preparation of Unit 2 of the ANPP for its restart in 1993-1995, a set of works on finishing investigations of the plant seismic conditions was performed by CJSC "Atomenergoseismoproject" for final resolution and approvement of the possibility of the plant restart and further operation. The whole processes of work and final resolution were considered and discussed with the IAEA experts. One of the major results of conducted investigations was the proving that the ANPP has been erected on a whole (undestructed) basalt block, i.e. absence of tectonically active break under the ANPP site was proved.

2.2. Nuclear Power Plants: Status and Operations

2.2.1. Status of nuclear power plants in operaiton, under construciton, closed down.

The ANPP consists of two nuclear power units of WWER-440 type. Since 1989, Unit 1 is in a state of stand-still. Since its restart (1995), Unit 2 of the ANPP has been in operation. Unit 2 installed gross capacity is 407.5 MW.

The total production of electricity in Armenia during 2002 amounted to 5,475 billion kW·h, with the nuclear share – 2,286 billion kW·h. The comparative figures on the electricity production in Armenia for all the power plants are shown in Table 2.

Table 1 shows the status and some other indicators of the nuclear power units of the ANPP.

TABLE 1. STATUS OF NUCLEAR POWER PLANTS

Units	Type	Net Capacity	Operator	Status	Reactor Supplier
ARMENIA-2	WWER	376	CJSC "ANPP"	Operational	MTM
ARMENIA-1	WWER	376	CJSC"ANPP"	Shut Down	MTM

Units	Turbogenerator Supplier	Construction Date	Criticality Date	Grid connection Date	Commercial Date	Shutdown Date
ARMENIA-2	KHTP	01-Jul-75	05-Jan-1980	05-Jan-1980	31-May-1980	
ARMENIA-1	KHTP	01-Jan-73	22-Dec-1976	28-Dec-1976	06-Oct-1979	25-Feb-1989

Note: Armenia 2 was shutdown in 1989 and restarted operation in November 1995
Source: IAEA Power Reactor Information System as of 31 December 2002

There is no nuclear power unit under construction in Armenia nowadays.

2.2.2. Performance of NPPs.

The main organizations and institutions involved in nuclear energy in Armenia are: the Ministry of Energy, the Armenian Nuclear Regulatory Authority, CJSC "ANPP", CJSC "Armatom", CJSC "Atomservice" and CJSC "Atomenergoseismoproject". Besides, some technical support has been providing by such organizations of Russian Federation as: OKB "Hydropress" - main reactor designer; "NIIAEP Nizhnii Novgorod" - main NPP designer; RNC "Kurchatov Institute" – scientific management, and others.

The issues of the ANPP safety upgrading are of much importance for the Armenian Ministry of Energy being first–rate priority. The safety level of the ANPP during the times of very limited financial resources was one of the main concerns of the Armenian Government. After numerous consultations with the experts from the USA, countries of Western Europe and Russian Federation,

Armenian specialists, with the assistance rendered by the IAEA experts, developed a new programme of the ANPP safety-upgrading. It was called “List of measures for Unit 2 of the Armenian NPP safety and reliability upgrading for the period of 2001 - 2004”, and was introduced to replace the previous one. The safety-upgrading process, having been permanently implemented at the ANPP, has been realizing according to the provisions of that programme.

US DOE and EC TASIC greatly assisted to the ANPP with implementation of many measures from that List. The activities enabled the ANPP to have the safety level increased much, so that the plant can withstand emergency situations without failures.

The information on the ANPP operational quality is given below.
In 1995, Unit 2 of the ANPP had five emergency events of level “0” on the International Nuclear Event Scale (INES). In 1996, there were 8 emergency events occurred at the ANPP, including: 1 – of level “1”, 7 of level “0” on the INES scale. In 1997, there were 5 emergency events occurred at the ANPP, including: 2– of level “1”, 3 of level “0” on the INES scale. In 1998, there were 7 emergency events occurred at the ANPP, including: 2– of level “2”, 1– of level “1” and 4 of level “0” on the INES scale. In 1999, had one emergency shutdown and one event of level “1”. In 2000, there were 3 events reported, one event was rated level “1”, and two events were rated level “0”. In 2001, there were 8 emergency events occurred at the ANPP, including: 3 – of level “1”, 5 of level “0” on the INES scale. In 2002, there were 8 emergency events of level “0” on the INES scale occurred at the ANPP, including 2 emergency shutdowns.

2.2.3. Nuclear electricity generation, share in operation electricity generation

The information on a total electricity generation and its distribution by plants types, as well as the capacities of those plants, is given in Table 2.

TABLE 2. ELECTRICITY PRODUCTION AND INSTALLED CAPACITY

	1988	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Electricity production (TW·h)												
- Total [1]	15.28	9.00	6.29	5.66	5.57	6.22	6.03	6.19	5.72	5.96	5.74	5.48
- Thermal	8.94	5.96	2.00	2.14	3.34	2.33	3.03	3.06	2.44	2.69	2.79	1.58
- Hydro	1.52	3.04	4.29	3.51	1.93	1.57	1.40	1.54	1.20	1.26	0.97	1.61
- Nuclear	4.82	-	-	-	0.30	2.32	1.60	1.59	2.08	2.01	1.98	2.29
Capacity of electrical plants (GW(e))												
- Total	3.51	2.75	2.75	2.75	2.75	3.04	3.04	3.13	3.13	3.05	3.05	3.05
- Thermal	1.75	1.75	1.75	1.75	1.75	1.66	1.66	1.75	1.75	1.67	1.67	1.67
- Hydro	1.00	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
- Nuclear	0.76	0.0	0.0	0.0	0.0	0.38	0.38	0.38	0.38	0.38	0.38	0.38

[1] Electricity losses are not deducted.
Source: IAEA Energy and Economic Database; Country Information.

2.2.4. Nuclear power development projections and plans.

In the frame of the IAEA TC project - ARM 0/004, there was developed the document “ Energy and Nuclear Power Planning Study for Armenia, covering the period up to 2020 ” which was completed in 2002. The document includes the future energy demand forecast for Armenia and the capacities which will be needed to cover that demand. During the study, the two options were chosen for Armenian energy system development – with the use of nuclear power and without it. According to that study, the first option is more preferable for Armenia because it can ensure the energy independence and energy security of the country, taking into consideration the fact that Republic of Armenia has limited domestic energy sources. According to the study, it will be needed to put into operation two new medium-size nuclear units, one in 2015, the other – in 2017.

2.3. Supply of NPPs.

Both units of the ANPP with the WWER- 440 (V-270) type reactors were designed and constructed by organizations of the former Soviet Union under the supervision of the Ministry of Energy and Electrification of the USSR. The design of the first stage of the plant was developed in 1969-1970. The chief scientific supervisor was Kurchatov Institute of Atomic Energy (Moscow). Now it is called RNC "Kurchatov Institute". The chief design organization was Thermoelectroproect (TEP), Gorki. Now it is called NIAEP, Nizhny Novgorod. The main reactor construction organization was OKB "Gidropress", Podolsk. The "Izhora Factory" Leningrad Enterprise was the manufacturer of the reactors and systems. The turbines were manufactured by the Kharkov Turbine Plant (KHTP). The electric generators were supplied by the "Electrosila" plant of Leningrad.

The building-construction work was performed by the "Gidroenergostroy", Yerevan.

All the nuclear fuel necessary for the ANPP operation was delivered in the past and has been delivering now by the "TVEL" concern of Russian Federation.

2.4. Operation of NPPs

In Armenia, the objects of Nuclear Energy are of State monopoly. In order to improve the ANPP management, the Government of RA issued a decree on "The Measures for Management Upgrading within the Energy Sector of RA", N 166, 22.02.2002. According to that decree, the management of the ANPP was transferred to five officials, in equal shares, so they are authorized to supervise over the ANPP shares. Those official are: the Prime Minister of RA, the Minister of Energy of RA, the Minister of Finance and Economy, the Minister of Justice and the Minister of Management of State Property.

Although the CJSC "Armenian NPP" was authorized to be the Operator of the ANPP, for other purposes, such as liability to foreign countries, the State is assumed to be the Operator.

2.5. Fuel Cycle, Spent Fuel and Waste Management Service Supply

Armenia has no fuel cycle industry. Up to now, all the nuclear fuel has been supplied by Russia. Originally, the spent nuclear fuel generated by the ANPP was managed by the Soviet Union central agencies of reprocessing and final disposal of the spent nuclear fuel. The recovered uranium and plutonium were retained by the central agencies in the Soviet Union. However, with the disintegration of the Soviet Union, Armenia had to find other solutions.

The ANPP is operating with the three-year fuel cycle. The spent nuclear fuel, before its transfer to the dry storage, is being kept in the wet nuclear fuel storages – fuel ponds.

In 2000, the construction of the first stage of spent fuel dry storage was completed. The construction was commissioned by the French firm Framatom and financed by the French Government. The spent fuel dry storage facility has been put into operation, and all the transportations of spent fuel were performed according to the requirements of the license given by the ANRA. Now, all the volume of the storage is filled with the spent fuel. It is envisaged to construct the second stage of the dry storage facility.

The final spent fuel and radwaste treatment and disposal concept will be developed and included into the ANPP Decommissioning Programme.

2.6. Research and Development Activities

There are no major R&D activities in the country.

2.7. International Co-operative Projects and Initiatives

Armenia has bilateral cooperation, mostly concerning safety of the ANPP, with such countries as Argentina, France, Italy, Russian Federation, UK and USA. Armenia also participates in several international projects in the frame of cooperation under the aegis of IAEA, TACIS (EC) and USAID.

Very close cooperation is established with the IAEA. Armenia has become a member of this organization since 1993. The IAEA experts have been participating in many various assistance projects since then. When in April 1993 the Government of Armenia made the decision to restart Unit 2 of the ANPP, the IAEA experts participated actively in pre-commissioning investigations and were performing the evaluation of the plant equipment condition. Moreover, they elaborated the whole concept of Unit 2 re-commissioning. Armenia is also collaborating with the IAEA in the field of nuclear safety upgrading. At present, several national programmes of the ANPP Unit 2 safety upgrading are in different phases of implementation. The IAEA is permanently assisting the ANRA providing it with the appropriate support and recommendations.

Since 1996, the EC started, within the framework of TACIS Assistance Programmes, the implementation of projects aiming at technical assistance in upgrading a level of the ANPP operation, as well as modernization of the plant technological equipment, construction of a multifunctional simulator for the ANPP, etc. Since 2000, a new cycle of the ANPP safety upgrading projects was initiated within the framework of TACIS Assistance Programmes.

Armenia cooperates with Argentina in the frame of bilateral project “Creation in Armenia of a Center for training and qualification in Non-Destructive Metal Testing Techniques”.

French experts from FRAMATOM were involved in a joint project of construction of the first stage of the spent fuel dry storage facility. The work started in 1996, and the storage has been now in operation.

The Italian firm SOGIN together with the CSJCs Armatom and Atomservice is working on the development of a part of the Probability Safety Analysis for the ANPP.

The Russian Federation is also an active partner of Armenia. There are many joint projects within the framework of the Nuclear Safety Assistance Programme, which are realized in close co-operation with the Russian experts. They also took active part in pre-commissioning and restart of Unit2 of the ANPP. In 1996, an agreement was signed between the ANPP and ROSENERGOATOM on industrial and technical-scientific co-operation. In 2000, the agreement was signed between the Governments of RA and RF on “Cooperation in the field of peaceful use of nuclear energy”.

There are a number of projects financed by the US Department of Energy (US DOE). Since 1996, in the frame of the Nuclear Safety Assistance Programme for Armenia, the USA specialists have implemented at the ANPP many technical assistance projects aiming at upgrading the safe operation of a plant. Among their number, the projects on improving the fire protection systems and purchasing the equipment for the new cooling system. They assisted also in computerization of the safety system and procurement of the equipment for the ANPP safe operation. The experts from US DOE are also participating in the development of a programme for future decommissioning of the ANPP.

In the frame of bilateral cooperation between the two countries, in 2001, at the “Armatom”

institute of RA, the International Nuclear Safety Center of Armenia was created. The Joint Statement on cooperation between International Nuclear Safety Centers of Armenia and USA was signed on 07.02.2001.

In 2000, the implementation of joint projects carried out with the assistance of the Department of Trade and Industry (DTI) of the United Kingdom was started. The projects were fulfilled in the frame of an assistance programme aiming at the ANPP safety upgrading. The activity included, in particular, the elaboration of plant operational procedures and development of a Quality Assurance programme. The cooperation related to the establishment of an emergency centre for the ANPP is still under way, and the development of some parts of the Probability Safety Analysis for the ANPP has been continuing.

Since 1996, the ANPP is a member of World Association of Nuclear Operators (WANO). The Moscow Centre of WANO has conducted at the ANPP two inspection checks with the intention to verify the plant's operational safety.

The ANRA has agreements for cooperation with Nuclear Regulatory Authorities of the following countries: Russia, USA, Argentina and Ukraine. The ANRA is a member of the FORUM organization, which members are the nuclear regulatory authorities from the countries operating WWERs. The ANRA participates also in the CONCERT Group work.

3. NATIONAL LAWS AND REGULATIONS

3.1. Safety Authority and Licensing Process

The state authority for supervision on nuclear and radiation safety was established by Government decree N573, 16.11.1993. It was called the State Department for Supervision on Nuclear and Radiation Safety of Utilization of Nuclear Energy at the Government of RA. By the same decree, the Statute of the ANRA was approved, and the authority was empowered to act as inspection.

By Government decree N70, 19.02.2000, the Department was authorized to have also the regulating functions, and, in accordance with that decree, a new Statute of the authority was prepared. It was approved by Government decree N385, 22.06.2000. A new name was given to he Department – the Armenian Nuclear Regulatory Authority (ANRA). The ANRA was under a direct subordination to the Armenian Government and independent from those organizations responsible for development and utilization of nuclear energy. According to its new Statute, the ANRA was to organize and perform State supervision and inspection on utilization of nuclear energy, as well as the regulation activity within the sphere of nuclear power..

On 24 of May, 2001, according to Government decree N 452, the ANRA was powered to have functions of State regulation on protection of ionization sources integrity and against their irradiation harmful impact.

The status of the ANRA was changed again on 27 June 2002, according to the Government decree N 912, in order to respond to the reforming principles implemented into the Armenian System of Government Management. The ANRA was included into the Ministry of Environmental Protection of RA. On 26 December 2002, a new Statute of the ANRA was approved by the Government decree N 2183. The ANRA was renamed, and now it is called the Inspection for State Supervision on Nuclear and Radiation Safety of Utilization of Nuclear Energy under the Ministry of Ecology of RA. According to the new Statute, the ANRA is charged with the following key duty: to perform State regulation within the field of nuclear energy utilization with the main objective - to secure the

protection of the population, the personnel involved into the nuclear industry, and environment against the dangerous radiation impact .

Armenia has a single-stage licensing process for NPPs, and the licensing authority is the ANRA. The licensee is responsible for the safety of nuclear power facilities. The licensee is obliged by the license to:

- guarantee the keeping of principles, criteria and requirements on the nuclear and radiation safety, as well as the conditions or acts of the temporary exploitation permission;
- inform the ANRA about the deviations of the conditions of the temporary exploitation permission, as well as the incidents and emergencies during the NPP power unit exploitation.

On 25 of April, 2001, according to the Government decision N 342, the Science-Research Centre of Nuclear and Radiation Safety was established at the ANRA with the objective to make it possible for the ANRA staff to carry out an independent expertise activity.

On the basis of the Government decree N 389, 22.08.1994, all the rules and norms applicable to nuclear power in Russia have been accepted in Armenia. The ANRA is aware of the fact that some of these regulations need revision. This process is under way.

3.2. Main National Laws and Regulations

The following laws and Government decrees concerning the activities in the field of nuclear energy use are in force in Armenia:

- Law on “Implementation of modifications and additions both in the Code of RA on administrative and criminal legal violations”, entered into force on 30 November 1996.
- Law on “Energy of the Republic of Armenia”, entered into force on 1 July 1997.
- The new Law on “Energy of the Republic of Armenia” entered into force in March, 2001, and replaced an old one which entered into force on 1 July 1997.
- Law on “Safe Use of Nuclear Energy for Peaceful Purposes” entered into force on 1 March 1999.
- The amendment to the law on “Safe Use of Nuclear Energy for Peaceful Purposes” entered into force on 21 March 2000.
- The Government Decree N-389, 22.08.1994, on the “Implementation in Armenia of Regulations and Standards on Nuclear and Radiation Safety which are in force in the Russian Federation”.
- The Government Decree N-401, dated 04.07.1995 on “Introduction of Additions in the Government Decree N-161, dated 05.03.1991” (about the types of activities that are subject to licensing).
- The Government Decree N-331, dated 08.12.1995 on “Restart of the ANPP Unit 2, and the Measures for Ensuring its Further Safe and Uninterrupted Operation”.
- The Government Decree N-465, dated 19.07. 1999, approved the list of objects, which are of safety importance in the field of nuclear energy use.
- The Government Decree N-769, dated 22.12. 1999, approved the list of operations and work positions, which are of safety importance in the field of nuclear energy use.

- The Government Decree N-746, dated 13.12.1999, approved the "Order of Evacuation of Population from the Contaminated Territories".
- The Government Decree N-679, dated 25.10.2000, approved the "Order of Providing the Population with the Individual Protection Means".
- The Government Decree N-640, dated 12.07.2001, approved the "Rules for Organizing and Conducting the Safety Expertise in a field of Nuclear Energy Utilization".
- The Government Decree N-1263, dated 24.12.2001, approved "Special Rules for Nuclear and Radioactive Materials Transportations".
- The Government Decree N-765, dated 16.08.2001, approved the "Order of State Registration of Ionisation Irradiation Sources".
- The Government Protocol N-51, dated 13.12.2001, adopted the "Principal Positions on Planning and Realisation Activities for the Nuclear and Radiation Accidents Resistance".
- The Government Decree N-931, dated 27.06.2002, approved the "Nuclear and Radioactive Materials Safety Transportation Rules".
- The Government Decree N-2013, dated 21.11.2002, approved the "Requirements to the Volume and Structure of Safety Analysis Report on the ANPP Unit 2".

4. CURRENT ISSUES

4.1. General

Nuclear power plays a crucial role in a country's electric energy supply. In Armenia, the share of nuclear electricity generation reaches 40 % of all electricity production. Therefore, to achieve the top level of safety in operation of the ANPP is the central issue of concern for the Government of Armenia. This problem attracts the attention of all the responsible bodies of the RA.

Since 1996, the Nuclear Energy Safety Council of the President has been acting in Armenia. Its general duty is to report annually to the President on the real situation with the nuclear energy safety at the ANPP. The members of the Council observe in advance all the relevant documents and listen to appropriate specialists reports before making their decisions. The Council consists of the internationally acknowledged specialists well known within the world nuclear power sphere.

The Ministry of Energy, defining the policies for the whole energy sector; is, in particular, responsible for the development of the ANPP safe operation programmes, and it acts in close cooperaiton with other responsible bodies.

4.2. Human resources development

Nuclear power in Armenia is not only an important branch of industry providing the country with the electric energy, it also ensures the employment for the population of the republic. Nowadays, more than 2000 employees are involved into the nuclear energy sector activity working both at the ANPP and in the sphere of nuclear sector supporting services. All of them are the Armenian citizens, and the majority of them has been graduated from the Armenian State Engineering University and Yerevan State University. The ANPP staff consists of educated people of various corresponding specialities. The above mentioned institutes continue to prepare specialists for the nuclear energy branch.

4.3. Privatisation and deregulation

In June 1999, the Government of Armenia, in accordance with the common strategy of transfer of the country to the market economy and law in force (Law "About the Plan of Privatization of State Property of the RA during the years 1999 – 2000" approved by the National Assembly of the RA on 17.01.1999), decided to privatize 4 Electricity Distribution Companies (ESCs) by the competitive international tender. Privatization of state companies was implemented to encourage market competition. The tender was declared, but it failed. In order to make Armenian Electricity Distribution System more attractive for the potential investors, those 4 Companies were united into one company which included also 110 kV Transmission Lines. The new company was called CJSC "Armenian Electric Networks" (ArmElNet).

On 26 of July 2002, a new tender for privatization of ArmElNet was announced. The deadline for presentation of proposals was established on 9 of August 2002. The only one proposal was submitted by the Midland Resources Holding LTD, so the company was recognized the winner and recommended for the award. On 26 August 2002, the company became an owner of ArmElNet.

On 5 November 2002, the protocol was signed on a transference of the Hrazdan TPP to the Russian Federation. The power plant became the Russian Federation property in account of Armenian State loan debt covering.

As to the ANPP, according to the acting laws of the Republic of Armenia - "Energy Law" and Law on "Safe Use of Nuclear Energy for Peaceful Purposes", the nuclear power plant is not subject to privatization.

4.4. Role of the government in the nuclear R&D

The Government is financing the R&D work " Energy Generation and Transmutation Radwaste by Using the Energy Amplifier" which began in 1998 and will be finished in 2004. The investigation has been performing by the staff of the Physical Department of the Yerevan State University.

In 2000, Armenia joined the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), IAEA initiative, in order to address the needs of economic, safety, non-proliferation and waste management aspects of nuclear energy and its fuel cycle with innovative technology.

4.5. Nuclear Energy and Climate Change

Nuclear power plant in Armenia, like those in many countries using nuclear way of electricity generation, is the most ecologically preferable electric energy generating facility from the view of the republic environment cleanliness and natural wealth protection. Unlike the most thermal power plants emitting the CO^2 gas, the ANPP makes it possible to keep the country's air purity within the limits of the internationally adopted norms and regulations.

4. 6. Safety and waste management issues

Since the restart of the ANPP, up to 01.01.2003, there have been completed 118 engineering activities and 1058 safety improvement measures. The most important of them are:

- Completion of the nuclear service water system project. This system is intended to endure earthquakes of high magnitude. Also seismic pumps and other equipment have been installed;
- 7 Fast closing main steam isolation valves (MSIV) were installed. They will provide better control in case of a steam line accident and will reduce the risk of a more serious accident involving overcooling of the primary coolant system and reactor vessel;
- 12 Steam generator safety valves (SGSV) were replaced by new ones;

- 2 Safety valves of the pressurizer were replaced by new ones;
- Replacement of more than 12,000 sq.m. of Reactor Department and Auxiliary Building combustible plastic floors with the non-combustible casting covering was carried out.
- Replacement of cable conduits doors and Turbine hall doors with the 90 min. fire-resistant doors was carried out.
- A new fire detection and alarm system was put into operation. 700 Smoke/fire type detectors were installed, of which 70 are blow resistant;
- An analysis of the material structure of the reactor vessel and primary circuit piping has been carried out by using various modern methods;
- The installation of a leak detecting system from the primary to the secondary circuit was implemented;
- The bearing metallic structures (columns) in the turbine hall building and in the emergency diesel-generator room have been coated with fire-resistant material.
- A seismic safety related re-evaluation programme for Unit 2 has been developed.
- A multifunctional simulator, for training the operators, was put into operation.
- Reconstruction of feed-water distribution headers inside the Steam Generator (SG) 1 and 6 was fulfilled.
- Review of "SIAZ" logic and scope in regard with the Service Water System implementation.
- Replacement of emergency condenser tubing in low-pressure cooling system (AK) was completed.
- Commissioning of new system for Reactor Cooling Pump (RCP) shaft seal was performed.
- Installation and commissioning of diesel-pump for feeding SG in the event of full de-energizing were completed.
- Reconstruction of Turbo Generator (TG) -3 shaft seal system was completed.
- Scenario was developed for reactor transfer to safe controlled condition in seismic event.
- Installation of a compressor for annual pressure tests of SG and RCP compartment tightness.
- Installation of two sulphur hexafluoride (SF6) breaker sets in main generator circuits.
- Reconstruction of TG-4 shaft sealing system.
- Improvement of two DG startup oil supply system.
- Implementation of pressurizer Safety Valve(SV) function for reactor cold overpressure protection.
- Installation of additional circuit breakers for control circuits of power-operated valves (410 pcs).
- Reconstruction of two SG -2;3 (Steam Generator) distributing headers.
- Replacement of two obsolete Reverse Motor Generator (RMGs).
- Installation of fire alarm in Units 1;2 boron compartment.
- Development and implementation of "Feed-and-Bleed" procedure.

According to the ANPP design, an annual Unit 2 radioactive waste (radwaste) generation is: 308 m^3 of solid LLW; 1,5 m^3 of solid MLW; 0,3 m^3 of solid HLW; 108 m^3 of liquid radwaste.

At the ANPP, there are storages for both solid and liquid radwaste. High-level waste is stored in a special room of the Reactor building. The storage area consists of 380 cells. The storage capacity

is 78.34 m^3. Medium-level radwaste is stored in the Special Building. Storage capacity is 1001,22 m^3.

Also, the deep evaporating facility containers are stored temporarily on the upper unheated floor of the Special Building. Its effective storage volume is 655 m^3 (3000 containers).

The storage facility for low-level radwaste consists of two compartments, each measuring 27x36x8.9 m. The total storage volume is about 17050 m^3.

Liquid radwaste is stored in the Special Building. Liquid wastes (evaporator residues) generated in the evaporators during drain water reprocessing are collected in the evaporator residue tank.

4.7. Other issues

In 2002, in Armenia, the All-Armenian Atomic Power Engineers Association was established. The founders of the Association are specialists from such organizations as the Ministry of Energy of RA, Armenian NPP, Armenian Nuclear Regulatory Authority (ANRA), State Engineering University (SEUA), and other nuclear power specialists.

The main objectives of the Association are:

- to promote the scientific idea development in nuclear engineering;
- to support the nuclear energy propaganda and further development;
- to conduct testing in the field of atomic energy according to the established procedures;
- to ensure the propaganda of nuclear energy by:

a) publishing articles, magazines, books, dictionaries, reference books;

b) organizing scientific seminars;

c) creating radio-programmes, documentary- and scientific films, video cassettes devoted to the nuclear energy;

d) creating computer training- and demonstration programmes;

- to organize public discussions of the problems relevant to nuclear energy.

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[6] IAEA Energy and Economic Database (EEDB).

[7] IAEA Power Reactor Information System (PRIS).

[8] EC TASIC Project N Europe Aid /112/135/C/SV/Multi " Energy Consumption Forecast

Appendix 1

INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

AGREEMENTS WITH THE AGENCY

• NPT related agreement INFCIRC No: 455	Entry into force:	5 May 1994
• Additional protocol GOV/2948	Signed:	29 September 1997
• Improved procedures for designation of safeguards inspectors		No reply
• Supplementary agreement on provision of technical assistance by the IAEA	Signed:	30 September 1999
• Agreement on privileges and immunities		Non-Party

RELEVANT INTERNATIONAL TREATIES OR AGREEMENTS

• NPT	Acceded:	15 July 1993
• Convention on the physical protection of nuclear material	Entry into force:	23 September 1993
• Convention on early notification of a nuclear accident	Entry into force:	24 September 1993
• Convention on assistance in case of a nuclear accident or radiological emergency	Entry into force:	24 September 1993
• Vienna convention on civil liability for nuclear damage	Entry into force:	24 November 1993
• Joint protocol		Non-Party
• Protocol to amend the Vienna convention on civil liability for nuclear damage		Not signed
• Convention on supplementary compensation for nuclear damage		Not signed
• Convention on nuclear safety	Entry into force:	20 December 1998
• Joint convention on the safety of spent fuel management and on the safety of radioactive waste management		Not signed

• ZANGGER committee		Non-Member
• Nuclear export guidelines		Not adopted
• Acceptance of NUSS codes		No reply
• Comprehensive nuclear-test-ban treaty		1 October 1996

BILATERAL AGREEMENTS

• Agreement with the Russian Federation on restarting operation of ANPP	Entry into force	17 March 1994
• Agreement with Republic of Argentine on co-operation for the peaceful uses of nuclear energy	Entry into force:	22 April 1999
• Agreement with the Government of the Russian Federation on co-operation in the field of peaceful use of nuclear energy	Entry into force	10 January 2001

Appendix 2

DIRECTORY OF THE MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

NATIONAL ATOMIC ENERGY AUTHORITY

Ministry of Energy Government House 2, Republic Square 375010 Yerevan, Republic of Armenia	Tel: 374 1 52 19 64 Fax: 374 1 15 16 87 E-mail: minenr@arminco.com
Atomic Energy Department	Tel: 374 1 56 27 76 Fax: 374 1 505 439 E-mail: atomen@freenet.am
Armenian Nuclear Regulatory Authority Tigran Mets av. 4 375010 Yerevan, Republic of Armenia	Tel: 374 1 58 19 62; 56 31 24 Fax: 374 1 90 68 74 E-mail: head@asas.asrmenia.su

MAIN POWER UTILITY

Armenian Nuclear Power Plant Metsamor, 377766 Armavir region 6 Republic of Armenia	Tel: 3741 28 85 80 Fax: 3741 15 18 60 E-mail: ANRA@anra.am

MANUFACTURES AND SERVICES

Armatom Admiral Isakov, 50 375114 Yerevan, Republic of Armenia	Tel: 374 1 74 21 30 Fax: 374 1 15 16 87 E-mail: armatom@freenet.am
Atomservice Metsamor, 377766 Armavir region 6 Republic of Armenia	Tel/Fax: 3741 28 55 32

HIGH ENERGY RESEARCH INSTITUTES, UNIVERSITIES AND OTHER ORGANIZATIONS

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