HUNGARY

(updated in 2012)

1. GENERAL INFORMATION

1.1. Country overview

Hungary is a landlocked central European country. Its history goes back to more than a thousand year in Europe. Once part of the Ottoman and Habsburg empires, it became a partner in the Austro-Hungarian Empire in the mid-19th century. After a period of turmoil following World War I, an independent kingdom of Hungary was established. The redrawing of European borders that took place after World War I left about five million ethnic Hungarians living in neighbouring countries. Their status remains a sensitive issue. Following World War II, the country found itself under communist rule. An uprising against Soviet domination in 1956 was crushed by Red Army forces, but Hungary did later become the first Eastern European country to gain some economic freedom. It embraced aspects of the free market while still under communist rule, and in 1968, the authorities allowed limited decentralisation of the economy. Hungary played an important part in accelerating the collapse of communism across Eastern Europe when, in 1989, it opened its border with Austria, allowing thousands of East Germans to escape to the West. Just a few months later, the Berlin Wall fell. Hungary's post-communist economic transition was achieved relatively smoothly. Within four years of the collapse of communism, nearly half of the country's economic enterprises had been transferred to the private sector, and by 1998, Hungary was attracting nearly half of all foreign direct investment in its region. Hungary joined the European Union on 1 May, 2004. It became a member of NATO on 12 March, 1999. The global economic crisis hit Hungary in 2008. The high level of both private and state borrowing left the country particularly vulnerable to the credit crunch, and in October 2008 the government was forced to appeal to international financial institutions, such as the International Monetary Fund and the World Bank, for massive loans in a bid to stave off economic collapse. After reaching the bottom in 2009, the global economy started to recover again in 2010 and this in turn had an effect on the Hungarian economy. After the election in 2010, the Hungarian government started taking steps to stabilize the economy. The global economic slowdown and heightened financial market stress have pushed an already fragile and highly-indebted economy towards recession. Controversial domestic policies have also contributed to uncertainty, hurting consumer, business and market confidence.

1.1.1. Governmental System

Politics of Hungary takes place within the framework of a parliamentary representative democratic republic, whereby the Prime Minister of Hungary is the head of government. Executive power is exercised by the government. Legislative power is vested in both the government and parliament. The party system is dominated by the Hungarian Socialist Party and by the conservative Hungarian Civic Union or FIDESZ. The Judiciary is independent of the executive and the legislature. The Republic of Hungary is an independent, democratic and constitutional state. Since the constitutional amendment of 23 October, 1989, Hungary is a parliamentary republic. Legislative power is exercised by the unicameral National Assembly, which consists of 386 members. Members of the National Assembly are elected for four year terms. In April 2010, a general election was held in Hungary. The unified party of the Hungarian Civic Union (FIDESZ) and the Christian Democratic People's Party (KDNP) won the election with great majority and formed the new government. A new governmental structure was developed, with ministries responsible for several fields.

1.1.2. Geography and Climate

Hungary has borders with Austria, the Slovak Republic, Ukraine, Romania, Serbia, Croatia and Slovenia. It is strategically located astride main land routes between Western Europe and the Balkan Peninsula as well as between Ukraine and the Mediterranean basin. Most of Hungary is a fertile rolling plain, lying east of the Danube river and drained by the Danube and Tisza rivers. In the extreme northwest is the Little Hungarian Plain. South of that area is Lake Balaton (648 km^2), the largest in central Europe. Hungary covers an area of 93,032 square kilometres.

Hungary has a continental climate with Mediterranean and Atlantic influences, with humid winters and warm summers. The average temperature in January is 2 °C (28 °F) and in July 23 °C (73 °F).

1.1.3. Population

TABLE 1. POPULATION INFORMATION

									Average annual growth rate (%)
Year	1970	1980	1990	2000	2008	2009	2010	2011	2000 to 2010
Population (millions)	10.322	10.709	10.374	10.200	10.031	10.014	9.986	9.960	-0.2%
Population density (inhabitants/km²)	111.0	115.1	111.5	109.6	108.5	107.6	107.3	107.3	
Urban Population as % of total	0.67	0.69	0.68	0.68	0.69	0.69	0.70	0.70	
Area (1000 km²)	93.032								

* Latest available data

Source: Hungarian Statistical Office

According to statistical data, 88 050 children were born in 2011, 2.6% fewer than in the previous year. The number of deaths was 128 700, a decrease of 1.3% from 2010. The natural decrease was slightly higher than one year before, with the difference between births and deaths amounting to 40 650 persons. Taking into account international migration, the population of the country was 9960 thousand at the end of 2011.

1.1.4. Economic Data

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	1970 (HUF)	1980	1990	2000	2005	2008	2009	2010	2011	Average annual growth rate (%) 2000 to 2010
GDP (millions of current US$)	332548	22165	33059	46370	110276	154515	126683	128503	-	17.7%
GDP (millions of constant 2000 US$)										
GDP per capita (PPP* US$/capita)	-	-		12135	16938	20432	20154	20545	21732	6.9%
GDP per capita (current US$/capita)	32171	2070	3187	4541	10932	15393	12853	12850	-	18.3%

* PPP: Purchasing Power Parity

** Latest available data

Source: Hungarian Statistical Office

In international terms, Hungary has relatively limited economic potential with a sensitive foreign economy. Based on its GDP, Hungary is ranked as a relatively small unit in the world economy. The Hungarian economy has undergone a dramatic transformation since 1995, and until 2005 the gross domestic product per employed person showed continuous improvement. Hungary became the member of the OECD in 1996 and the European Union in 2004, and this greatly influenced its economic development. In contrast to the European boom, the Hungarian economy was characterised by minimally decelerating growth that still exceeded 4% in 2005. From 2006, the rate of growth of GDP started to decrease and had fallen to 1.3% by 2007. The global economic crisis hit Hungary in 2008. The mitigation of the external slump is also perceivable in Hungary`s economic performance. However, the real economic impacts of the crisis seem to be longer term, largely due to the fact that the economic crisis hit Hungary during a period of internal balance improvement and so the slowdown of the slump in the Hungarian economy, largely dependent on international booms, occured with some delay. in parallel with the global economic recession, the performance of the Hungarian economy fell. The gross domestic product of Hungary in 2011, coupled with decreasing growth in the year, was 1.7% higher than the year before. This is the highest increase since 2006. Taking into account all these aspects, the level of economic performance in Hungary was lower than it was in 2008, before the crisis.

Although the economic environment has been becoming less favorable within the EU. And this is reflected by the external trade performance in Hungary, external trade in goods and services remains the only engine of growth on the expenditure side of the domestic economy. Exports and imports rose by 8.4% and 6.3% respectively, in 2011, compared to the previous year, and the balance of net exports was 7.4% of GDP. Actual final consumption, calculated as the total of the actual consumption of households and government was essentially unchanged in 2011. The total performance of goods-producing branches increased by 6.3%, while that of services decreased by 0.6%. The performance of agriculture was increasing continuously at an even rate throughout the year. Looking at 2011 as a whole, expansion reached 27%, compared to the low base, as a consequence of the high rise of the value added by crop production. Industrial production reached a volume increase of 5.7%, within which manufacturing was responsible for

7%, contributing significantly to the expansion of GDP. The consumer price rise was 3.9%, over the year. The amount and rate of unemployment was about half a million persons and 11.1%, respectively. At the same time, the employment rate rose by 0.7% to 56 % in 2011.

The new government, elected in 2010, aims to decrease the exceptionally high national debt (about 80% of GDP) and to increase the growth rate of the economy. One of the first steps in improving competitiveness of the country was a substantial decrease in tax rate. The government wants to achieve its goals by decreasing the bureaucracy and expenditure of the government. Several changes have been implemented in many sectors including education, health care and the social support system, the result of which is expected in the near future.

1.2. Energy Information

1.2.1. Estimated available energy

TABLE 3. ESTIMATED AVAILABLE ENERGY SOURCES

	Estimated available (exploitable) energy sources					
	Fossil Fuels			Nuclear	Renewables	
	Solid	Liquid	Gas	Uranium	Hydro	Other Renewable
Total amount in specific units*	8516 Mt	43.54 Mt	2392.9 Gm^3	26.8 Mt		
Total amount in Exajoule (EJ)					0.016	60.110

* Solid, Liquid: Million tons; Gas: Billion m3; Uranium: Metric tons; Hydro, Renewable: TW
Source: Hungarian Office for Mining and Geology

Hungary has estimated coal reserves of more than 8.5 billion tons. The bulk of this is lignite, with 4.3 billion tons, followed by 2.2 billion tons of brown coal and 1.9 billion tons of hard coal. The coal found in Hungary has comparatively low calorific value, with high ash and sulphur content. Only lignite deposits in the north-east region of Hungary represent profitable and prospective possibility for mining. An important element of coal mining is the rigorous application of environmental protection requirements. Although the major share is used for power generation, a significant amount of coal was used for heating and cooking in households and communal facilities until the early 1990s, although since then it has rapidly declined. Domestic production has declined for the last two decades. Hungary produced about 9 Mt of coal in 2010, and imported 2.06 Mt. The imports come mostly from the Czech Republic, Poland and Russia. Hungary`s oil and gas reserves are relatively small. Hungary`s uranium resources are limited to those of the Mecsek deposit. Between 1956 and 1997, uranium was mined at the underground Mecsek mine by the state owned (until 1992) Mecsek Ore Mining Company, producing a total of just over 21 000 tU (tonnes of uranium metal). Until an ore processing plant became operational at the site in 1963, all ore was shipped to the Sillimae metallurgy plant in Estonia. After 1963, uranium concentrates produced at the processing plant were shipped to the Soviet Union. The mine was closed in 1997 due to poor market conditions. Remediation activities began the following year and were completed in 2008. Ongoing treatment of contaminated water from the mine and tailing ponds results in the collection of between 1 and 3 tU per year. With a general increase in prices since 2003, and with the prospect of rising demand, uranium exploration and mine development activities were re-started in many countries, including Hungary. In 2009, Australian-based Wildhorse Energy signed a co-operation agreement with Mecsek-Öko and

MECSEKÉRC, both Hungarian state-owned companies that are currently responsible for uranium mining, exploration and rehabilitation activities. The goal of this agreement is to work toward resuming the mining of uranium in the Mecsek Hills. Wildhorse Energy is continuing exploration activities, with the aim of defining a sufficiently large resource base to support commercial mining operations. A government resolution published in June 2012, in the official gazette Magyar Közlöny, gives the national development minister to the task of examining state-owned Mecsek-Öko, Mecsekérc and the state-owned Hungarian electricity company MVM. Depending on the standing of MVM, the Hungarian nuclear power plant MVM Paksi Atomerőmű Zrt. may participate in a joint venture to be established by Australia's Wildhorse Energy.

1.2.2. Energy Statistics

TABLE 4. ENERGY STATISTICS (Exajoule)

	1990	2000	2007	2008	2009	2010	Average annual growth rate (%) 2000 to 2010
Energy consumption**							
- Total	1.204	1.055	1.125	1.126	1.056	1.085	0.28
- Solids***	-	0.160	0.129	0.123	0.100	0.112	-3
- Liquids	-	0.330	0.394	0.381	0.341	0.357	0.78
- Gases	-	0.377	0.395	0.410	0.378	0.373	-0.11
- Nuclear (electricity)	-	0.141	0.153	0.152	0.167	0.168	0.98
- Hydro	-	-	-	-	-	-	-
- Other Renewables	-	0.033	0.054	0.061	0.071	0.073	12.1
Energy production							
- Total	0.634	0.485	0.427	0.436	0.458	0.461	-0.5
- Solids***	-	0.121	0.074	0.071	0.065	0.066	-4.5
- Liquids	-	0.070	0.051	0.053	0.051	0.045	-3.6
- Gases	-	0.104	0.084	0.084	0.096	0.093	-1.0
- Nuclear	-	0.155	0.160	0.161	0.168	0.172	1.1
- Hydro	-	0.001	0.001	0.001	0.001	0.001	-
- Other Renewables	-	0.035	0.057	0.066	0.078	0.083	13.71
Net import (Import - Export)							
- Total	0.570	0.570	0.698	0.690	0.597	0.624	0.95

* Latest available data
** Energy consumption = Primary energy production + Net import (Import - Export) of secondary energy.
*** Solid fuels include coal, lignite

Source: "Energy Centre" (Energy Efficiency, Environment and Energy Information Agency Non-Profit Company), Central Statistical Office

1.2.3. Energy policy

Hungary has successfully introduced legislation laying the foundation for market reform, in line with the most recent EU Gas and Electricity Market Directives. From 1 July, 2007, all electricity and gas customers became fully eligible to freely select their supplier. An act on electricity (Act LXXXVI of 2007) has been adopted by the Hungarian Parliament. The aim of the act is full liberalization of the electricity market, in order to enhance economic competitiveness and provide sustainable security of supply. The Act is in harmony with the requirements of the European Union. The provisions of the Act came into force partly from 15 October, 2007, and partly from 1 January, 2008. Since the beginning of 2008, the electricity market has become fully liberalized. Nevertheless, 2008 was considered a transition period, and the players of the market have had to learn the new rules. Real market competition is expected by the end of 2012. Hungarian electricity consumers are paying for substantial subsidies to the renewables and combined heat and power (CHP) sectors, through levies on their tariffs.

In February 2008, the National Climate Change Strategy for the period of 2008-2025 was adopted by the Hungarian Parliament. The strategy emphasizes the need for increasing energy efficiency, energy savings and for the use of renewable energies (wind, solar, geothermic, biomass). It does not mention nuclear energy as part of the concept.

In April 2008, a resolution on a new energy policy concept for the period of 2008-2020 was adopted by the Parliament. The Hungarian energy policy aims at maintaining a balance between security of supply, cost-effectiveness, energy efficiency and protection of the environment. According to the resolution, the Government should start working on preparations for the decision on new nuclear capacity to replace the old plants, and the proposal should be submitted to the Parliament in time. The Government should create the necessary conditions for the implementation of the programs aimed at the final disposal of radioactive wastes. The Government should update the Parliament on the implementation of the energy policy at least once every two years, and, in case of need, it should propose the review of the relevant concept.

The Hungarian Energy Strategy was adopted by the Parliament in October 2011. The Energy Strategy provides a roadmap until 2030 and has a vision until 2050. The main aim of the strategy is to ensure the optimal balance of security of supply, competitiveness and sustainability. The energy import should be decreased by diversification of resources and/or origins. The government considers energy production as a way out of the economic crisis. The main elements of the strategy include the increased use of renewables, maintenance of nuclear capacity (life-time extension and consideration of new capacity building), development of regional energy infrastructure, development of new organisational systems as well as increased effectiveness and efficiency in energy use. The National Energy Strategy can be found on the website of the Ministry of National Development (www.nfm.gov.hu)

The Act on Atomic Energy (Act Nr. CXVI of 1996) was modified to a great extent in 2011. The most important elements of the modification concerned safety principles and the tasks and activities of the Hungarian Atomic Energy Authority. The nuclear safety codes have also been modified, and the WENRA reference levels were built in. The set of requirements was completed by two new volumes, in order to define requirements for all parts of the life-time of nuclear facilities. The new set of requirements came into force on 1 November, 2011. The modified Act and the new safety codes can be found on the HAEA's website (www.haea.gov.hu).

After the severe accident at TEPCO Fukushima Dai-ichi Nuclear Power Plant, all European countries operating nuclear power plants had to perform the Targeted Safety Re-assessment (TSR) (the so-called stress test) at the instruction of the European Council. The TSR of Paks NPP focused on topics specified by the ENSREG: the issues corresponding to earthquake and/or flooding and other external natural hazard factors, to the loss of electric power supply and loss of ultimate heat sink or a combination of those, and to severe accident management. In relation to the hazard factors, it was assessed whether the design basis of the plant was duly determined and whether there are sufficient reserves beyond design base before severe damage occurred. Based on the final report of the Paks NPP, submitted to the HAEA for regulatory review, the HAEA agreed that the tasks proposed in the report would be carried out in order to further improve the plant safety, and identified a few additional options. Along with the detailed coverage of the topics specified by ENSREG, HAEA also established that the national legal requirements for the safety of nuclear power plants are in line with international standards and best practices. HAEA submitted the National Report on the results of the review to the European Commission by the end of 2011, and have published the report on its website (www.haea.gov.hu). Based on the results of the regulatory review of the TSR, HAEA concluded that the design basis of Paks NPP is adequate and complies with the legal requirements and international practice. The safety systems and safety functions satisfy requirements of the design base. After the last Periodic Safety Review of Paks NPP, specific safety enhancement measures have been implemented, mainly in order to improve the plant's capabilities beyond design basis. These measures are also fully in line with expectations of the Targeted Safety Re-assessment. It can be concluded that Paks NPP is safe, and no deficiencies have arisen which might call into question the adequacy of its design basis or require any urgent regulatory intervention. The measures initiated by the last Periodic Safety Review have also provided the plant with robust capabilities for the successful managing of severe situations. In addition to these positive findings, the Targeted Safety Re-assessment identified a number of options and measures to enhance plant safety even further. The HAEA has ordered the operator of the plant to elaborate the detailed program, by the end of the first half of 2012, for realizing these options.

1.3. The electricity system

1.3.1. Electricity policy and decision making process

The reform of the electricity industry commenced in 1994, when Act No. XLVIII on the Production, Transportation and Supply of Electricity was formulated and came into effect. The Hungarian Energy Office was established in 1994. The privatisation of the electricity sector began and took place in several phases. At present, the majority of power stations and 100% of the electricity suppliers (the grid and the distributors) are privately owned.

In Hungary, the electricity policy is an integrated part of the energy policy. The most important document, upon which the liberalisation of the Hungarian electricity market was based, is „Principles of Hungarian Energy Policy and a New Business Model". It was adopted by the Government in 1999 (Government Resolution No. 2199/1999).

Hungary became a member-state of the European Union in 2004, which necessitated further harmonizing of the Hungarian legal framework with EU law. An important step in this harmonisation was the adoption of a new Act on Electricity LXXXVI (2007), passed by parliament in 2007. The harmonisation and the electricity policy objectives are reflected in the Act. Its goal is the effective operation of the competitive electricity market. Access to the electricity grid is guaranteed at regulated prices, while transmission, distribution and system operation tariffs are set and published by the Minister of National Development. New capacities are established on a commercial basis through an authorization process. The new Act regulates the rules of full market opening effective from 2008.

Delayed by half a year, then set in EU Directive, the market was fully opened on 1 January, 2008. To supply the vulnerable consumers, universal service supplier licenses were issued in addition to the license types in earlier use. In parallel with the abolishment of public utility supply, the license for public utility wholesale was also abolished. The European Committee investigated the compatibility of long term contracts with the competitive market, which aimed to prepare for privatisation in the single buyer model. In its decision No. C-41/2005, published on 4 June, 2008, the Committee stated that the contracts implied prohibited state subsidy, and ordered that they be terminated and the prohibited state subsidy repaid. The system of long term contracts was thereby ceased at the end of 2008. Due to the lack of generation sources in the region and the high oil prices, the full market opening resulted in an unanticipated price rise also in the domestic market. The Electricity Act was again amended in June 2008, to ensure an “intervention possibility” in determining prices. Based thereon, and after identifying the participants with considerable market power, the Hungarian Energy Office ordered MVM Trade ZRt. and GTER ZRt. to apply electricity price caps. The universal service category includes household consumers and (former public utility) low voltage consumers with a nominal current of lower than 3×50 A. In this circle, authority (regulated) pricing continues to exist. The competitive market consumers have to purchase power from traders and have to sign a network use contract with the network license holder competent in the relevant area. Authority pricing now concerns only the system use charges; the prices of electricity traders are set by the competitive market. However, network access is ensured for each market participant. The relevant laws are available on the website of the Hungarian Energy Office (www.eh.gov.hu)

The responsibility for ensuring the reliable, efficient and environment-friendly supply of energy to Hungary belongs to the **Ministry of National Develeopment** (www.nfm.gov.hu), established in 2010. It is ranked directly under the top political level of energy issues, handled by the Minister of State for Climate and Energy Affairs. Development, competitiveness, security and sustainability are the key words directing the activity of the ministry.

The Hungarian Energy Office (MEH) (www.eh.gov.hu) is currently responsible for licensing energy suppliers, supervising the satisfaction of consumer demand as well as the standards of service provision, and protecting consumer interests. Pursuant to Section XIX of Electricity Act, the Hungarian Energy Office is an independent governmental office with separate and independent financial management. The MEH is self-financing. Licensees are charged supervisory and administrative fees for their activities. Following a proposal by the Ministry of National Development, the Prime Minister appoints and releases the MEH president and vice-president. Their appointment is for a six-year term. MEH resolutions can only be challenged and amended in court. The goal of MEH is to ensure market operation, to promote competition and to effectuate the efficiency requirements and principle of least cost, to sustain and improve security of supply and to protect the interests of users and license holders as well as to regulate prices in order to have a fair competition.

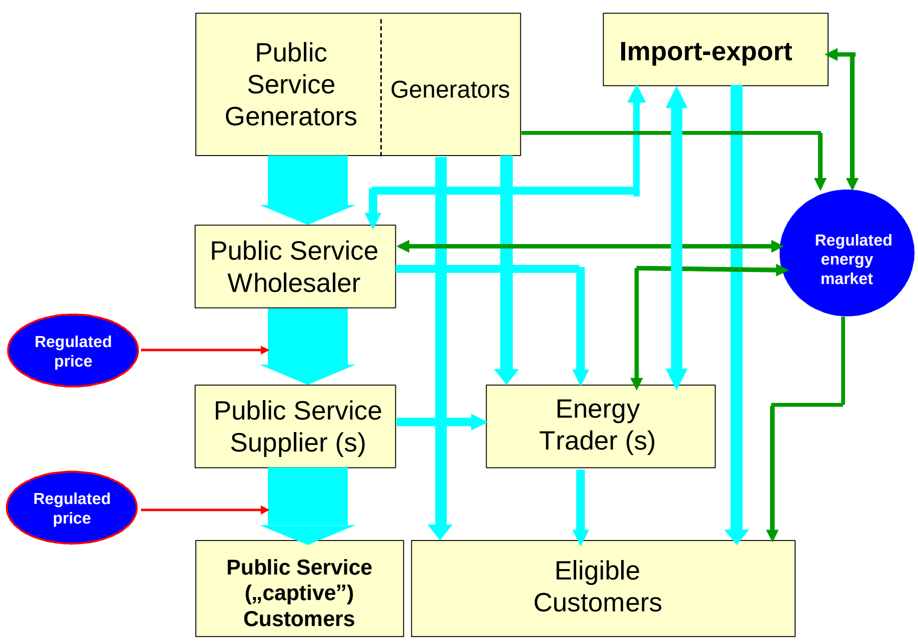
Ministry of Rural Development, established in 2010, is responsible for environmental issues. The task of the State Secretariat for Environmental Affairs is promotion of sustainable development, the preservation of air, water and soil quality and the protection of natural assets. In the area of waste management, the aim of the Office is to reduce pollution and to aid the recycling and up-to-date treatment of waste produced.

According to the legislation in force, the approval of the Government or the Parliament is needed for the establishment of power plants above 200 MW capacity. Between 200 and 600 MW capacity, it is the right of the Government to approve it, while above 600 MW capacity, it has to be approved by Parliament. Any nuclear installation including power and research reactors should be approved by the Parliament regardless of their capacity.

1.3.2. Structure of electric power sector

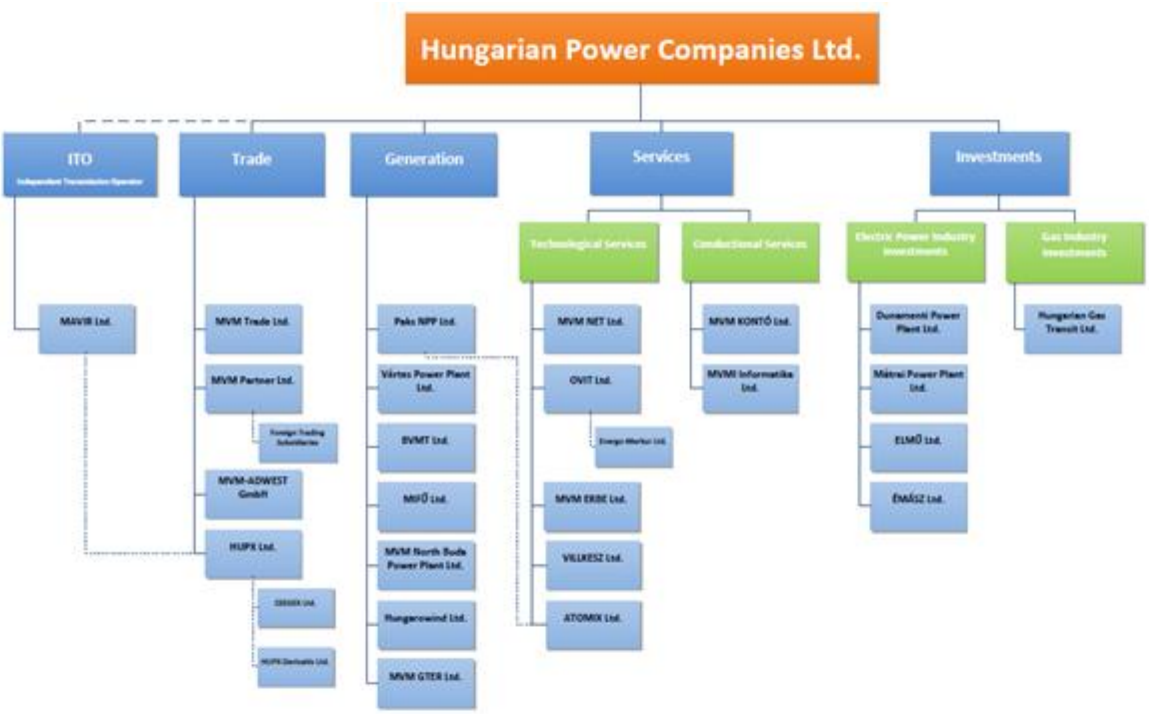
In the last decade, Hungary made substantial progress in restructuring its electricity sector and creating a market-oriented regulatory framework which fully conforms with EU regulations. Today, the power industry is restructured and mainly privatised. Its prices cover costs.

Figure 1. A simplified model of the Hungarian electricity industry.



The Hungarian Power Companies Ltd. (MVM Zrt.) (www.mvm.hu) plays a decisive role in the secure and reliable electricity supply of Hungary. The MVM Zrt., together with the Group it controls, constitutes the most significant domestic group of companies in national ownership. The members of the Group are well-known actors in the Hungarian electricity sector. MVM Rt. is primarily responsible for the public utility wholesale of electricity, with a turnover covering around three-fourths of the whole domestic power wholesale. The transmission activity of MVM Rt. is the other key factor in the domestic power supply. On high-voltage transmission lines, the company transmits the electric power obtained from domestic power plants and from import resources to the distributors, who sell it directly to the consumers. The MVM Group plays an active part also in power generation. This is primarily through the Paks Nuclear Power Plant, which has a crucial share in domestic power generation and so in ensuring a favourable price for electric energy. The MVM Group has no direct access to consumers. In 2005, the still indirectly (through MVM) state-owned independent MAVIR Rt. merged with MVM Rt. Due to a governmental decree (246/2005(XI.10)) about the execution of the former Electricity Act (CX. 2001), the activities and responsibilities of MAVIR have beoame much wider. Until the end of 2005, MAVIR ZRt. had the license of System Operation. Now, since the beginning of 2006, MAVIR ZRt. has received a license for Transmission, as well.

Figure 2. The structure of the MVM Group



Companies operating power plants of 50 MW capacity or higher:

AES Tisza Erőmű Kft. www.aes.hu
AES Borsodi Energetikai Kft.
Bakonyi Erőmű Zrt. www.bakonyi.hu (BVMT Bakony Power Generation Co. Ltd.)
Budapesti Erőmű Zrt. www.bert.hu
Csepeli Áramtermelő Kft. www.atel.hu

Debreceni Kombinált Ciklusú Erőmű Kft.
Dunamenti Erőmű Zrt.
ISD-Power Ltd. www.isdpower.hu
MVM Gázturbinás Erőműveket Üzemeltető és Karbantartó Kft. www.mvm.hu
Mátrai Erőmű Rt. www.mert.hu
Paksi Atomerőmű Zrt. www.npp.hu
PANNON Hőerőmű Zrt. www.pannonpower.hu
Vértes Erőmű Zrt. www.vert.hu
There are 200 companies operating 314 (small) power plants under 50 MW capacity.

Transmission system operation:

MAVIR Ltd. www.mavir.hu

Electricity distribution:

There are six privatised regional-distribution companies, responsible for the operation of networks with voltage 120 kV and below as well as supply for the customers.

E.ON Észak-dunántúli Áramszolgáltató Zrt. www.edasz.hu
DEMASZ Hálózati Elosztó Kft. www.demasz.hu
E.ON Dél-dunántúli Áramszolgáltató Zrt. www.eon-deldunantul.com
E.ON Tiszántúli Áramszolgáltató Zrt. www.eon-tiszantul.com
ELMÜ Hálózati Kft. www.elmu.hu
EMASZ Hálózati Kft. www.emasz.hu

The installed capacity of domestic power plants, as of 31 December 2010, was 9,317 MW(e). Compared to the value of 31 December 2009 (9,172.6 MW), it has increased by 144.4 MW, due to the commissioning of new units during the year and the decommissioning of units which were in "constant shut-down". The peak load of the Hungarian electricity system was 6,560 MW in 2010, which means a rise of 180 MW compared to 2009 (6,380 MW). Though the increase in energy efficiency may help to reduce the rate of increase of primary energy consumption, it is still probable that the electricity demand will increase after overcoming the current world crisis. The capacity expansion need by 2030 will be between 600 and 2600 MW. Taking into account the necessary closure of old fossil-fuel power plants, new capacity of between 6,000 and 8,000 MW is needed by 2030.
The capacity structure of the Hungarian electricity system is well balanced at present, with about 39% carbonhydrogen, 40 % nuclear share, 18% coal and an increasing ratio of renewables. In 2010, the gross domestic electricity production of Hungary increased by 4.1% (37.448 TWh compared to 35.908 TWh in 2009), whereas the net electricity import slightly decreased (from 5.513 to 3.195 TWh). The demand for electric energy also increased, by almost 3% (42.643 compared to 41.421 TWh in 2009). Nuclear energy accounted for about 42% of production. The electricity production from renewable energy sources is growing, in accordance with the EU directive on green electricity. Though the Hungarian target was 3,6% for 2010, nearly 8% of electricity came from renewable sources (wind, hydro and biomass) in 2010.

The Hungarian energy supply is about 60-65% import dependent, therefore its security is a crucial priority of the national energy strategy. The safe, successful and profitable operation of the state owned Paks Nuclear Power Plant greatly contributes to meeting this challenge. The obligatory stockpiling of nuclear fuel for two years is also an essential element in ensuring the stability of supply in case of any disruptions in import.

1.3.3. Main indicators

TABLE 5. ELECTRICITY PRODUCTION, CONSUMPTION AND CAPACITY

	1970	1980	1990	2000	2005	2008	Average annual growth rate (%) 2000 to 2008
Capacity of electrical plants (GWe)							
- Thermal				6,32	6,35	6,63	
- Hydro				0,05	0,05	0,05	
- Nuclear				1,85	1,87	1,87	
- Wind				0,00	0,02	0,07	
- Geothermal				0,00	0,00	0,00	
- other renewable				0,07	0,09	0,10	
- Total	2,48	4,98	6,60	8,29	8,38	8,71	
Electricity production (TW.h)	**1970**	**1980**	**1990**	**2000**	**2009**	**2010**	**2000 to 2010**
- Thermal			14.53	20,62	17.5	18.49	-10%
- Hydro			0.18	0,18	0,18	0,18	0
- Nuclear			13.7	14,2	15.43	15.76	+11%
- Wind			0	0,00	0,133	0,153	
- Geothermal			0	0,00	0,00	0,00	
- other renewable			0.18	0,22	2.44	2.5	1036%
- Total (1)	**14.5**	**23.9**	**28.47**	35,19	35,91	37.45	6.4%
Total Electricity consumption (TW.h)	17.94	31.3	39.6	41.4	46.88	47.8	15.5%

(1) Electricity transmission losses are not deducted.
* Latest available data
Source: Hungarian Power Companies Ltd.

TABLE 6. ENERGY RELATED RATIOS

	1990	2000	2009	2010
Energy consumption per capita (GJ/capita)	116	103	106	109
Electricity consumption per capita (kW.h/capita)	3817	3500	4695	4787
Electricity production/Energy production (%)	14.4	27.0	34.1	35.7
Nuclear/Total electricity (%)	48.1	40.3	43.0	42.1
Ratio of external dependency (%) (1)	47.34	54.0	62.0	57.51

(1) Net import / Total energy consumption.
* Latest available data
Source: Hungarian Statistical Office

2. NUCLEAR POWER SITUATION

2.1. Historical development and current organizational structure

2.1.1. Overview

The first Hungarian reactor was built for research purposes at Csillebérc, on the outskirts of Budapest, in 1959. The reactor, of Soviet origin and refurbished by Hungarian experts after 30 years of operation, was put into operation again in 1993, by the Atomic Energy Research Institute. The Budapest Research Reactor is a tank type reactor with 10 MW_{th} power.

The Nuclear Training Reactor of the Institute of Nuclear Techniques (INT), of the Budapest University of Technology and Economics, was put into operation in 1971. Since then it has participated in education in the nuclear field. It is a pool type reactor with 100 kW_{th} power.

In 1966, it was decided to construct a nuclear power plant in Hungary. The decision included two WWER-440 type, 230 model reactors. Construction work started in 1968, but was interrupted in 1970 as, at that time, oil-fired stations were considered to be more economical. The actual construction work began after the oil crisis, in 1975. The final decision included four second-generation reactors, i.e. WWERs-440/213, instead of the two 230 model reactors, all to work as part of one nuclear power plant. The plant is located about 5 km south of the town Paks, on the right bank of the river Danube. Since 1987, these four reactors have been generating electricity to the Hungarian electric energy system. The installed capacity of the reactors was 4 times 440 MW(e). Earlier upgrades of the secondary circuit and turbine resulted in approximately 470 MWe with an unchanged thermal capacity at all four units. An upgrade of the primary side was decided on, to increase the nominal power by 8% to 1,875 MWth, resulting in about 500 MWe generated power per unit. The power uprate was completed in 2009.

Hungary`s national policy concerning the application of atomic energy is regulated by law. The basic purposes of Act CXVI of 1996 are to protect the health and safety of the population and to protect the environment. The requirements of the Act state that the use of atomic energy is allowed only in a manner provisioned by law and under the permanent control of the competent authority. Regardless of what aspect of atomic energy is being considered, safety is a priority.

2.1.2. Current organizational chart(s)

Licensees:

Paks Nuclear Power Plant Ltd. (www.npp.hu). It has four WWERs-440/213 type power reactors.

Public Agency for Radioactive Waste Management (www.rhk.hu). It operates the Interim Spent Fuel Storage Facility at Paks, and the Radioactive Waste Treatment and Disposal Facility (RWTDF) at Püspökszilágyi, that manages low- and intermediate-level waste generated by medical, industrial and research applications. It also operates the National Radioactive Waste Repository in Bátaapáti, dealing with low- and intermediate-level waste generated by the Paks NPP.

KFKI Atomic Energy Research Institute (www.kfki.hu). It operates the Budapest Research Reactor.

Institute of Nuclear Techniques of the Budapest University of Technology and Economics (www.reak.bme.hu/nti/). It operates the BME Training Reactor.

Governmental organisations with responsibility in nuclear field:

The **Hungarian Atomic Energy Authority** (HAEA) (www.haea.gov.hu) is a public administration body, acting in the field of peaceful applications of atomic energy with a specified scope of tasks and authority, independent from both organizational and financial bias. Its basic tasks include establishing regulatory duties in connection with the safety of the peaceful application of nuclear energy, particularly with the safety of nuclear facilities under normal and accidental conditions and with nuclear emergencies. In addition, the HAEA is required to harmonise and handle related public information activities. Acting independently and supervised by a minister appointed by the Prime Minister, the HAEA is primarily concerned with ensuring nuclear safety in accordance with the law. Since 2010, the Minister of National Development is responsible for supervision of the HAEA's activity. The Director General of the HAEA is appointed and relieved by the Prime Minister. HAEA resolutions can only be challenged and amended in court.

The **Ministry of National Resources** undertakes the tasks of the authority regarding issues related to radiation protection and concerning the facility-level licensing and supervision of the storage of radioactive wastes. Other competent administrative bodies take part in the Ministry's licensing procedure as special authorities.

Within the **Ministry of Rural Development,** the State Secretariat for Environmental Affairs is responsible for establishing air and water quality standards, limits in radioactive releases from nuclear facilities, as well as for controlling releases at the facilities into the environment.

Research Institutes:

The **HAS Centre for Energy Research** was established in January 2012 on the basis of two former independent institutions, the Institute of Isotopes and the KFKI Atomic Energy Research Institute. The Centre is part of the research network of the Hungarian Academy of Sciences (HAS). The website of the new organisation can be found at www.energia.mta.hu.

The centre operates the 10 MW_{th} Budapest Research Reactor. It is active in several fields of nuclear technology such as reactor physics, thermal-hydraulics, health physics, simulator techniques and reactor chemistry. It performs a wide variety of research related to the use of radioactive materials and nuclear techniques, among them a research and development program for nuclear safeguards. It also provides expert support and the laboratory backgrounds for the HAEA.

The **Institute of Nuclear Research (ATOMKI, Debrecen) of the Hungarian Academy of Sciences** operates a 20 MeV cyclotron and a 5 MeV Van de Graaff accelerator. It is active in several fields of nuclear physics and nuclear techniques. (homepage: www.atomki.hu)

- The "**Frédéric Joliot Curie" National Research Institute for Radiobiology and Radiohygiene** (OSSKI, Budapest) performs research on a wide spectrum of relevant topics, including the biological effects of radiation and radioisotopes, radiohygiene (operational and environmental), sterilisation, detoxification etc. (homepage: www.osski.hu)

- The **Nuclear Safety Research Institute** (NUBIKI, Budapest) works in the field of safety analysis of nuclear power plants, PSA and severe accidents, noise analysis, etc. (homepage: www.nubiki.hu)

- The **Institute of Nuclear Techniques of the Budapest University of Technology and Economics** (BME NTI) operates a research reactor for training purposes, teaches nuclear technology for engineers, physicists, chemists and environmentalists, and performs research in some specialised fields. (homepage: www.reak.bme.hu)

- The **Power Engineering and Contractor Co.** (ETV-ERŐTERV Co., Budapest) works in the field of design, construction, commissioning and operation management of nuclear facilities. Its activities include waste management (treatment, storage and disposal). (homepage: www.etv.hu)

The **Institute of Experimental Physics of the University of Debrecen** operates the **Laboratory for Nuclear Safety and Techniques, NUBITEL** (https://regiszter.nekifut.hu/ki/nubitel-debrecen) (http://fizika.ttk.unideb.hu/kisfiz/nubitel/) and the **Quantechnologies Research and Development Co.** (http://www.quantec.hu/). The following main fields represent their areas of operation: in-situ alpha-, beta-, gamma-activity; measurements in nuclear power plants (primary circuit, refueling-, storage- and technical ponds); exploration and handling of nuclear wastes; detection of radioactivity in the environment (NORM/TENORM), under-water gamma-spectrometry; data evaluation and trend analysis; education and training in applied nuclear physics.

The Institute of Radiochemistry and Radioecology at University of Pannonia has a wide range of topics in research and education in two main fields: radiochemistry and nuclear technology as well as radioecology and radiation protection. (http://radio.mk.uni-pannon.hu/)

2.2. Nuclear power plants: Overview

2.2.1. Status and performance of nuclear power plants

Taking into account the energy situation in Hungary, the operation of its only nuclear power plant is crucial. The design lifetime of the VVER-440/213 Units at Paks is equal to 30 years, while the operational license is formally limited in time by the planned operational lifetime. As in other countries, the current Hungarian legislation for nuclear energy permits the renewal of the operating license, provided the safety of the continuing operation can be demonstrated and the renewal is approved by the responsible authorities.

TABLE 7. STATUS AND PERFORMANCE OF NUCLEAR POWER PLANTS

Station	Type	Net Capacity MWe	Operator	Status	Reactor Supplier	Construction Date+	Grid Date ++	Commercial Date	Shutdown Date	UCF for year **
PAKS-1	PWR	473	Paks NPP Ltd.	Operational	***	1974/08/01	1982/08/10	1983/08/10	N/A	
PAKS-2	PWR	473	Paks NPP Ltd.	Operational	***	1974/08/01	1984/09/06	1984/11/14	N/A	
PAKS-3	PWR	473	Paks NPP Ltd.	Operational	***	1979/10/01	1986/09/28	1986/12/01	N/A	
PAKS-4	PWR	473	Paks NPP Ltd.	Operational	***	1979/10/01	1987/08/16	'1987/11/01	N/A	

* UCF (Unit Capability Factor) for the latest available year (only applicable to reactors in operation).

** Latest available data

*** There are no NPP suppliers in the country; the main components of the Paks NPP were made abroad. (i.e. in Russia and Czech Republic). The main constructor was AEE (Atomenergoexport) and the main architect ERBE -EROTERV (Hungary). The manufacture of many components of the Russian-designed WWERs was done in the former COMECON countries under a multilateral agreement.

+ Date, when first major placing of concrete, usually for the base mat of the reactor building is done.

++ Date of the first connection to the grid

Source: PRIS database (www.iaea.org/pris).

The Paks Nuclear Power Plant is about 120 km south of Budapest. The Paks Nuclear Power Plant generated 15,685.0 GWh of electric energy in 2011, which represents 43.25 % of the gross domestic electricity production of Hungary. This amount was generated by four Units as follows: Unit 1: 3,700.3 GWh; Unit 2: 4,037.2 GWh; Unit 3: 3,888.8 GWh; Unit 4: 4,058.7 GWh. As far as the amount of produced energy is concerned, 2011 is considered an outstanding year, because the second largest production result was achieved in the history of the power plant. The total of all electricity generated by Paks NPP since the date of the first connection of Unit 1 to the grid was higher than 366.8 TWh as of the end of 2011.

Figure 3. Map of Hungary indicating the location of Paks NPP

2.2.2. Plant upgrading, plant life management and license renewals

The Paks NPP consists of four VVER-440/213 type reactor units, originally designed to produce 1,375 MWth and 440 MWe each. Earlier upgrades of the secondary circuit and turbine increased the electrical output to about 470 MWe in each unit, with no change to thermal capacity. Recently an upgrade of the primary side has been completed that increased the nominal power by 8%, to 1,485 MWth, resulting in about 500 MWe of power generated by each unit. The power increase is primarily reached by refined primary pressure regulation, a core control system upgrade and the use of a new type of fuel assembly. Additional modifications have been performed in certain technological components, e.g. replacing some of the MCP impellers and decreasing the initiating pressure value of the hydro-accumulators. By the end of 2009, the uprating process was completed successfully on all four units. 2010 was the first year these operated at the increased power level.

In order to enhance its economic and operational efficiency and to improve its position in the market, the Paks NPP has begun an Economical Efficiency Enhancement Programme (EEP). The principal elements of the EEP are enhancing human resources efficiency, power uprating, optimizing maintenance and initiating service life extension. The objectives of EEP for 2011 were reached as planned.

At the end of 2008, Paks NPP submitted a Lifetime-extension program to the Hungarian Atomic Energy Authority to justify the establishment of the operating conditions and safe operation beyond the designed lifetime. HAEA evaluated the program and ordered the licensee to implement the program with certain conditions. The technical preparatory activities covered determination of the aging effects and aging processes requiring treatment, the status of the systems, structures and components, the evaluation of the existing aging management programs and, if necessary, the amendment or development of new programs. HAEA regularly reviews and evaluates the progress reports on the Lifetime-extension program. In December 2011, in compliance with the legal requirements, Paks NPP submitted the beyond designed lifetime license application of Unit 1, one year before the expiration of its licensed operating time. By the end of 2012, HAEA will have evaluated the license application and the additional information, and will make a decision on the extension.

2.3. Future development of Nuclear Power

2.3.1. Nuclear power development strategy

The construction of new reactors at the Paks site has been proposed in order to meet future electricity demands. Under Hungary's Nuclear Energy Act, the government needs to obtain preliminary conceptual approval from parliament before taking specific steps leading to the construction of new nuclear capacity. On 30 March, 2009, members of the Hungarian Parliament approved a decision in principle (330 votes yes, 6 votes no and 10 abstentions) that permits preparations for new unit(s) at the Paks NPP. According to the explanation of the resolution, preparations for the investment will take at least 5 years while commissioning, planning and implementation will require a minimum of six years. Construction of a new nuclear unit will therefore take at least 11 years. As the explanation observes, more than 70% of Hungarians support nuclear power generation in the country. It is consequently anticipated that the first planned unit will be commissioned between 2020 and 2025.

Since the go-ahead from the Hungarian Parliament, preparatory work related to the extension of Paks NPP has accelerated.

As the part of the preparation for new units, the management of the MVM Group founded a project in 2007. The aim of this project was to make the necessary preparations on which the parliamentary decision could in principle be based. The project tasks included feasibility studies, preliminary environmental assessment, the evaluation of storage possibilities for spent nuclear fuel elements and radioactive waste, as well as preparation for communication. The current decision of the Parliament, in March 2009, is not a direct agreement that new nuclear units will be built. After the parliamentary decision, the Paks nuclear power plant, along with its owner, the Hungarian Power Companies Ltd. (MVM Zrt.), established the Lévai Project to carry out tasks to commence the extension of the Paks NPP in accordance with the resolution. Preparation for the construction of new units is taking place within this project. Activities include preparations for obtaining environmental and site licenses. Within the project, engineering, analysis, legal, communication and financial tasks were implemented in 2011. A survey was initiated to determine the possible suppliers for the construction of the new unit and the demand for the necessary man-power. An interactive mobile exhibition, launched in the end of 2009, assists in public information on the life time extension and the new units. It has had more than 60 000 visitors in 150 settlements since October 2009. The support of nuclear energy by the Hungarian public remained outstanding. According to the latest poll, conducted in 2011, 73 % of the population agrees with the operation of Paks NPP and only 23 % is against it. In 2012, the Board of the MVM Zrt. took the decision to establish a company to continue the tasks of the Lévai project. This company is called MVM Paks II. Zrt. The tasks of the company include the examination of all essential aspects of the construction to take a responsible decision on the construction of the new units at the Paks NPP.

The government decided to make the extension process faster, and three governmental decrees was adopted in 2012. The government determined the tasks and responsibilities (1194/2012 (VI. 18) Gov. decree) for the preparation of the construction of the new units at the Paks NPP. It established a Nuclear Energy Governmental Committee to deal with the strategic issues (1195/2012 (VI. 18) Gov. decree). Moreover, it declared the extension as high priority project (1196/2012 (VI. 18) Gov. decree).

The Hungarian Atomic Energy Authority (HAEA) has started the preparations for the licensing of the new units by reviewing four important areas including regulatory requirements, licensing framework, technological and safety characteristics of possible new units and international framework. The most important goal of the preparation of HAEA is to adopt the strictest requirements set by the latest results of science and technology and at the same time to avoid any unnecessary complication of the licensing process. As part of the review process the representatives of the nuclear industry, the HAEA and the Hungarian National Standard Committee agreed on the promulgation of a series of international standards specific to nuclear power plants to cover the necessary technical fields on which Hungarian National Standards were not available. The first series of standards covering the principles of instrumentation, control room and emergency control room design, safety parameter displaying, detection of leakages and loose parts in primary circuit, neutron flux monitoring, radiation monitoring and alarming were published as Hungarian National Standards in January 2011.

According to the Act on Atomic Energy, the safety requirements of the use of nuclear energy must be regularly reviewed and modernized, taking into account the achievements of science and international experience. Governmental decree 89/2005.(V.5.) states that the Nuclear Safety Code must be reviewed and updated if necessary at least every five years. As a result of the review, the governmental decree 118/2011.(VII.11.) on the nuclear safety requirements of nuclear facilities and on the related legal activities was issued and came into force on August 10, 2011. The reviewed Nuclear Safety Code was published as annexes of the government decree.

Recently, the requirements related to the new nuclear facilities have been elaborated (Volume 9 of Nuclear Safety Code) and the extended set of regulations has come into force on 1st April, 2012, by government decree 37/2012 (III. 9.).

Based on the nuclear safety codes in the field of nuclear safety, it is mandatory to present independent technical expert opinions to the license applications for plant modifications. The registration and evaluation process of these technical experts is prescribed in the Atomic Energy Act (Act Nr. CXVI of 1996) and its executive decree (Government decree 247/2011).

2.4. Organizations involved in construction of NPPs

Not applicable

2.5. Organizations involved in operation of NPPs

The Paks Nuclear Power Plant Ltd. is a state owned business entity. More than 99% of shares are held by the Hungarian Electricity Board Ltd. (with authority granted by the state) while the remaining part is held by local authorities. The operator is the Paks NPP Ltd., while the technical supporting organisations (TSO) are listed in 2.1.2 (Current organisational chart)

2.6. Organizations involved in decommissioning of NPPs

Decommissioning is not a current issue for Hungarian nuclear facilities. Nevertheless this question has been covered in regulations, as the final phase of the life-cycle of the installations. As for all other phases, it requires a nuclear safety license. For decommissioning, a multi-step licensing procedure is established, wherein the first step is to obtain the authorities' consent to terminate operations. A further requirement is a valid environmental protection license, based on environmental impact assessment and public hearing. As in all phases of the life-cycle of a facility, radiation protection authorities are involved in these licensing processes, and they license separately the appropriate radiation protection programme and radiation protection organisation. During the dismantling, decontamination and other steps, an ongoing task of the authority is the control of the radiation situation within the facility and around it, and the monitoring of personal doses and of discharges and radiation in the environment. Emergency plans have to be updated with new or likely scenarios, and any necessary organisational changes required must be adjusted accordingly.

The Public Limited Company for Radioactive Waste Management is a 100% state owned, non-profit oriented enterprise, which was established by the Director General of Hungarian Atomic Energy Agency on behalf of the Government. Its tasks include the storage and final disposal of radioactive wastes generated during the use of nuclear technology, and the dismantling of nuclear installations.

2.7. Fuel cycle including waste management

Fuel Cycle

Hungary has 20,000 metric tons of exploitable uranium resources and 10,000 metric tons of additional reserves. There are three areas in Hungary where uranium occurrences are known, but only one region in Mecsek Mountains has been exploited. Hungary was mining uranium ore, which was processed to yellowcake at Mecsek and then shipped to Russia. Fuel cycle services, including the fabrication of fuel assemblies, the shipping of the fabricated fuel assemblies to Hungary and the return of spent fuel to the former USSR, were guaranteed by the former USSR when Hungary purchased Soviet reactors. Hungary does not have other fuel cycle capabilities such as fuel conversion, enrichment, and fabrication.

There are no reprocessing capabilities in Hungary, and no plans to develop any. Hungarian spent fuel is reprocessed in Russia and the recovered plutonium does not have to be returned to Hungary. At present, Hungary has no plans for recycling plutonium as fuel.

A new type of fuel assembly with improved parameters is being introduced at the Paks NPP. The enrichment of the new fuel has been increased and it contains burnable poison (Gd isotope). The increased enrichment enhances the economic efficiency of the fuel cycles, while the application of the burnable poison compensates for the negative effects of the increased enrichment on the safety features of the reactors and of the transport and storage devices. This change conforms with a world-wide trend. In 2010, test operation of 18 assemblies was completed, following licensing in 2009. The preliminary use of the test assemblies was necessary for the validation of the reload design computer codes. When the test program was finished successfully, the Hungarian Atomic Energy Authority issued a license for the general use of the new fuel. On this basis, the first batch of new fuel assemblies was loaded at Unit 4 in 2010. The results of a special inspection program showed that the behavior of the fuel assemblies is in harmony with the preliminary estimates and design requirements. The transition to the new fuel will be finished gradually during the next four to five years.

Spent Fuel

According to the Hungarian-Soviet Inter-Governmental Agreement on Co-operation in the Construction of the Paks Nuclear Power Plant, concluded on 28 December, 1966, and the Protocol, concluded on 1 April, 1994, attached to this Agreement, the Soviet and/or Russian party undertakes to accept spent fuel assemblies from the Paks Nuclear Power Plant in such a manner that the radioactive waste and other by-products arising from the reprocessing of such fuel is not returned to Hungary. Until 1992, the return of the spent fuel assemblies was conducted without problems, under conditions which were very favourable to Hungary but which nevertheless deviated from normal international practice. Following the collapse of the Soviet Union, however, this method of returning spent fuel became less and less reliable. For this reason and in the interests of ensuring the undisturbed operation of the nuclear power plant, it became necessary to find an interim solution (50 years) for the storage of spent fuel assemblies.

The Interim Spent Fuel Storage Facility at the Paks site is a 'modular vault dry storage' type facility, and has been receiving irradiated fuel assemblies from the Paks NPP since 1997. The increase of storage capacity is in line with the demands of Paks NPP. The planned 37 modules are assumed to be capable of storing all spent fuel until the end of the extended service life of the plant. The extension of the storage facility with four new modules was finished at the end of 2011. At present, 20 storage modules are ready. Beginning with module 17, square arrangement will be applied for the storage tubes, instead of the triangular arrangement that is used in modules 1-16. Consequently, 527 storage tubes can be stored instead of the original 450. When the storage facility reaches its maximum planned capacity, it will be capable of storing a total of 18,267 fuel assemblies within the 37 modules.

Waste Management

The basic regulation in force at present, Act CXVI of 1996 on Atomic Energy, expresses Hungary's national policy in the application of atomic energy. Among other aspects, it regulates the management of radioactive waste and authorises the Government and the competent Ministers to issue executive orders specifying the most important requirements in this field. The Hungarian Parliament approved the present Act on Atomic Energy in December 1996, and the Act entered into force on 1 June 1997. For radioactive waste repositories, the Act prescribes that Parliament's preliminary approval in principle is required in order to initiate activities in preparation for their establishment.

In accordance with the basic rules laid down in the Act, radioactive waste management shall not impose any undue burden on future generations. To satisfy this requirement, the long-term costs of waste disposal and of the decommissioning of nuclear power plant shall be paid by the generations that enjoy the benefits of nuclear energy production and the applications of isotopes. Accordingly, by the Act and by its executive orders, a Central Nuclear Financial Fund was established on 1 January, 1998, to finance radioactive waste disposal, interim storage and disposal of spent fuel, as well as the decommissioning of nuclear facilities. The Government authorised the Director General of the Hungarian Atomic Energy Authority to establish the Public Agency for Radioactive Waste Management, and this agency has been in operation since 2 June, 1998. In line with the corporate forms used in the European Union, the Public Agency for Radioactive Waste Management has been transformed, as of 7 January 2008, into the **Public Limited Company for Radioactive Waste Management**.

On the basis of the Act, the Public Agency for Radioactive Waste Management shall design and carry out radioactive waste management in such a way that it shall be safe during the whole duration of the activity and shall not affect human health and the environment abroad to a greater extent than the accepted value within the country.

In the field of radioactive waste management the following projects are underway:

a) Disposal of high-level and long-lived radioactive waste

In 1995, a programme was launched for solving the disposal of high-level and long-lived radioactive wastes. (Even if the spent fuel of Paks NPP can later be shipped back to Russia, a domestic repository must be created for other high level waste, including decommissioning waste). The programme mainly focuses on investigations in the area of the Boda Claystone Formation. An underground laboratory is to operate from 2017 to 2032, and the repository is due to be operated by the end of the 2040s.

b) Disposal of low- and intermediate-level radioactive waste from the Paks NPP

For the disposal of low- and intermediate-level radioactive waste from the Paks NPP, following a country wide screening and ensuring public acceptance, explorations have been carried out in the vicinity of Bátaapáti (about 45 km south-west of Paks). Based on the results of the extensive research, the Hungarian Geological Survey declared the site geologically suitable for housing a repository. In November 2005, after a decade spent siting in the vicinity of Bátaapáti (Tolna County) for a L/ILW geological repository, the Hungarian Parliament gave the green light for construction with resolution 85/2005. (XI. 23.) OGY, giving its preliminary approval in principle for the construction. This is a formal requirement in accordance with the Act on Atomic Energy. 96.6% of lawmakers voted in favour of the joint resolution on the life-extension of the Paks NPP and the waste repository, clearly showing that Hungary has broad political consensus in such matters. Prior to the parliamentary vote, 91% of Bátaapáti residents voted in favour of the repository at a local referendum.

In addition to ongoing underground research activities, both the licensing procedure and preparations for construction could begin in 2006. The competent authority issued the environmental license in 2007. The construction license for the surface part (central and technological buildings) and for 4 underground disposal vaults entered into force in 2008. By October 2008, the surface buildings of the National Radioactive Waste Repository were completed. Later, the authority granted the operation license for the surface part of the facility. The operational license allows the interim storage of 3,000 drums (200 litre capacity each), containing low-level solid radioactive waste from the Paks NPP. The first transports of waste were delivered to the facility by the end of 2008, and by December 2011, a total of 3,000 drums were stored there. According to plans, the first two underground disposal vaults of the repository can be put into operation in 2012, after extending the operational license to cover future disposal activities in the repository.

c) Radioactive Waste Treatment and Disposal Facility

The near-surface repository for institutional low- and intermediate-level radioactive wastes, the Radioactive Waste Treatment and Disposal Facility in Püspökszilágy, was commissioned in 1976. The disposal capacity is 5,040 m^3, and by the end of 2004 the repository had been filled. However, according to long term plans, the repository is expected to be in operation for further decades, receiving radioactive waste from small-scale producers within the country. To this end, measures are to be taken to provide additional disposal capacity within the site. The safety of the facility was assessed from 2002 to 2005, and upgrade work is ongoing. The removal of certain long-lived and high-activity spent sources from the vaults, within the framework of the safety enhancement programme, provides a good opportunity to achieve this goal. This work, combined with some repackaging of wastes in the facility, has created additional storage capacity which will host L/ILW of non-nuclear plant origin.

A recent achievement at the facility is the conversion of the existing treatment building into a centralised interim store that can serve as a ‘buffer storage’ until new disposal capacity is available in the repository. The renovated building is also designed and licensed for the interim storage of long-lived radioactive waste, sealed sources, until a high-level waste repository is available.

2.8. Research and development

2.8.1. R&D organizations

Legal framework for the implementation of an R&D program is established in the Act on Atomic Energy (Act CXVI of 1996 on Atomic Energy), according to which the technical support activities needed for improving the safety of the peaceful application of nuclear energy shall be financed via the HAEA. It is thus the responsibility of the HAEA to manage the scientific-technical support for nuclear safety regulatory activities. In order to manage the quality of such a complex program, the HAEA has defined its basic principles and requirements for performing technical support activities. Scientific-technical support is provided by a group of scientific-technical institutions and other engineering organizations (Technical Support Organizations – TSO). As a rule, the scientific-technical co-operation with the partner TSOs (with a wide range of competency in the nuclear facility operation and regulation) is based on a long term memorandum, accepted and signed by both the HAEA and the partner TSOs. At present, there are several strategic partner TSOs including the KFKI Atomic Energy Research Institute AEKI, the Nuclear Safety Research Institute (NUBIKI) and the Institute of Nuclear Techniques of the Budapest University of Technology and Economy (BME-NTI). The requested technical support from a TSO is described in a contract in which the deadline and the expected quality are further defined. In urgent regulatory matters, the strategic TSO Partners provide technical support quickly and flexibly on a free-of-charge basis. This system of TSOs ensures that the HAEA has appropriate engineering and scientific reserve capacities to handle situations which need fast and technically-correct decisions.

To efficiently harmonize the TSO co-operation, the HAEA has elaborated a mid-term R&D concept, which has been regularly updated. The R&D concept assigns the main goals, the area of the support program and the most important requirements for competencies of contractors.

Areas of R&D activities change all the time, as new safety upgrading measures and operation improving modifications come up at the licensees, age dependent and decommissioning related tasks arise and as the nuclear safety regulation has to be periodically upgraded. The most important R&D areas are:

- Support of regulatory activities (evaluation of safety analyses, development of alternative computer codes, questions related to the behaviour of fuel in given conditions)
- Support of activities related to power upgrading and operational license prolongation (ageing effects regulation)
- Decommissioning
- Operational safety (human performance, safety culture evaluation, event analysis techniques)
- Support in preparing risk-informed nuclear safety regulation
- Design basis and severe accident analyses

The collection of data about the knowledge and competencies of TSOs was started in 2005, and 18 institutions have been surveyed about their competencies and co-operation affinity in 10 main areas of regulatory interest, divided into 48 specific sub-areas. As a result, it was concluded that all major scientific-technical areas important for Hungarian nuclear safety were covered by research or technical institutions, and that in each of the 48 sub-areas of regulatory importance there were at least two independent experts.

Hungarian research organisations continued the necessary analytical activities related to the Paks NPP lifetime extension. Analysis of the integrity of the primary circuit has led to satisfactory results, although some further refinement of the methodology is still needed in order to avoid technical measures.

The introduction of burnable absorbers is the next important modification at Paks NPP. This will compensate for the increased fuel-cycle costs of cores at power uprated by 8%. The R&D background necessary to apply burnable absorbers is fully available in Hungary, however, appropriate core monitoring still requires research work. This research work is based on detailed measurements of flow mixing and temperature distributions within the fuel assemblies.

After licensing of the lifetime extension, Paks NPP is expected to be operated without major technical modifications and so will not necessitate many safety research tasks for research organisations. However, lifetime extension will presumably cover important plant modifications, like I&C reconstruction. If the construction of new nuclear units in Hungary is approved, the research organisations will definitely be involved in the licensing and construction process. The strategy of the country and the region concerning the closure of the fuel cycle and final disposal of spent fuel and high-activity waste should be elaborated, and this represents a major challenge to the Hungarian research organisations.

2.8.2. Development of advanced nuclear technologies

The attention of research organisations is also attracted by other nuclear systems. The Generation-4 SCWR (more accurately, its European version, HPLWR) is currently studied in Hungary within the framework of a nationally financed project, which gives Hungary a solid base for participation in an EU project with a similar aim, and in several bilateral co-operations. The decision on constructing ITER also attracts scientists to deal with various aspects of fusion technology, rather than restricting themselves to plasma physics.

The Centre for Energy Research, together with its Czech, Slovak and Polish partners, and with strong technical support from CEA, started the preparatory activities, in 2010, to launch the ALLEGRO project for establishing a 75 MW_{th} demonstration of gas fast reactor technology. These preparatory activities include

- finalising the design and the safety concept of the ALLEGRO reactor
- clarifying the fuel related problems
- defining the R&D needs for starting the licensing and construction of ALLEGRO
- paving the way to the licensing of ALLEGRO by the nuclear safety authorities
- preparing the outline of EIA
- defining the technical details of site selection
- proposing the method of site selection
- defining the governance structure of the project
- clarifying IPR
- organising the political support and financial support of the project.

Most of these activities will be concluded in 2013, however R&D activities will continue on the medium and long run.

2.8.3. International co-operation and initiatives

In Hungary, both the licensee and the Authority maintain wide-ranging relations with various international organizations, with other countries and with institutions involved in the design, manufacture, installation and operation of nuclear facilities and research institutes.

These relations serve as a means of exchanging knowledge and experience. The fact that Hungarian experts are internationally held in high esteem is demonstrated by their active role on different committees, with many of them board members in international organizations or invited experts.

Hungary is a Member of the International Atomic Energy Agency (since 1957) and the OECD Nuclear Energy Agency (since 1996).

Hungary has bilateral governmental agreements with Australia, Austria, Canada, Croatia, the Czech Republic, Germany, Romania, Russia, the Slovak Republic, Slovenia, Ukraine, and the United States of America.

There are agreements on mutual information exchanges between the Hungarian Atomic Energy Authority and other regulatory bodies, including that of the Czech Republic, Romania, the Slovak Republic and the United States of America.

Regional programmes organised by the EU and the International Atomic Energy Agency play an important role in the co-operation between the regulatory bodies of the neighbouring countries. Furthermore, the Hungarian Atomic Energy Authority (HAEA) is taking part in a quadrilateral co-operation with new EU member states, including the Czech Republic, the Slovak Republic and Slovenia.

The Hungarian Atomic Energy Authority takes part in several international co-operations, including:

- *European Nuclear Safety Regulators Group (former European High Level Group on Nuclear Safety and Waste Management*) organised by the EU (co-operation to progressively develop a common understanding and to further common approaches in priority domains related to the safety of nuclear installations)
- *VVER Forum* (established by the regulatory bodies of countries operating Soviet-designed pressurised water reactors)
- *Standing committees* of the *OECD Nuclear Energy Agency* (CNRA, CRPPH, RWMC)
- *WENRA* (Western European Nuclear Regulatory Association)
- ESRA (European Security Regulator's Association)
- *NERS* (Association of countries with small nuclear programmes)
- *ESARDA* (European Safeguards Research and Development Association)
- *Global Initiative* to combat nuclear terrorism
- *IFNEC* (International Framework for Nuclear Energy Cooperation former Global Nuclear Energy Partnership GNEP)
- *Zangger Committee* (dealing with controlling the export of nuclear materials and equipment)

– *Nuclear Suppliers Group* ((*NSG)* dealing with controlling the export of nuclear materials and equipment and the dual use of materials and equipment).

The Paks Nuclear Power Plant is a member of several international bodies of major importance, including the World Association of Nuclear Power Plant Operators (WANO), the WWER-440 operators' club, the WWER users' group, the International Nuclear Safety Program (the so-called Lisbon Initiative) and the Nuclear Maintenance Experience Exchange (NUMEX).

The Hungarian Nuclear Society is a member of the European Nuclear Society (ENS), and the Health Physics Section of the Roland Eötvös Physical Society is a member of the International Radiation Protection Association.

The technical support organizations of the HAEA take part in international activities including the working groups of the OECD NEA.

2.9. Human resources development

The Budapest University of Technology and Economics (BUTE) operates a training reactor with the nominal power of 100 kW. This university has a special training program for engineering-physicist students. Students may choose the nuclear technique module in the 4th and 5th years of their studies. Those who have any other kind of degree in engineering or science have the option of studying for 2 more years at the BUTE to earn a nuclear engineer secondary-degree. There is also the possibility of getting a masters degree in medical physics.

There is a particle accelerator at the University of Debrecen, which is another source for specialists in the field of nuclear sciences.

At the Faculty of Science of Eötvös Lóránd University (ELTE), students of the faculty of physics also learn about nuclear technique and practice at the KFKI Atomic Energy Research Institute.

Paks NPP

The Paks NPP has a special training program for newcomers. At the beginning, they have to take part in nuclear courses, where they learn about the basics of radioactivity and about the operation of the NPP. Based on their future work position, they may take further courses on the primary and secondary circuit or on the electrical and mechanical systems of the NPP. There is a full scope simulator for operator training. The special Maintenance Training Center, established in an IAEA model project, also plays a very active role in staff training. The training system of the Paks NPP is operated on the basis of the IAEA Systematic Approach to Training (SAT) system.

Hungarian Atomic Energy Authority

At the HAEA NSD, inspectors take part in a predefined training program, which is reviewed annually. The training plan is divided into three parts: mainly the training of newcomers, refresher training and specific training. The training plan also includes the utilization of results of the R&D projects.

Newcomers to the HAEA NSD have to complete special training. It includes all important fields related to the HAEA NSD responsibility areas, and also to special training courses at the nuclear power plant and at the other licensees. After the one year program, the newcomers have to pass the so-called inspector exam, where they analyze real events regarding the licensing, supervision and investigation process of the HAEA NSD.

At the HAEA NSD, a knowledge profile survey takes place biannually. The inspectors rate their knowledge profile in predefined expertise areas (regulation, quality assurance, construction of nuclear facilities, lifecycle of nuclear facilities, operation of nuclear facilities, technical-scientific background, safety analysis, radiation protection, management of nuclear and radioactive material, safety culture, human factor, supervision, nuclear emergency preparedness, office technology). The knowledge profile is evaluated according to the current needs.

The longer-term training program contains training directions based on the knowledge profile survey and on the future projects and strategy of the HAEA NSD, for example: bigger systems of the Paks NPP, life-time extension at the Paks NPP, decommissioning, R&D projects, legal environment, etc.

At the initiation of the director general of the HAEA, following thorough negotiations conducted in 2009, the representative of the leading Hungarian nuclear organizations established the Hungarian Nuclear Knowledge Management Database System on June 22, 2010, by signing a joint co-operation agreement at the headquarters of the HAEA. The main objective of the system is to collect and maintain the Hungarian-made documents, on the expertise accumulated during the application of atomic energy, for future generations. This continuously-updated common database facilitates the sharing of knowledge and information within the nuclear community.

The code of conduct developed by the editorial committee was signed on December 15, 2010. This established the administrative conditions for the operation of the knowledge management database, aside from the technical provisions. Consequently, ordinary use of the “common electronic repository” of the Hungarian nuclear community began in 2010.

2.10. Stakeholder Communication

According to the latest poll, conducted in 2010, 78% of the population agrees with the operation of Paks NPP and only 18% is against it. The favorable results are due to the communication efforts of the nuclear society, including all players in the nuclear field. Openness and transparency are key values in communication about nuclear energy. There are many ways to communicate with stakeholders, including informing the media about any important events. Seminars, presentations, exhibitions and visits to nuclear facilities are organised to give more information about nuclear energy and future plans.

3. NATIONAL LAWS AND REGULATIONS

3.1. Regulatory framework

3.1.1. Regulatory authority(s)

Before 1991, the Hungarian Atomic Energy Commission (HAEC) managed most nuclear aspects which were related to international relations, preparation for legislation, internal relations, and nuclear regulatory and licensing activities. The scope of activities and responsibilities of the HAEC were redefined in a government decree, which came into force on 1 January, 1991. The HAEA, as a new, nation-wide central state administration organization was established under the supervision of the President of the HAEC. The revised Act on Atomic Energy adopted at the end of 1996 (Act CXVI of 1996 on Atomic Energy), and its Decrees on Implementation, introduced further changes in the scope of authority and organizational structure of the national regulatory bodies related to nuclear safety.

Owing to the above-mentioned changes, the licensing of nuclear facilities became the responsibility of HAEA. In addition, regulatory control over certain constructional, technical radiation protection and nuclear accident prevention issues was also transferred into the scope of the authority of the HAEA.

Hungary’s accession to the European Union required a further strengthening of the regulatory bodies’ independence. To this end, the Parliament amended the Act on Atomic Energy in 2003. Pursuant to this amendment, the operation of HAEC was discontinued and one of the ministers of the Government appointed by the Prime Minister – currently the Minister of Transport, Telecommunication and Energy - was given the task of supervising the HAEA. The role of the Director General of the HAEA became more significant: he is responsible for giving an annual account to the government of the safety of the domestic application of nuclear energy, in place of the chairman of the HAEC. Furthermore, he shall participate, with consultation right, in sessions of the Government when any proposal related to the scope of activity of the HAEA is considered.

The administrative duty of the nuclear safety authority comprises two types of tasks. On the one hand, the authority shall perform the relevant regulatory tasks and issue standards and requirements, while on the other hand, these regulations and requirements must be enforced (during the implementation of the licensing and inspection/enforcement procedures).

The supervisory competences of the HAEA involve the following activities: enforcing compliance with the provisions of relevant statutory regulations, ensuring that the requirements of Nuclear Safety Regulations are observed and the conditions serving as a basis for regulatory licenses are met, and, in addition, monitor the implementation of measures imposed by the Authority. The HAEA also carries out analysis and assessment activities related to its licensing and inspection responsibilities. In some cases, the official licensing and inspection activity also entails the initiation of law enforcement measures. Enforcement activities comprise all the measures to enforce licensees to return to compliance, in the case of deviations from the regulations, and also involve those that encourage participants to avoid repetition.

There was an amendment of the Act on Atomic Energy in 2005 (owing to the new general rules of the administrative regulatory procedures), which introduced continuous regulatory supervision as a new term. The supervision may be exercised through online computer systems connected to the authority office network. It also provided a definition of clients in the licensing and permission cases. Furthermore, the deadlines of the administrative regulatory procedures were also modified for the HAEA and its co-authorities (60+30 days for equipment level licenses, 180+90 days for facility level licenses, 30+30 / 60+30 days for the co-authorities). In case of imminent danger, accident or emergency situations in the nuclear facility, it also provided an opportunity for deviations from the procedural rules.

Further modification of the Act CXVI of 1996 on Atomic Energy was adopted in 2011. In Act No. CIX of 2006, on the reorganization of the governmental structure, the HAEA is listed among the government offices. The scope of authority and duties of a government office are required to regulate on the statutory level. Until 2011, the legal regulation of scope and duties was included in two different sources: the Act on Atomic Energy and Governmental Decree No. 114/ 2003 on the Scope of Duties, Authority and Competence to Impose Penalties of the Hungarian Atomic Energy Authority, and on the Activities of the Atomic Energy Co-ordination Council. The modification makes an end of the two-level regulation system and takes all the relating regulation to the statutory level. The modification also concerned the use of subsidies by municipal associations around nuclear facilities, and how they may be used for information, monitoring, and operation, as well as to ensure municipal development.

According to the Act, the licensee is obliged to present an expert's report before an administrative procedure (non-procedural expert). The amendment moves the task for previous evaluation by independent nuclear experts to the Hungarian Chamber of Engineers. The Hungarian Chamber of Engineers as an independent, professional, public body that can give substantive assistance to the regulatory body. The new modification of the Act defines the Design Basis Threat (DBT) and nuclear security, and provides a clear basis for allocating responsibilities between the organizations involved. The Act also identifies protection functions that are the responsibility of the State. The Government is empowered by the Act to elaborate more detailed provisions of DBT and nuclear security in a governmental decree.

3.1.2. Licensing Process

The basic principles of the licensing procedure of a nuclear power plant, and the authorities involved in the process, are regulated by Chapter III of the Act on Atomic Energy. To establish a new nuclear power plant or a new nuclear power plant unit, the preliminary consent in principle of Parliament is required before starting preparatory work, whereas in order to establish ownership of a nuclear power plant that is in operation or to transfer the right of operation, the consent in principle of the Government is required. In concordance with regulations in force, a license shall be obtained from the authorities for all phases of operation (siting, construction, commissioning, operation, decommissioning) during the lifetime of a nuclear power plant. Moreover, a separate license shall be obtained for all plant-level or safety-related equipment-level modifications. Within the licensing procedures, technical aspects are enforced by legally delegated authorities. The Authority shall take account of opinions of legally delegated special authorities. When the installation of a new nuclear power plant is being considered, the precondition for launching the licensing procedure is the existence of an environmental protection license. During the licensing procedure, the licensee prepares a preliminary environmental impact study. The environmental protection authority then sends the preliminary impact study to the relevant authorities to seek the opinion of authorities of potentially affected areas who, in turn, expose it to public view. The environmental protection authority, if it does not reject the detailed environmental impact study that has been submitted, shall subsequently hold a public hearing. Based on the detailed environmental impact study and on any responses received, the environmental protection authority may issue an environmental protection license for the construction and operation of the plant.

The safety-related licensing of a nuclear installation takes place after the environmental licensing. The environmental protection authority plays the role of special authority in the course of licensing a nuclear installation. During the licensing of installations and equipment, and the licensing of their modifications, the contributing procedure of the environmental protection special authority provides the possibility for civil organizations to act as clients. The decisions of the nuclear safety authority are made public. Those licenses, based on Act CX. of 2001 on Electric Energy, are also required for establishing and operating a nuclear plant. Licenses are valid for fixed periods; on request, and provided that the necessary requirements are fulfilled, they may be extended. A licensee can appeal against the decisions of the Authority. It has the right to take the case to court.

Every ten years, a periodic review of the safety of the nuclear power plant is performed on the basis of a comprehensive, predefined programme known as the Periodic Safety Review. Any decision on the further validity and conditions of the operating license is made within the framework of the review. For certain facilities beyond the regulatory licensing procedure, the Act on Atomic Energy prescribes higher approval, as well.

3.2. Main national laws and regulations in nuclear power

Main National Laws:

- **Act CXVI (1996) on Atomic Energy** (Nuclear Law, establishing responsibilities for different areas);
- **Governmental Decree 227/1997. (XII. 10.) on the type, conditions and sum of the liability insurance or other liability financial coverage concerning atomic damage** (Civil nuclear liability)
- **Act CXVI (1996) on Atomic Energy** (Establishing a regulatory body)
- **Law-decree 9 of 1972 on the promulgation of the agreement concluded between the Hungarian People's Republic and the International Atomic Energy Agency for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons,** signed in Vienna on the 6th of March in 1972Act XC of 1999 on the confirmation and promulgation of the Additional Protocol signed in Vienna on the 26th of November in 1998 in connection with the agreement for the application of the safeguards concerning the treaty on non-proliferation of nuclear weapons, concluded between the Republic of Hungary and the International Atomic Energy Agency and signed in Vienna on the 6th of March in 1972

- **Decree of the Minister of transport, telecommunication and energy 11/2010. (III.4.) KHEM on the rules of accountancy for and control of radioactive materials, and on the corresponding data provisions** (Implementing IAEA safeguards)
- **Act of LIII (1995) on General Rules for Environmental protection** (Rules for environmental protection)
- **Act of LXXVI (1999) on the Protection of intellectual property rights** (Protection of intellectual property rights)
- **Governmental decree 144/2011. (VII. 27.) on the regulation of international transfer of nuclear and nuclear dual use items** (Import and export controls of nuclear material and items)
- **Law-decree 8 of 1987 on the promulgation of the convention on physical protection of nuclear materials** (Security principles, including physical protection of nuclear material and facilities and protection of sensitive information)
- **Act CXVI (1996) on Atomic Energy** (Roles of national government, local government, and stakeholders)

Main Regulations in Nuclear Power:

- **Government Decree 112/2011. (VII. 4.) on the scope of activities of the Hungarian Atomic Energy Authority in connection with its international obligations including the European Union, its authority and penalizing rights, the assignments of its co-authorities and on the Scientific Committee assisting the HAEA's activity** (Regulation for establishing an authorization system, responsibilities of the operator, inspection and enforcement)
- **Governmental Decree 118/2011 (VII.11.) on the nuclear safety requirements for nuclear facilities and the procedures of the Hungarian Atomic Energy Authority in nuclear safety regulatory matters**
- **Annex No.1: Nuclear Safety Code Volume 1, Authority procedures applied to nuclear facilities**
- **Annex No. 2: Nuclear Safety Code Volume 2, Management systems of nuclear facilities**
- **Annex No. 3: Nuclear Safety Code Volume 3, General requirements for the design of nuclear power plants**
- **Annex No. 4: Nuclear Safety Code Volume 4, Operational safety requirements of nuclear power plants**
- **Annex No. 5: Nuclear Safety Code Volume 5, Design and operation of research reactors**
- **Annex No. 6: Nuclear Safety Code Volume 6, Design and operation of spent fuel storage facilities**
- **Annex No. 7: Nuclear Safety Code Volume 7, Site assessment of nuclear facilities**
- **Annex No. 8: Nuclear Safety Code Volume 8, Decommissioning of nuclear facilities**
- **Annex No. 9: Definitions of nuclear safety codes,**

- **Decree of the Minister of Industry, Trade and Tourism - 62/1997. (IX. 26.) on the geological and mining requirements for the siting and planning of nuclear facilities and radioactive waste disposal facilities** (Site selection and approval, safety of nuclear installations)
- **Decree of the Minister of Health 16/2000. (VI. 8.) on the execution of certain provisions of the Act CXVI of 1996 on Atomic Energy associated with radiation protection** (Radiation protection, including protection of workers public and environment)
- **Act CXVI (1996) on Atomic Energy and Governmental Decree 240/1997. (XII. 18.) on the establishment of the organisation designated for implementing disposal of radioactive waste and spent fuel, as well as decommissioning of nuclear installations, and on the financial source for performing tasks** (Radioactive waste and spent fuel management, including storage and disposal, decommissioning, including funding and institutional control, mining and milling)
- **Governmental Decree 179/1999. (XII. 10.) on the execution of Act LXXIV of 1999 on Disaster Management and Governmental Decree 167/2010 (V. 11.) on the National Nuclear Emergency Preparedness System,** (Emergency preparedness)
- **Decree of the Minister of Transportation and Post 20/1979. (IX. 18.) on the promulgation and inland application of Appendixes "A" and "B" of the European Agreement about the International Public Road Transportation of Dangerous Goods**
- **Decree of the Minister of Transportation, Telecommunication and Water 13/1997. (IX. 3.) on the promulgation of the regulation on the safe railway transportation of spent nuclear fuel**
- **Decree of the Minister of Transportation, Telecommunication and Water 14/1997. (IX. 3.) on the transportation, shipment and packaging of radioactive materials** (Transport of radioactive material)

References

Not provided.

Appendix 1: International, Multilateral and Bilateral Agreements

NPT	Entry into force:	27 May 1969
Convention on physical protection of nuclear material	Entry into force:	8 February 1987
Convention on early notification of a nuclear accident	Entry into force:	10 April 1987
Convention on assistance in the case of a nuclear accident or radiological emergency	Entry into force:	10 April 1987
Vienna convention on civil liability for nuclear damage	Entry into force:	28 October 1989
Paris convention on third party liability in the field of nuclear energy	Not applicable	
Joint protocol relating to the application of the Vienna and Paris conventions	Entry into force:	27 April 1992
Protocol to amend the Vienna convention on civil liability for nuclear damage	Signature:	29 September 1997
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	Entry into force:	18 June 2001

OTHER RELEVANT INTERNATIONAL TREATIES

Treaty banning nuclear weapon testing in the atmosphere, in outer space and under water	Entry into force:	5 August 1963
Treaty of the prohibition of the emplacement of nuclear weapons and other weapons of mass destruction on the seabed and the ocean floor and in the subsoil thereof	Entry into force:	13 August 1971
ZANGGER Committee	Member	
Improved procedures for designation of safeguards inspectors	Accepted:	9 May 1988
Nuclear Export Guidelines	Adopted	
Acceptance of NUSS Codes	Accepted	
Nuclear Suppliers Group	Member	
Standard agreements concerning technical assistance to Hungary	Parties: - United Nations Organization - International Labour Organization - Food and Agriculture Organization of the UN - International Civil Aviation Organization - World Health Organization - International Telecommunications Union - International Atomic Energy Agency	

Appendix 2: main organizations, institutions and companies involved in nuclear power related activities

NATIONAL NUCLEAR ENERGY AUTHORITY

Hungarian Atomic Energy Authority H-1539 Budapest P.O. Box 676 Hungary	Tel: (361)-436-4800 http://www.haea.gov.hu
HAEA General Nuclear Directorate	Tel: (361) 436 4841 Fax: (361) 436 4843
HAEA Nuclear Safety Directorate	Tel: (361) 436-4881 Fax: (361) 436-4883

NUCLEAR RESEARCH INSTITUTES

HAS Centre for Energy Research Address: 29-33 Konkoly Thege Miklós street 1121 Budapest, Hungary Mailing address: 1525 Budapest 114., P.O. Box 49., Hungary	Tel: (361) 392-2222 Fax: (361) 395-9293 http://www.energia.mta.hu
Institute of Nuclear Research (ATOMKI Debrecen) of the Hungarian Academy of Sciences P.O.Box. 51 4001 Debrecen,	Tel: 36-(52) 509-200 Fax: 36-(52) 416-181 http://www.atomki.hu
Nuclear Safety Research Institute (NUBIKI) 1525 Budapest, POB: 49	Tel: (361) 392 2700 Fax: (361) 392 2701 e-mail: nubiki@nubiki.hu http://www.nubiki.hu/
"Frederic Joliot-Curie" National Research Institute for Radiobiology and Radiohygiene P.O.Box 101, 1775 Budapest	Tel: 36-1-482-2000 Fax: 36-1 482-2003 http://www.osski.hu
Power Engineering and Contracting Co. (ETV-ERŐTERV) P.O. Box 111 1450 Budapest	Tel: 36-1-455-3600, Fax: 36-1-215-1854 http://www.etv.hu

OTHER NUCLEAR ORGANIZATIONS

Paks Nuclear Power Plant Ltd.
P.O. Box 71
7031 Paks

Tel: 36-(75) 505-000
Fax: 36-(75) 506-634, 36-(75) 506-787
http://www.atomeromu.hu

Public Limited Company for Radioactive Waste Management (PURAM)
2040 Budaörs, Puskás Tivadar u. 11.

Tel: (36) 23/423-180
Fax (36) 23/423-181
http://www.rhk.hu

UNIVERSITIES

Eötvös Loránd University of Sciences

http://www.elte.hu

Budapest University of Technology and Economy
Institute of Nuclear Techniques
Műegyetem rkp. 9
1111 Budapest

Phone: 36-1-463-1111
Fax: 36-1-463-1954
http://www.reak.bme.hu/en/

University of Debrecen
Institute of Experimental Physics

http://fizika.ttk.unideb.hu/kisfiz

Quantechnologies Research and Development Co.

http://www.quantec.hu/

Laboratory for Nuclear Safety and Techniques, NUBITEL
H-4026 Debrecen, Bem ter 18/A
H-4010 Debrecen, P.O.Box 105.
Hungary

https://regiszter.nekifut.hu/ki/nubitel-debrecen
http://fizika.ttk.hu/kisfiz/nubitel

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University of Pannonia
Institute of Radiochemistry and Radioecology
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