TURKEY

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1. ENERGY, ECONOMIC AND ELECTRICITY INFORMATION

1.1. General Overview

As of its geographical situation Turkey connects Europe to Asia. Turkey is an important candidate to be the “Energy Corridor”, for the transmission of the **Central Asian Countries** rich oil and natural gas resources to the **Western Markets**. Turkey has borders with Greece, Bulgaria, Romania, Georgia, Armenia, Azerbaijan, Iran, Iraq and Syria. Turkey’s total area is 779 452 km^2, about 97% of which is situated in Asia and 3% in Europe. Four seas, the Marmara, the Aegean, the Mediterranean and the Black Sea surround Turkey.

Turkey's strategic location makes it a natural "energy bridge" between major oil producing areas in the Middle East and Caspian Sea regions on the one hand, and consumer markets in Europe on the other. Turkey's port of Ceyhan is an important outlet both for current Iraqi oil exports as well as for potential future Caspian oil exports. Turkey's Bosphorus Straits are a major shipping "choke point" between the Black and Mediterranean Seas.

Except for the eastern part of the Black Sea coastlands, most of Turkey has a very sunny climate even in winter. Average daily sunshine amounts range from three to four hours in midwinter to as much as twelve to thirteen hours in summer. The Black Sea coast has some rain all the year round. Although summer temperatures are rather high, the heat is tempered by the low humidity inland and the sea breezes along the coast. Occasionally the nights may be sticky and humid on the Aegean and Mediterranean coasts.

In 2002, the population was almost 70 million and the population density reached 89 inhabitants per km^2 (see Table 1). The annual population growth rate from 2001 to 2002 was about 1.5 %.

TABLE 1. POPULATION INFORMATION

	1960	1970	1980	1990	1999*	2000*	2001*	2002*	Annual av. growth rate (%) 1980 to 2001
Population (millions)	27.5	35.3	44.4	56.1	65.6	66.7	67.8	69.7	2
Population density (inhabitants/km²)	35.3	45.3	57	72	84.1	85.5	86.9	89.4	
Area (1000 km²) 779.5									

Source: IAEA Energy and Economic Database, Data & Statistics/The World Bank, *National data

Gross Domestic Product (GDP) in 2002 was 184,648 millions US$ (Table 2) and the GDP growth increased 8.1% from first quarter of 2002 to first quarter of 2003. Agriculture accounts for some 16 percent of GDP, industry for 24 percent, and services for 60 percent.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	1980	1990	2000	2001	2002*	Growth rate (%/yr) 1980 to 2001
GDP (millions of current US$)	68,795	150,676	190,265	192,805	184,648	5.0
GDP (millions of constant 1990 US$)	90,677	150,676	213,743	220,723		4
GDP per capita (current US$/capita)	1,541	2,686	2,854	2,851	2,649	3.0

Source: IAEA Energy and Economic Database. * http://ekutup.dpt.gov.tr/eg/, (2002 GDP value was calculated as GDP at current TL producers' prices divided by annual average exchange rate of TL)

The five main energy reserves are given in Table 3 and Table 4. The energy consumption per capita in 2002 was 47.08 GJ/capita.

TABLE 3. ESTIMATED ENERGY RESERVES

	Estimated energy reserves in (Exajoule)					
	Solid	**Liquid**	**Gas**	**Uranium (1)**	**Hydro (2)**	**Total**
Total amount in place	93.29	1.81	0.27	4.97	39.81	140.14

(1) This total represents essentially recoverable reserves.

(2) For comparison purposes a rough attempt is made to convert hydro capacity to energy by multiplying the gross theoretical annual capability (World Energy Council - 2002) by a factor of 10.

Source: IAEA Energy and Economic Database.

TABLE 4. PRIMARY ENERGY RESOURCES AND RESERVES

Reserves	Unit	Proven	Probable	Possible	Total
Hard Coal	Mt	428	456	245	1,129
Lignite	Mt	7,339	626	110	8,075
Asphaltite	Mt	45	29	8	82
Bituminous Shale	Mt	555	1,086		1,641
Hydro	GW·h/a	125,328			125,328
	MW/a	35,310			35,310
Crude Oil	Mt	41			41
Natural Gas	bcm	8.6			8.6
Nuclear	t Uranium	9,129			9,129
	t Thorium	380,000			380,000
Geothermal	MW/a electricity	200		4,300	4,500
	MW/a heat	2,250		28,850	31,100
Solar	MW/a electricity				8.8
	MW/a heat				26.4

Source: Ministry of Energy and Natural Resources.

Energy demand, production, import and export amounts of Turkey are given in Table 5. Energy demand increased from 69.86 Mtoe in 1996 to 78.40 Mtoe in 2002. Between 2000 and 2001, energy demand decreased approximately 5% due to economical conditions of the country.

TABLE 5. PRIMARY ENERGY CONSUMPTION

Mtoe

	1996	1997	1998	1999	2000	2001	2002
Demand	69.86	73.78	74.71	74.28	81.25	75.95	78.40
Production	27.39	28.21	29.32	27.66	26.86	25.17	24.57
Import	44.33	47.52	48.63	49.41	56.28	52.70	58.34
Export	1.88	1.63	2.40	2.79	1.58	2.62	3.16
Bunkers	0.46	0.62	0.63	0.59	0.47	0.62	1.23
Net Import	41.99	45.27	45.61	46.03	54.23	49.46	53.9
Production/Demand (%)	39.2	38.2	39.3	37.2	33.1	33.1	31.3

Source: Ministry of Energy and Natural Resources.

The sectoral energy consumption in 2002 is given in Table 6 and some statistical data between 1960-2002 are given in Table 7.

TABLE 6. TOTAL FINAL CONSUMPTION BY SECTOR IN 2002

Sector	Mtoe	%
Industry	24.47	31.2
Residential (H'holds&Services)	18.18	23.2
Transportation	11.32	14.4
Agriculture	3.03	3.9
Non Energy	1.78	2.3
Conversion sector	19.63	25.0
TPES	78.40	100

Source: Ministry of Energy and Natural Resources.

TABLE 7. ENERGY STATISTICS

Exajoule

	1960	1970	1980	1990	1999	2000	2001	2002	Average annual growth rate (%) 1960 to 1980	Average annual growth rate (%) 1980 to 2002
Energy consumption										
- Total [1]	0.20	0.79	1.34	2.22	3.11	3.40	3.18	3.28	9.98	4.15
- Solids [2]	0.12	0.44	0.61	0.97	1.12	1.24	1.05	1.07	8.47	2.59
- Liquids	0.06	0.33	0.67	1.00	1.26	1.35	1.29	1.29	12.82	3.02
- Gases				0.13	0.49	0.57	0.62	0.68		14.78*
- Primary electricity [3]	0.01	0.01	0.04	0.09	0.13	0.11	0.09	0.13	7.18	5.50
Energy production										
- Total	0.14	0.61	0.73	1.07	1.16	1.12	1.05	1.03	8.61	1.58
- Solids	0.12	0.44	0.58	0.79	0.84	0.83	0.80	0.74	8.20	1.11
- Liquids	0.02	0.16	0.10	0.16	0.13	0.12	0.11	0.11	8.38	0.43
- Gases				0.01	0.03	0.02	0.01	0.02		5.95*
- Primary electricity [3]	0.01	0.01	0.04	0.09	0.13	0.11	0.09	0.13	7.18	5.50
Net import (import - export)										
- Total	0.05	0.18	0.61	1.19	1.91	2.27	2.07	2.26	13.32	6.13
- Solids	0.00	-0.01	0.02	0.19	0.33	0.44	0.28	0.40		14.59
- Liquids	0.05	0.19	0.59	0.88	1.12	1.26	1.15	1.19	13.13	3.24
- Gases				0.12	0.47	0.56	0.62	0.66		15.26 [4]

[1] Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.+ direct use of geothermal heat and solar +stock changes..
[2] Solid fuels include coal, lignite and commercial wood.
[3] Primary electricity = Hydro + Geothermal + Nuclear + Wind.
[4] 1990-2002 Growth
Total Energy Production includes direct use of geothermal heat and solar.
Total Net Import includes net electricity import.
Source: Ministry of Energy and Natural Resources.

During the period of 1996-2000, the primary energy demand in Turkey increased by 4.5 % per year and reached to 82.2 Mtoe by the year 2000. During the same period, the electricity production increased about 8.2 % per year, and reached to about 125 TW·h at the end of this period. In the period of 2000-2001 both primary energy demand and electricity consumption decreased to 78 Mtoe and 123 TW.h respectively, but in 2002 electricity production increased to 129 TWh. The primary energy consumption per capita is about 1.2 toe and the net electricity consumption per capita is about 1,475 kW·h in 2002. In 2002, installed capacity in Turkey reached 31846 MW of which 62% was coming from thermal resources (19605 MW) and the rest 38% (12241 MW) was from hydro resources. Until 1985, in thermal production lignite power plants have the largest share in the total thermal capacity. After this year, the share of lignite plants decrease gradually and there is a rapid increase in natural gas plants. In 2002, the share of natural gas plants, coal plants and oil plants in the total installed capacity were 30%, 22% and 9% respectively. Tables 8 – 11 and Figure1-2 show characteristic electricity data of the country.

TABLE 8. INSTALLED GENERATION CAPACITY AND PRODUCTION BY ENERGY SOURCE IN 2002

Energy source	Capacity (MW)	Production (GW·h)
Hard coal	480	4093
Lignite	6503	28056
Oil	2856	10744
Natural Gas	9702	52497
Geothermal&Wind	36	153
Others*	28	173
Total Thermal	19605	95716
Total Hydro	12241	33684
TOTAL	31846	129400

* Includes wood, wood wastes, liquid sulphur, sulphur cake, wind, multi-fuel fired etc.
Source: Ministry of Energy and Natural Resources.

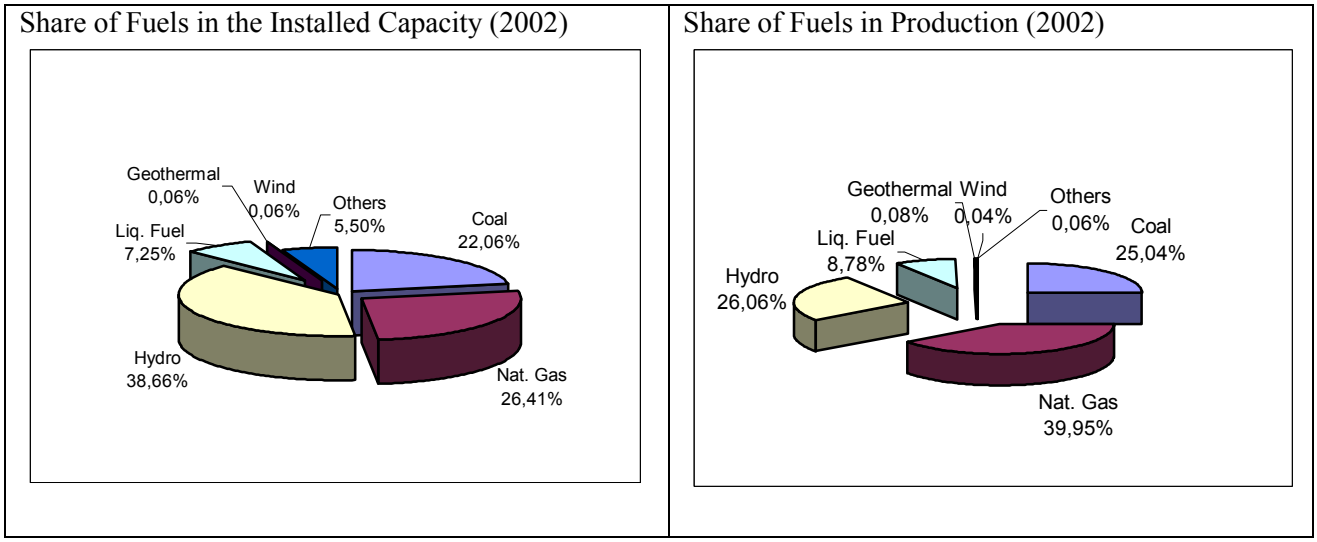


FIG.1. Share of Fuels in the Capacity and Production in 2002

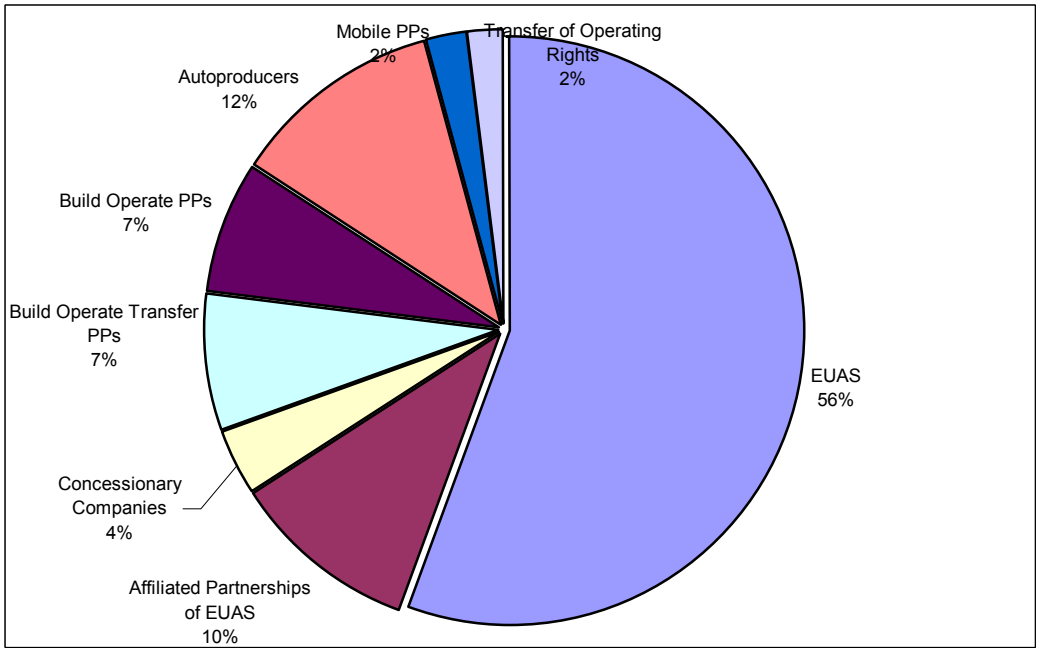


FIG.2. The Distribution of Installed Capacity by the Turkish Electricity Utilities in 2002

TABLE 9. NATIONAL ELECTRICITY DATA FOR 2002

Total Electricity Production (Gross)	129,400	GW·h
Total Electricity Consumption	132,553	GW·h
Per capita Consumption (Net)	1475	kW·h
Share of electricity in total final energy consumption	14.8	%

Source: Ministry of Energy and Natural Resources.

TABLE 10. HISTORICAL ELECTRICITY PRODUCTION AND INSTALLED CAPACITY

									Average ann. growth rate (%)	
	1960	1970	1980	1990	1999*	2000*	2001*	2002*	1960 to 1980	1980 to 2000
Electricity production (TW·h)										
- Total[(1)]	2.82	8.62	23.28	57.54	116.44	124.92	122.72	129.40	11.14	9.06
- Thermal	1.81	5.58	11.93	34.32	81.66	93.93	98.56	95,6	9.88	10.18
- Hydro	1	3.04	11.35	23.15	34.64	30.88	24.01	33,7	12.9	7.58
- Geothermal + Wind				0.08	0.10	0.11	0.15	0.15		5.8
Capacity of electrical plants (GW(e))										
- Total	1.67	2.31	5.59	16.32	26.12	27.26	28.33	31,85	6.22	7.76
- Thermal	1.26	1.59	3.21	9.54	15.56	16.05	16.62	19,57	4.79	7.76
- Hydro	0.41	0.72	2.38	6.77	10.54	11.18	11.67	12,24	9.16	7.74
- Geothermal +Wind				0.02	0.02	0.04	0.04	0,04		4.2

[(1)] Electricity losses are not deducted.

Source: IAEA Energy and Economic Database, * Ministry of Energy and Natural Resources

TABLE 11. ENERGY RELATED RATIOS

	1970	1980	1990	2000	2001	2002
Energy consumption per capita (GJ/capita)	22.37	30.12	39.54	50.16	46.33	47.08
Electricity per capita consumption (kW.h/capita) (Gross)	244	554	1013	1892	1849	1901
Electricity production/Energy production (%)	5	12	19	40	42	45
Nuclear/Total electricity (%)						
Ratio of external dependency (%) (1)	22.8	45.52	53.6	66.7	65.1	68.8
Load factor of electricity plants						
- Total (%)	43	48	40	72	77	
- Thermal	40	42	41	97	105	
- Hydro	48	54	39	37	37	
- Nuclear						

(1) Net import / Total energy consumption.

Source: Ministry of Energy and Natural Resources.

1.2. Energy Policy

The Turkish energy policy is mainly concentrated on assurance of energy supply in a reliable manner and sufficiently in time, under economic and clean terms and in a way to support and orientate the target growth and social developments.

Although almost all conventional resources exist in Turkey, these resources are not sufficient to meet the energy demand, except for lignite and hydro. More than half of the energy demand has been met through imports. Energy planning studies show that energy demand of the country will increase parallel with its development and industrialization. In order to meet its demand reliably, a significant increase is expected both in energy production and in supply during the coming years.

The Turkish environmental policy considers that energy policy should take into account environmental problems and that a balance should be found between increases in energy demand required for economic development, and environmental concerns. Some of the main criteria for energy policy are given below:

- A dynamic and feasible master plan which accomplishes the optimum planning of resources in an economical and reliable way and which minimises the environmental problems taking place during the production and consumption of energy has been prepared;
- For Turkey, it is necessary to meet energy requirement with national resources as much as possible and to use new technologies, which eliminate and the adverse effects of energy production on the environment;
- According to the development plans, "energy saving" is one of the basic principles.

With respect to global environmental issues, although Turkey`s emissions (CO_2) are still the lowest among Organization for Economic Cooperation and Development (OECD) countries in terms of per capita emissions, these emissions too have been growing rapidly at an average annual rate of 4.3 percent since 1990. In the previous position Turkey was classified as a developed country in the United Nations Framework Convention on Climate Change (UNFCCC) and was included in Annex I and Annex II to the Convention, together with the developed countries. Therefore, Turkey has not signed the UNFCCC, regarding the national economic circumstances and the development level of the country and in accordance with the "common but differentiated responsibilities" principle of the Convention**.**

In the process of the Convention, Turkey proposed to be deleted from Annex I and Annex II to the Convention. However, during the 6th Conference of the Parties (COP-6) held in the Hauge-Holland, on 13-24 November 2000, Turkey has made a proposal. This proposal was on remaining in Annex I, but enjoying a certain degree of flexibility, within the "common but differentiated responsibilities", regarding the Turkey's difficulties stemming from the fact that Turkey is still in the process of industrialization, but deleting of her name from Annex II.

The new approach of Turkey was discussed and the Conference agreed that the subject proposal should be referred to the Subsidiary Body for Implementation (SBI) at its next session for consideration.

The concerned intention of Turkey has negotiated by SBI, the definitive action has taken in COP-7 held on 29 October-9 November 2001 in Marrakesh, upon the related proposal of SBI. According to the decision taken during COP-7, the name of Turkey will be deleted from Annex II and, after becoming a party, she will remain in Annex I in a situation different from that of other parties included, by recognizing the special circumstances of the country.

1.3 The Electricity System

The Ministry of Energy and Natural Resources is the main body of the Turkish energy sector and is responsible for the preparation and implementation of energy policies, plans and programmes in co-ordination with its dependent and related institutions and other public and private entities.

The Turkish Electricity Generation and Transmission Corporation (TEAS) is in charge of planning, building (only thermal power plants), operation and maintenance of electricity generation and transmission installations in the framework of general energy planning studies. Transfer of Operating Rights of main thermal and some hydro plants are being carried out. TEAS separated into three entities on 4 April 2000. The Turkish Electricity Transmission Company (TEİAŞ) is responsible for electricity transmission and load dispatch activities. The Electricity Generation Company (EÜAŞ) is responsible for operation of existing power plants owned by the public. The Turkish Electricity Trading and Contracting Company (TETTAŞ) is responsible for electricity wholesale sales and purchases.

The Turkish Electricity Distribution Corporation (TEDAS) is responsible for carrying out electricity distribution activities. Related to these activities are activities such as necessary construction, operation and maintenance of installations, buying electricity from generating utilities and selling electricity to purchaser, which are also under TEDAS responsibility. Privatization, under the scope of the privatization of the 20 regions through the Transfer of Operating Rights formula, is at an advanced stage.

The State Water Works (DSI) is in charge of the planning, design and building of hydro plants as well as flood protection, irrigation, water supply to big cities and land drainage works.

Electricity Market Regulatory Authority has been established as per Law no. 4628 and it has later been renamed as Energy Market Regulatory Authority (EPDK) as per the provisions of Natural Gas Market Law no. 4646. The objective of the above mentioned Laws is to establish a financially viable, stable, transparent and competitive energy market, which will function as per the provisions of private law and ensure independent regulation and supervision of the market in order to provide sufficient electricity and natural gas of good quality to consumers, at low cost, in a reliable and environment friendly manner.

2. NUCLEAR POWER SITUATION

2.1. Historical Development and current nuclear power organizational structure

Studies to build a nuclear power plant in Turkey were started in 1965. Later, between 1967 and 1970, a feasibility study was made by a foreign consultant company to build a 300-400 MW NPP. The NPP would have been in operation in 1977. Unfortunately, because of the problems relating the site selection and other issues the project could not come into life.

In 1973, Turkish Electricity Authority (TEK) decided to build an 80 MWe prototype plant. However, in 1974 the project was cancelled due to reason that this project could delay the construction of a greater capacity nuclear power plant. Instead of this prototype plant, TEK has decided to build a 600 MWe NPP in southern Turkey.

Site selection studies have been made in 1974 and 1975 and the Gülnar-Akkuyu location was found suitable for the construction of first NPP. In 1976, the Atomic Energy Commission granted a site license for Akkuyu. In 1977, a bid was prepared and ASEA-ATOM and STAL-LAVAL companies were awarded as the best bidders. Contract negotiations continued until 1980. However, in September 1980, due to Swedish Government’s decision to withdraw the loan guarantee, the project was cancelled.

The third attempt was made in 1980. Three companies were awarded to build four nuclear power plants (1 CANDU unit by AECL and 1 PWR unit by KWU in Akkuyu and 2 BWR units by GE in Sinop). Due to Turkey's request to apply the BOT model, KWU resigned from the bid. Although AECL accepted the BOT model, it insisted upon the governmental guarantee on the BOT credit. The Turkish government refused to give the guarantee and as a consequence the project was cancelled.

In 1992, the Ministry of Energy and Natural Resources stated in a report submitted to the Government that without the installation of new energy resources before 2010, the country would face an energy crisis, suggesting that nuclear energy generation should be considered as an option.

In 1993, the High Council of Science and Technology identified nuclear electricity generation as the 3rd highest priority project of the country. In view of this decision, the Turkish Electricity Generation and Transmission Company (TEAŞ) included a NPP project in its 1993 investment programme. In 1995, TEAŞ selected the Korean KAERI as the consultant for the preparation of the bid specifications. The bid process started in 1996. Three consortiums offered proposals in 1997: AECL, NPI and Westinghouse. After a series of delays, in July 2000, the Government decided to postpone the project.

2.2. Nuclear Power Plants: Status and Operations

There is no nuclear power plants in operation, under construction and **decommissioned.** According to the current long term energy planning studies in Turkey, nuclear electricity will began to contribute national electricity production in 2020 with a capacity of 2 GWe.

2.3. Research and Development

The nuclear policy of the country includes research and development activities in the application of nuclear energy sectors. Research and development activities in the nuclear field in Turkey are performed by the following organizations:

The Turkish Atomic Energy Authority (TAEK) is responsible for determining the basis of the national policy and the related plans and programs regarding the peaceful utilization of atomic energy for the benefits of State; executing and supporting research, analysis and studies that might lead to nation's scientific, technological and economical development related with the utilization of atomic energy; establishing research and training centers, laboratories, test facilities, pilot plants without energy producing purposes wherever it is needed in the country; educating the personnel in the nuclear field and make cooperation with the universities and related organizations; giving approval, permission and license, related to the site selection, construction, operation of nuclear installations; enlightening the public in nuclear matters; and preparing and implementing the decrees and regulations to determine the basis for the nuclear and radiological safety.

The Mineral Exploration and Research Directorate is responsible for the systematic investigation and research on all kinds of resource including thorium and uranium.

Research and development activities in nuclear technology are performed in related departments of some universities in Turkey.

2.4. International Co-operation and Initiatives

Co-operation with international/national groups on theoretical and experimental projects concerning SMRs and innovative technologies would lead to an increase of staff capabilities and experience on nuclear technology in Turkey. To achieve this goal, Turkey has been participating in the "International Project on Innovative Nuclear Reactor Technologies and Fuel Cycles" and "Technical Working Group on Gas Cooled Reactors" coordinated by the IAEA.

There is an IAEA TC project to enlighten the public with bare facts of nuclear technology to develop an unbiased understanding in nuclear field in Turkey.

2.5. Human Resources Development

The Hacettepe University, Nuclear Energy Engineering Department educate students in the field of nuclear engineering. TAEK is also educating the personnel in the nuclear field in its research and training centers, laboratories, test facilities, pilot plants without energy producing purposes and also making cooperation with the universities and related organizations.

3. NATIONAL LAWS AND REGULATIONS

3.1. Safety Authority and the Licensing Process

The Authority responsible from the enforcing nuclear safety is the Turkish Atomic Energy Authority (TAEK). TAEK is the main driving force for enhancing and broadening of all nuclear related activities in Turkey. Beside her other duties, TAEK undertakes all regulatory activities including licensing, drafting regulations, and performing inspections, etc. over the special nuclear materials, radioactive materials and nuclear facilities.

The bodies of TAEK are:

- *The Atomic Energy Commission,*
- *The Advisory Committee,*
- *The Specialized Departments, and*
- *The Affiliated Centres.*

Nuclear Safety Department (NGD) of TAEK is the responsible unit from evaluation of licensing applications of nuclear installations under the coordination and supervision of the Vice President of TAEK responsible from Nuclear Power and Safety. “Decree Pertaining to Issue Licence for Nuclear Installations” regulates the application requirements and procedures of licensing activities for all nuclear installations and for all stages. The licensing of nuclear facilities is composed of three main stages. The first stage is the Site Licence. The second stage is the limited work permit and the Construction Licence. Final stage is composed of commissioning permit, fuel loading and start up tests permit and the Operating Licence.

NGD reviews, assesses and evaluates each application, prepares a report and submits to the Vice President, who conveys this report to the President with an additional report of his/her own. The President brings these reports to the first Atomic Energy Commission (AEK) meeting for adoption. An affirmative response of AEK with the signature of the Prime Minister is the License. This procedure is applicable for all permits and licenses.

3.2. Main National Laws and Regulations in Nuclear Power

The 1982 Act (No. 2690, published in Official Gazette No. 17753 on 13 July 1982) established TAEK and superseded the former organization - the Atomic Energy Commission. The Act defines the structure of the TAEK, the duties, responsibilities and jurisdiction of each unit. According to the Act, TAEK is the judicial organization for preparing the regulatory framework concerning radiation protection, nuclear safety.

Beside the Act mentioned above, TAEK issued two decrees concerning the licensing procedures of nuclear installations and radiation safety. “Decree Pertaining to Issue Licence for Nuclear Installations” (Official Gazette, No.18256, 19 December 1983) regulates the licensing procedures and necessary documents for licence application.

There are thirteen Codes of Practice issued by TAEK to cover more detailed issues like licensing of radioactive devices, quality assurance for nuclear installations and site selection for nuclear power plants. A few more Codes of Practice are ready to be issued. Guides and recommendations of the Atomic Energy Commission serve only for advisory purposes.

NGD is implementing a project since 2000 for revising existing regulations and drafting new ones, aiming to have a consistent and comprehensive set of regulations on nuclear installation safety, mainly based on the IAEA Safety Series. As a part of this project, a new set of regulatory documents called the TAEK Nuclear Safety Series are used for detailed regulations. TAEK Nuclear Safety Series documents are drafted, changed and issued according to provisions of a regulation issued in December 2002. A few documents from these series have been drafted and are waiting for issuance by AEK. More documents regarding detailed regulations are expected to be drafted continuously.

Since there are no nuclear facilities which produce nuclear waste that should be disposed within Turkey and which is expected to go for decommissioning in the near or mid-term future, there are no regulations set or being drafted on financing mechanisms for these activities. However, the above mentioned project is expected to produce a draft nuclear law which would contain articles addressing these issues.

The list of issued regulations is as follows:

- Regulations on General Project and Safety Criteria for Design and Construction of Nuclear Power Plants
  03.09.1975, *RG[1] (under revision)*
- Regulations on Physical Protection of Special Nuclear Materials
  RG No:16702 of 20.07.1979
- Decree Pertaining to Issue of Licenses for Nuclear Installations
  RG No: 18256 of 19.12.1983
- Decree on Radiation Safety
  RG No: 18861 of 7.9.1985
- A Guide on the Earthquake Related Subject Requested in the Issuance of Limited Work Permit and Site License, 1989.
- Regulations on Radiation Safety
  RG No: 23999 of 24.03.2000
- Regulation on Licensing Procedures and Determination of Responsibilities and Authorities for the Research Reactor Operators
  RG No: 20255 of 17.09.1989
- Regulation on Preparation and Enactment of Safety Guides Determining Safety Principles of Nuclear Installations
  RG No: 18572 of 11.11.1984
- A Guide on Seismic Design and Qualification of Nuclear Plant Facilities.
  Approved by AEC on 29.5.1996

[1] RG : Official Gazette

- Regulations on Quality Assurance and Inspection of Nuclear Installations
  RG No: 22932 of 13.3.1997
- Regulations on Nuclear Materials Accounting and Control
  RG No: 23106 of 10.9.1997
- Regulations on Safe Transport of Radioactive Materials
  RG No: 23106 of 10.9.1997
- Regulations on the Establishment and Working Procedures of Nuclear Safety Advisory Committee
  RG No: 23106 of 10.09.97
- Regulation on Quality Assurance Criteria in Scope of PSAR
  RG No: 23965 of 15.02.2000
- Regulation on General Safety Rules Related to the Siting Activities of Nuclear Power Plants
  RG No: 23975 of 25.02.2000
- Regulation on Quality Assurance for Studies on Survey and Evaluation Concerning Site Selection of Nuclear Power Plants

  RG No: 24766 of 26.05.2002
- Regulation on Fundamental Criteria of Quality Assurance Program for Nuclear Installations

  RG No: 23991 of 12.03.2000

Regulations Approved by AEC (waiting for approval of Prime Ministry) and Regulations under Discussion (not submitted to AEC):

- A Guide on Fire Protection in Nuclear Power Plants
  Approved by AEC
- A Guide on External Man-Induced Events in Relation to Nuclear Power Plant Design
  Approved by AEC
- Regulation on Principles for Preparing, Adopting, Enforcing and Amending of Nuclear Safety Series Documents
  Waiting for approval by AEC
- Regulations Related to Quality Assurance in the Procurement, Design and Manufacture of Nuclear Assemblies
  Under Discussion
- Regulations for Design Basis Flood for Nuclear Power Plants on Coastal Sites
  Under Discussion

- A guide on Quality Assurance for Studies on Survey and Evaluation Concerning Site Selection of Nuclear Power Plants

  To be submitted to AEC
- A guide on Site Survey for Nuclear Power Plants

  Under discussion
- A guide on Design Basis Flood for Nuclear Power Plants on River Side

  Under discussion
- Regulations related to Handling and Storage of Nuclear Fuels in Nuclear Power Plants
  Under Discussion

- Objectives for the Safety of Nuclear Installations
  Approved by AEC
- Basic Principles for the Safety of Nuclear Installations
  Approved by AEC
- Specific Principles for the Safety of Nuclear Power Plants
  Under Discussion
- Nuclear Safety Series AR-1, Unusual Event Reporting in Research Reactors
  Waiting for approval by AEC
- Nuclear Safety Series AR-2, Records and Reports in Research Reactors
  Under Discussion
- Nuclear Safety Series AR-3, Inspection of Research Reactors
  Under Discussion

4. CURRENT ISSUES AND DEVELOPMENTS ON NUCLEAR POWER

4.1. Energy Policy

Turkey's energy policies which are under implementation in order to promote economic development and welfare of the country can be summarized shortly in five groups according to their priorities:

- Liberalization of the sector, enhancing productivity and ensuring transparency in the sector by creating a competitive environment in the energy market,
- Transportation of abundant resources of the East to the West markets through the energy corridor over Turkey,
- Giving priority to resource diversification for energy security in our country which is getting more and more dependent to external sources in meeting its energy demand,
- Targeting sustainable development in evaluation and consumption of energy resources, taking into consideration the environmental issues as well,
- Intensifying studies on new energy technologies, including nuclear.

If expected economical growth rate can be sustained, the projected (according to BASE scenario of demand projection) electricity generation for 2020 is about 508 TW·h. In spite of the fact that nuclear energy contribution was planned to be 13.8 TWh by the year 2020 and that there was a strong intention of the Government to install the first NPP in Akkuyu, the Government had decided to postpone the Akkuyu NPP project, following the meeting of the Cabinet held on 25 July 2000. Since Turkey needed to concentrate on a programme of economic stability aiming to reduce inflation rates at considerable amounts, under supervision of the IMF, the government could not afford the estimated three to four billion US dollars needed for construction of the country's first nuclear power plant. The Government declared also that the cancellation of the Akkuyu NPP project did not mean that Turkey will refrain from using nuclear energy in the future. The Cabinet's announcement also included the need of contributing to the technological improvements of new generation nuclear power plants.

Thus nuclear energy is the most important alternative to fossil resources when diversity and energy supply security are taken into consideration. Today, the electricity generation composition is about 74% thermal (coal, gas, oil, geothermal) and 26% hydro.

4.2. Privatisation and deregulation

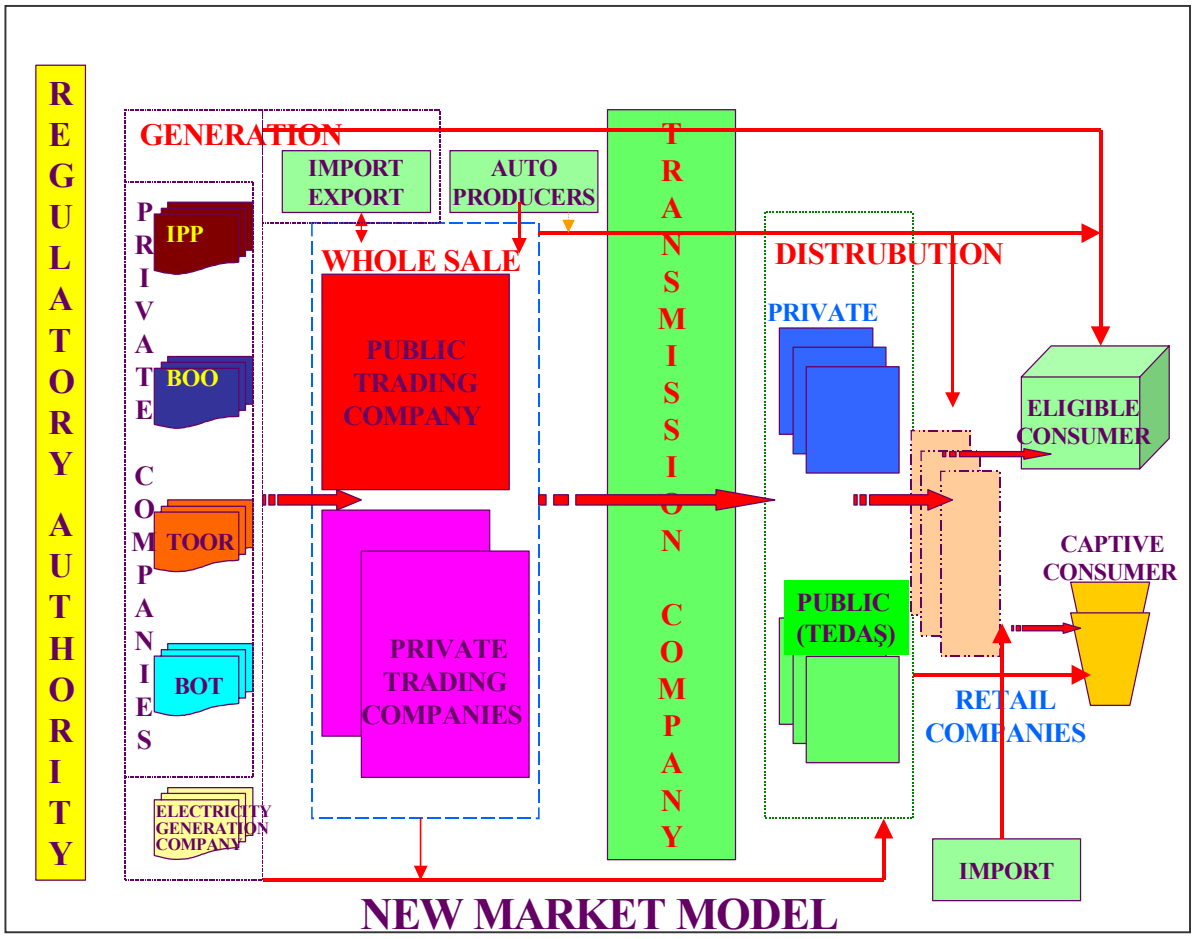
The "Electricity Market Law" no: 4628, published in the Official Gazette dated 3 March 2001, is enacted to unbundle electricity market activities, enable progress into a liberalized electricity market and provide for fair and transparent market regulation.

In summary, the new laws include the following key elements:
- An autonomous Energy Market Regulatory Authority, governed by a Board;
- A new licensing framework for market participants;
- An energy market, to comprised bilateral contracts between market participants;
- Eligible consumer concept, eligible consumers to be free to choose their suppliers;
- A transition mechanism to be implemented over a two year programme for electricity and 1.5 year programme for gas.

In addition, all over the world energy sector investments are gradually being undertaken by the private sector and Turkey is following this global trend as well. It is important to ensure that this transition smooth and effective. The purpose of this Law is to ensure the formation of an electricity market which is financially strong, transparent and operates in accordance with provisions of private law in a competitive environment, to achieve a stable supply of adequate, low-cost, and environment-friendly electricity of good quality, and to ensure autonomous regulation and supervision of this market.

The main objective of this law is to create a competitive electricity market with the great majority of the participants in this market being private firms and most of the assets used to supply electricity being privately owned (see Figure 3). The role of the State would be greatly reduced. The Law has a number of provisions. These are:

- First it creates a framework in which there will be privately owned generation companies, privately owned retail and wholesale companies, and Government owned transmission company. The private generation companies will sell electricity to the supplier companies with the transmission company transmitting the electricity. All participants must obtain license to perform activities in the market.
- Second, the law allows larger electricity consumers (eligible consumer) to buy power from any source rather than just from the local distribution company. This is designed to introduce competition and to meet the requirement of the European Electricity Directive.
- Third, it establishes a Regulatory Body to issue licenses and oversee the market; especially the transmission and distribution charges and the tariffs for captive consumers.
- Fourth, the law limits monopoly in the sector.
- Fifth, the law allows the privatization of electricity assets according to the Privatization Law (Law no:4046).
- Sixth, the law allows all those TOORs which cannot be finalized by June 30, 2001 to lapse.
- Seventh, the law limits Tresury Guarantess for new BOT's and BOO's to certain plants which have already been agreed between Treasury, State Planning Organization (SPO) and Ministry and even then the guarantee applies only if these plants can be in operation before the end of 2002.



BOO: Build Own Operate *IPP: Independent Power Producers*
BOT: Build Operate Transfer ***TOOR:Transfer of Operating Rights***

FIG. 3 Schematic view of the new market model

Generation, transmission, distribution, wholesale, retail-sale and retailing services, import, export of electricity and the establishment of the Energy Market Regulatory Authority and rules and principles related to it's operations, is the subject of the law.

The Electricity Generation Company and private sector generation companies may sell electricity and/or capacity to customers in accordance with their licenses. The Electricity Generation Co. Inc. may build, lease and operate new generation facilities on behalf of the State where deemed necessary in accordance with the Board-approved generation capacity projection, taking into account private sector generation investments. The total market share of a private sector generation company, which it may acquire through the generation facilities it operates together with its affiliates, may not exceed twenty percent of the published figure for the total actual installed electricity generation capacity in Turkey in the preceding year. Generation companies may enter into affiliate relationship with distribution companies without having controlling power over them. Generation companies may not engage in any market activities other than those described above.

An Auto-producer and Auto-producer Group can sell within a competitive environment, a certain percentage (not exceeding twenty percent in any case) to be determined by the Board of the electricity it has generated in a calendar year. The Board, under exceptional circumstances, can increase this percentage by half. Obtaining a generation license is required in case the amount of the electricity sold in a calendar year exceeds this percentage.

The Turkish Electricity Transmission Co. Inc. is empowered to take over all transmission facilities owned by the public and plan the transmission investments for the proposed new transmission facilities and to build and operate these new transmission facilities. The Turkish

Electricity Transmission Co. Inc. will perform international interconnection activities in line with the decision of the Ministry and will provide transmission and connection services to all system users including eligible consumers connected and/or to be connected to the transmission system, without discrimination, in accordance with provisions of grid code and transmission license. The Turkish Electricity Transmission Company may not engage in any activity in the market other than the transmission activity.

Distribution companies in areas specified in their respective licenses shall conduct the electricity distribution activities. Distribution companies by obtaining a retail sale license can sell electricity to consumers in their respective areas on a retail basis and/or can provide retail sale services even if there are other retail companies in their designated regions. Apart from distribution and retail sale operations, private sector distribution companies are allowed to establish a generation facility in the region specified in their licenses, provided that they have obtained a generation license and that the amount of the annual electricity then generate does not exceed 20 percent of the total amount of electricity offered for sale in this region during the previous year.

Distribution companies may not purchase more than 20 percent of the electricity that they have distributed during the previous year in the area defined in their license from generation companies that they own or are affiliated with.

The Turkish Electricity Trading and Contracting Co. Inc. and private sector wholesale companies shall conduct wholesale activities. The total market share of any private sector wholesale company together with its affiliates may not exceed ten percent of the total electricity consumed in the market during the preceding year.

Retail sale companies shall conduct activities involving retail sale of electricity and/or capacity and of retail sale services. Retail sale companies are allowed to engage in retail sale or retail sale service activities without being subject to any regional limitation.

Any distribution company having a retail sale license may sell electricity and/or capacity to any eligible consumer in another distribution company's area provided that its retail sale license includes such a provision.

Import or export of electricity with the Board approval from or to countries that fulfil the requirement of international interconnection in accordance with the Ministry's policy, may be conducted by the Turkish Electricity Trading and Contracting Co., Inc. and private sector wholesale companies and retail companies in accordance with provisions of this Law, applicable regulations, their respective licenses, grid code and distribution code.

The main objective of the "Electricity Market Law" is to create a competitive electricity market with the great majority of the participants in this market being private companies and most of the assets used to supply electricity being privately owned. The role of the State would be greatly reduced. Hence, the decision for constructing nuclear power plants should be given by private companies, as in the case of other electricity generating technologies, like gas combined and hydro power plants, and the legal entities should take license from the EMRB for installing such power plants. However, it might still be possible for the Government to give decision for constructing nuclear power plant(s).

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

The objective of the Turkish government R&D programme is to secure medium and long-term energy supply through the clean use of domestic coal and renewable sources such as geothermal, solar and wind energy, and to encourage energy efficiency and conservation, particularly in energy-intensive industries. The main institutions involved in the definition of R&D priorities and programmes are:

- State Planning Organisation,

- Ministry of Energy and Natural Resources and its related bodies and enterprises
- Ministry of Environment,
- TUBITAK (Scientific and Technical Research Council of Turkey),
- TAEA
- Universities.

The Supreme Council for Science and Technology (the highest body for science and technology policy-making) issues periodic plan for setting R&D priorities. Targets and priorities have been established by the council for the years 1993-2003.

- TAEA is the national authority responsible for the R&D activities in nuclear energy and technology. TAEA has five departments and four research and training centers.

4.4. Nuclear Energy and Climate Change

According to a study by TEAS, projected growth in CO_2 emissions (base case) would reach about 440 million tonnes of CO_2 in 2012. This corresponds to an average growth of 6.3% over the period 1999-2012, i.e. more than the historical rate. Such growth would closely track the increase in TPES, projected at 6.2 % per year, and would be driven by energy demand in electric power generation and industrial sectors such as iron, steel and cement production. In 2012 coal use would account for about one-half of CO_2 emissions, oil for about one-third, and gas for the remainder. (source: Energy Policies of IEA Countries-Turkey 2001 Review)

The main drawback of fossil fuel utilization is the environmental pollution, especially the CO_2 emission. The nuclear energy is an important option and alternative to fossil fuels.

4.5. Safety and waste management issues

There was limited number of regulations relevant to the safety issues in nuclear power plants. The project on drafting new regulations implemented in Dept. of Nuclear Safety of TAEK directly addresses this issue by focusing on safety goals and basic and specific safety principles for nuclear installations, including nuclear power reactors. The documents concerning the nuclear power are completed and approved by the Atomic Energy Commission. These documents will be issued as decree and/or regulations upon completion of the project by 2006.

Waste management is limited to radiological waste in Turkey, and there is a facility for interim storage of these wastes. However, waste management issue for nuclear power is addressed in above mentioned documents in terms of principles, where the detailed regulations are yet to be drafted.

REFERENCES

[1] IAEA Energy and Economic Data Base.

[2] Data & Statistics, the World Bank, www.worldbank.org/data.

[3] Ministry of Energy and Natural Resources

[4] The State Planning Organization, http://ekutup.dpt.gov.tr/teg/

[5] The Turkish Electricity Transmission Company, www.teias.gov.tr

Appendix 1

INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

AGREEMENTS WITH THE IAEA

• NPT related Agreement INFCIRC/295	Entry into force:	1 September 1981
• Additional protocol	Signed on:	6 July 2000
• Improved procedures for designation of safeguards inspectors	Accepted on:	18 January 1989
• Supplementary agreement on provision of technical assistance by the IAEA	Entry into force:	11 November 1980
• EURATOM	Entry into force:	September 1984
• RCA	Non-Party	
• Agreement on privileges and immunities	Entry into force:	26 June 1978

MAIN INTERNATIONAL TREATIES and CONVENTIONS.

• NPT	Entry into force:	17 April 1980
• Convention on physical protection of nuclear material	Entry into force:	6 February 1987
• Convention on early notification of a nuclear accident	Entry into force:	3 February 1991
• Convention on assistance in the case of a nuclear accident or radiological emergency	Entry into force:	3 February 1991
• Paris convention on civil liability for nuclear damage	Entry into force:	10 October 1961
• Joint protocol relating to the application of the Vienna and the Paris conventions	Signature:	21 September 1988
• 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:	24 October 1996

• Joint convention on the safety of spent fuel management and on the safety of radioactive waste management	Not signed	

OTHER RELEVANT INTERNATIONAL AGREEMENTS

• ZANGGER Committee	Member	21 October 1999
• Nuclear Export Guidelines (INFCIRC/254)	Adopted	
• Acceptance of NUSS Codes	Summary: Codes are used as reference In preparing national nuclear legislation and regulations. S1 and S2 are used as safety guides. Letter of:	31 October 1988
• Nuclear Suppliers Group	Member	20 April 2000
• International convention No: 42 on the compensation of professional disease	Ratification:	16 February 1946
• Convention on the co-operation in the atomic energy field between the NATO members and its amendment	Signature: Ratification:	22 June 1955 1 September 1956
• Convention on the establishment of a security control in the field of nuclear energy, protocol on the establishment of a court and convention on the European company for the chemical separation of radioactive fuel (EUROCHIME)	Signature: Ratification:	20 December 1957 25 May 1959
• Treaty banning nuclear weapons tests in the atmosphere, in outer space and under water	Signature: Ratification:	5 August 1963 13 May 1965
• International labour conference convention number 115 concerning the protection of workers against ionizing radiations	Ratification:	7 March 1968
• Treaty on the prohibition of the emplacement of nuclear weapons and other weapons of mass destruction on the seabed and ocean floor and in the subsoil thereof	ratification:	27 April 1972
• Convention for the protection of the Mediterranean Sea against pollution	Signature: Ratification:	16 February 1976 RG: 12 June 1981
• Protocol for the protection of the Mediterranean Sea against pollution from land originated sources	Ratification:	18 March 1987

• The international convention on railway transportation	Ratification:	21 March 1985
• Convention on the protection of the Black Sea against pollution	Ratification:	7 December 1993
• Comprehensive test ban treaty	Ratification	2000

BILATERAL CO-OPERATION AGREEMENTS

- Agreement For Cooperation Concerning Civil Uses of Atomic Energy Between the Government of Turkey and the USA
  Signature: 10 June 1955
  Ratification date: 4 December 1956
  Several amendments and revisions (1956-1981)
  Extension (1981-1985)
  Termination: 1985
- Agreement Between The Government of Canada and The Government of Turkey for Cooperation in The Peaceful Uses of Nuclear Energy
  Signature: 18 June 1985
  Ratification: 23 February 1986
- Agreement Between The Government of Argentina and The Government of Turkey for Cooperation in The Peaceful Uses of Nuclear Energy
  Signature: 3 May 1988
  Ratification date: 21 May 1991
- Agreement Between The Government of South Korea and The Government of Turkey for Cooperation in The Peaceful Uses of Nuclear Energy
  Signature: 26 October 1998
- Agreement Between The Government of Germany and The Government of Turkey for Cooperation in The Peaceful Uses of Nuclear Energy
  Initialled: 14 January 1998
- Agreement Between The Government of France and The Government of Turkey for Cooperation in The Peaceful Uses of Nuclear Energy
  Signature: 21 September 1999
- Agreement Between The Government of USA and The Government of Turkey for Cooperation in The Peaceful Uses of Nuclear Energy
  Initialled: 26 July 2000

BILATERAL AGREEMENTS ON EARLY NOTIFICATION

- Agreement Between The Government of Republic of Bulgaria and The Government of Republic of Turkey on Early Notification of a Nuclear Accident and on Exchange of Information on Nuclear Facilities
  Signature: 28 July 97
  Ratification: 11 Sept. 1997
- Agreement Between The cabinet of ministries of Ukraine and The Government of Republic of Turkey on Early Notification of a Nuclear Accident and on Exchange of Information on Nuclear Facilities
  Signature: 23 November 2000

- Agreement Between The Government of Russia and The Government of Republic of Turkey on Early Notification of a Nuclear Accident And on Exchange of Information on Nuclear Facilities
  Initialled: 29 July 1988
- Agreement Between The Government of Romania and The Government of Republic of Turkey on Early Notification of a Nuclear Accident And on Exchange of Information on Nuclear Facilities and for Cooperation in The Peaceful Uses of Nuclear Energy.
  Initialled: 14 September 1993

Appendix 2

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

NATIONAL ENERGY AUTHORITY

Turkish Ministry of
Energy and Natural Resources
İnönü Bulvarı, No:27 Bahçelievler
Ankara
Tel**:** (312) 212 69 15
Fax**:** (312) 286 47 69
http://www.enerji.gov.tr/

Turkish Atomic Energy Authority
Eskisehir Yolu
Lodumlu, TR-06530
Ankara
http://www.atom.gov.tr/

OTHER ORGANIZATIONS

Nuclear Engineering Department
Hacettepe University
06532 Beytepe, Ankara
http://www.nuke.hun.edu.tr/

Nuclear Engineers Society
http://www.nuke.hun.edu.tr/dernek/dernek.html

Institute for Energy
Technical University of Istanbul
Ayazaga Kampusu
TR- 80626 Istanbul

Institute of Nuclear Sciences
Ege University
İzmir
http://nukleer.ege.edu.tr/