The role of coal in the Hungarian electricity sector

with special attention to the use of lignite

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Preface

When defining the scope of this report, the original focus was to be the use of lignite in the Hungarian energy sector. However, while preparing the report we came to realise that this would be an artificial distinction. Given the relationship between the electricity and coal mining sectors, including the restructuring process in the nineties, it would be entirely arbitrary to separate the history of lignite use from the last few decades of mining and use of coal. Hence this report takes into consideration the entire coal mining and combustion industry.
However, the emphasis remains clearly on lignite, taking into account the recent characteristics of the use of coal, including carbon-dioxide emissions, as well as recent development plans which focus almost entirely on lignite.

For the sake of clarity, when the report mentions coal, this should be taken to mean all the kinds of coal used in Hungary (black coal, brown coal, lignite); when this is not the case, we have indicated as such. When talking about the quantity of electricity produced, the figures refer to net production.

Specific data (e.g. share) on energy sources may differ between certain graphs. This can be attributed to the difference between the quality of certain fuels, and the different efficiency of the power plants.

I'd like to express my thanks to Ada Ámon, Brigitta Bozsó, Zsuzsanna Koritár, and Péter Kardos of the Energia Klub, György Dallos from WWF for their help in preparing this report, and to Tracey Wheatley for proof-reading.

1. Executive summary

Hungary's coal resources total 3,300 million tons, most of which is lignite. The annual production is between 9-10 MT (of which 8 MT is lignite). At this rate of use the reserves could last for centuries.

Since the late seventies the significance of coal has been decreasing in the primary energy supply, as has its role in electricity production. At the same time however, the role of lignite has increased significantly. While there is only a small increase in the amount used, in 2007 lignite accounted for 15% of produced electricity. These figures are for the Mátra Power Plant, Hungary's only lignite-fuelled plant.

In respect of CO_2 emissions, energy sector emissions have decreased since the late seventies, while the lignite-based emissions have increased. The 6 MT annual emission of the Mátra Power Plant now represents slightly more than 10% of the national CO_2 emissions, roughly matching the total emissions of all Hungary's natural gas plants. It should be noted that 2.5 times more electric power was generated using gas than lignite.

At the end of the eighties, it became clear that the uneconomic, state-subsidised coal-mining industry and the related part of the energy sector had to be reshaped. Although all but one underground coal mines have been shut down, the process has not resulted in a full restructuring of the electricity sector. Indeed, most of the outdated and inefficient units are still operating, in some cases after switching the fuel to firewood, burning biomass in an unsustainable way.

The privatisation of the energy sector in the nineties preserved the polluting and costly structures. The privatisation contracts and the long-term purchasing agreements cemented the new owners of the old plants into their positions. Since there was no room for new players on the market, there was no chance of substituting the polluting technologies.

The state, taking also into consideration its interests in the partly or the last entirely state-owned coal plants, has played a determining role in the process through its scheme of administrative support and financial subsidies, financed by taxpayers and electricity consumers. The EU accession and the liberalisation of the energy sector in 2008 did not change this picture significantly. The Kyoto process, due to the determined base years of 1985-87, does not effectively force the implementation of measures to decrease CO_2 emissions, but serves as just another source of state subsidies to which the government contributes with other preferences. By keeping the polluting and costly structures alive, the process, which has been accompanied with transparency problems, did not serve the interests of the public.

Looking to the future, as underground coal mining in Hungary has stopped, only lignite offers any long term perspective as a national resource, due to both its quantity and the low cost of exploitation. However, there are also plans for generating electricity based on imported black coal. The most advanced plan is the enlargement of the Mátra Power Plant for lignite use, in a construction in which the state has an 85% share approximately. This plan raises many economical, environmental, social and legal questions, among other concerns. The planned new investments would certainly hinder the development of sustainable solutions. Without a change in the approach of the state administration, there is only a very limited chance to implement the necessary changes in the power system.

2. Coal and lignite resources

On 1st January 2006, reserves totalled 3,300 million tons (MT), lignite accounting for the greater part (~90%), the rest being divided in nearly two equal parts between black and brown coal. To give base for comparison, when we consider that annual production is between 9-10 MT (of which around 8 MT is lignite), it becomes clear that at this rate of use the reserves could last for centuries.

2.1. Black coal

Lower Jurassic (Lias) black coal in the southern Mecsek Mountains is Hungary's only black coal reserve, calculated to be 198.8 MT. Due to the complicated geological circumstances and the high cost of exploitation, production was stopped in 2004. There are no plans for reopening the mine, but according to recent reports some ideas have been put forward for exploiting methane or building a power plant which would use the gasified coal.

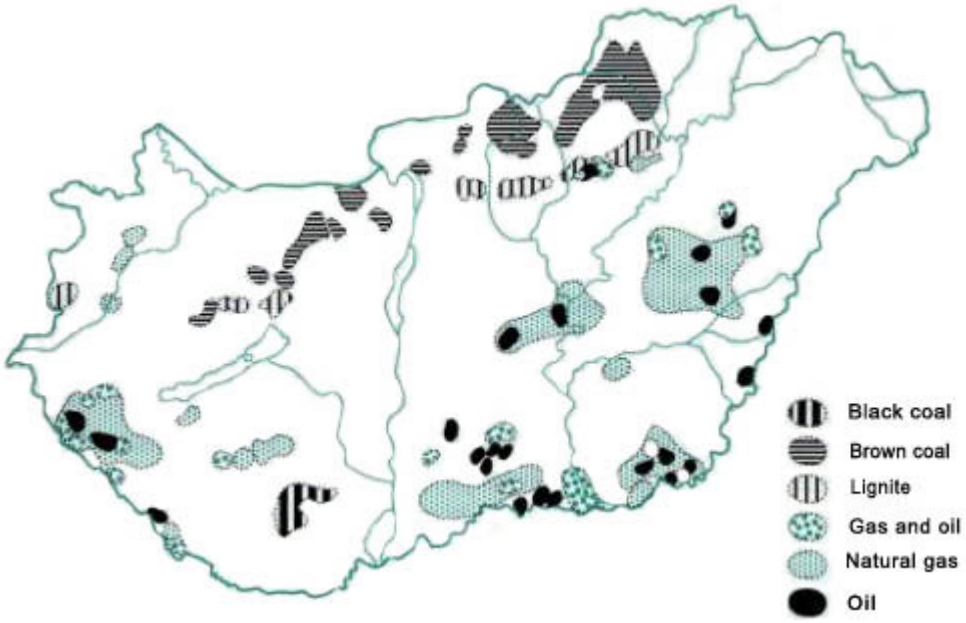
2.2. Brown coal

Brown coal was widely mined throughout recent decades, supplying a significant amount of Hungary's energy needs. Mainly due to economic reasons, mining has virtually stopped, with remaining reserves calculated to be 170 MT.
Good quality Eocene and Oligocene coal can be found in the Transdanubic Mountains. Reserves are estimated to be 123.7 MT, but only one mine is operating, supplying the Vértes Power Plant.
Cretaceous coal exploitation in the region ended in 2004, after resources ran out.
Poor quality Miocene reserves can be found in Northern Hungary. While these are estimated at 46 MT, with the closure of Lyukóbánya (the Lyukó mine) in 2004, all underground mining ceased. Some small open-pit mines are still operating and exploitation can be extended.

2.3. Lignite sites

Lignite accounts for the greatest share (~90%) of the Hungarian coal reserves, which means that lignite is first on the list of the country's conventional energy sources. This, together with the possibility of cheap exploitation in open-pit mines, now seems to offer the industry the hope of building the first large scale unit in 35 years, which is not nuclear or based on natural gas.
While some Miocene lignite reserves ran out in the Transdanubic Mountains back in 1996, nearly 3 GT (2925.8 MT) of Miocene-Pliocene lignite can be found in three other areas: Visonta and Bükkábrány at the foot of the Northern Mountains, and Torony on the western border (the reserve actually falls on both sides of the Austrian-Hungarian border). Recently the Visonta and Bükkábrány sites have been subject to vast open-pit mining (supplying the Mátra Power Plant); the Torony site remains practically untouched by any mining activity.

Picture 1: Fossil energy sources of Hungary



3. Recent and historical characteristics of coal use in the Hungarian energy system

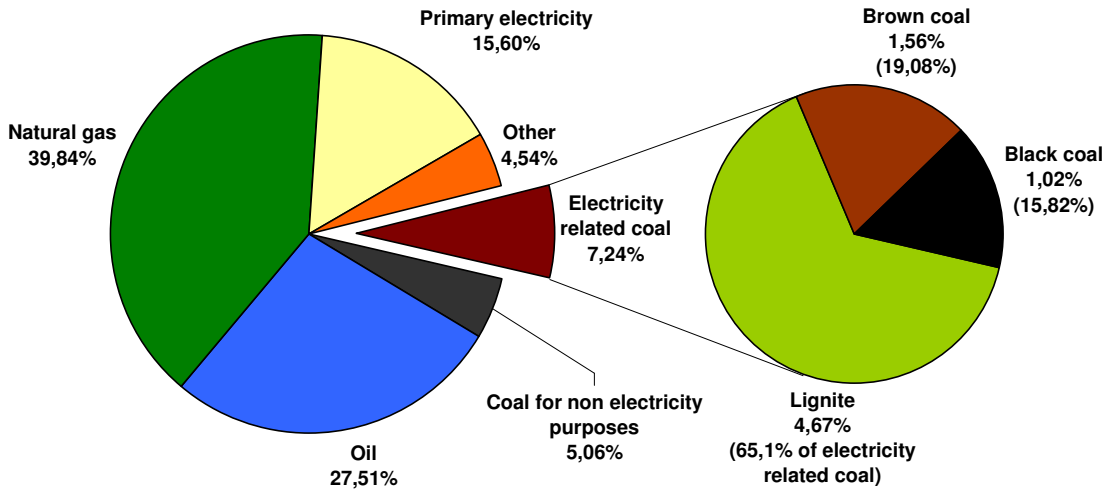
3.1. Role of coal in the Hungarian energy system

In 2007, fossil fuels represented around 80% of the Hungarian primary energy supply. While natural gas (40%) and oil (27.5%) together constituted the most significant share, coal used in electricity generation played a more limited role, its 7.2% share having decreased from approximately 10% since the beginning of the nineties. Lignite supplied 4.7% of the primary energy in 2007.

In the field of electricity generation, taking into account primary energy content, coal's significance has rapidly reduced: while it had an over 50% share in 1980, this decreased to 30% by the mid nineties, and then to 20% in 2007. The decline is basically due to the fall in the use of brown coal, while in the case of lignite, a slight, but continuous increase is observable over the last three decades.

Graph 1

Primary energy supply of Hungary, with the breakdown of the electricity related coal, 2007



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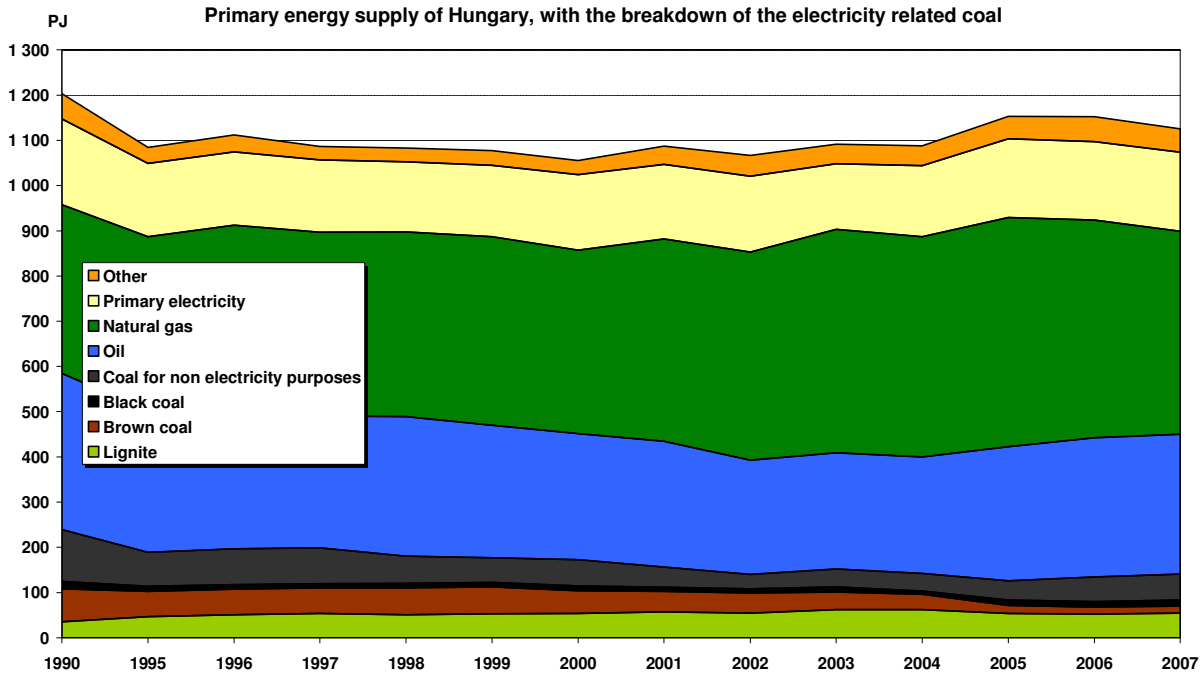
Sources: Ministry of Transport, Telecommunication and Energy;
Statistical Data of the Hungarian Power System 2007

Graph 2



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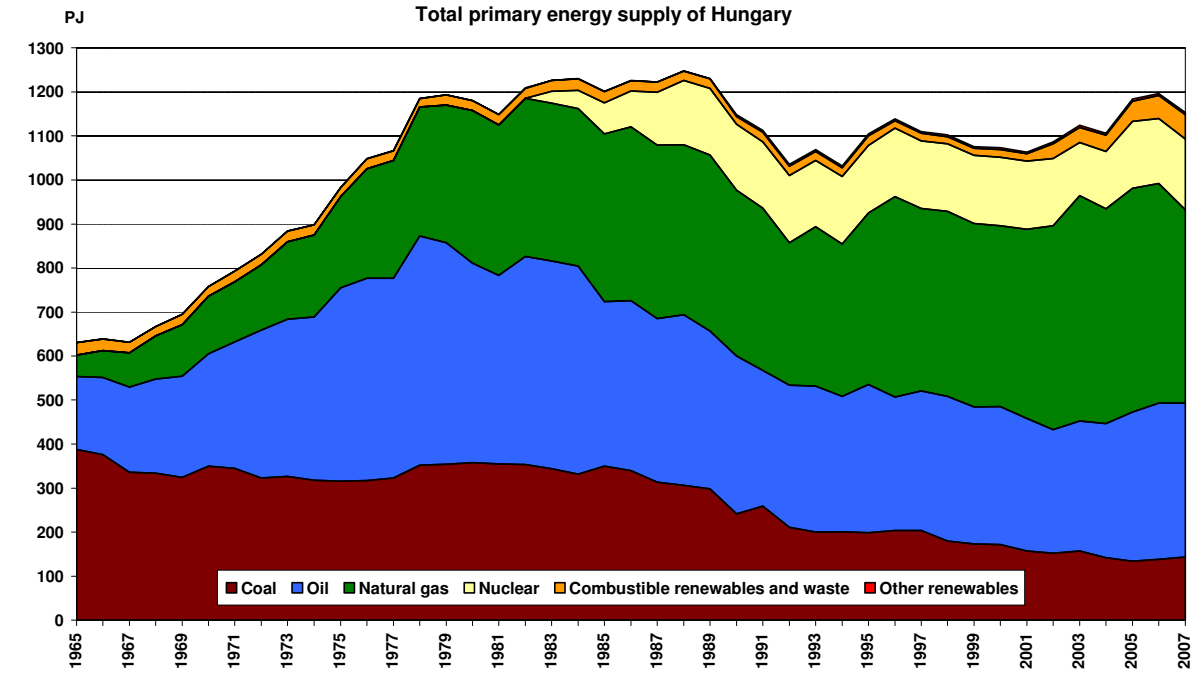
Sources: Ministry of Transport, Telecommunication and Energy; Statistical Data of the Hungarian Power System 2007

Graph 3



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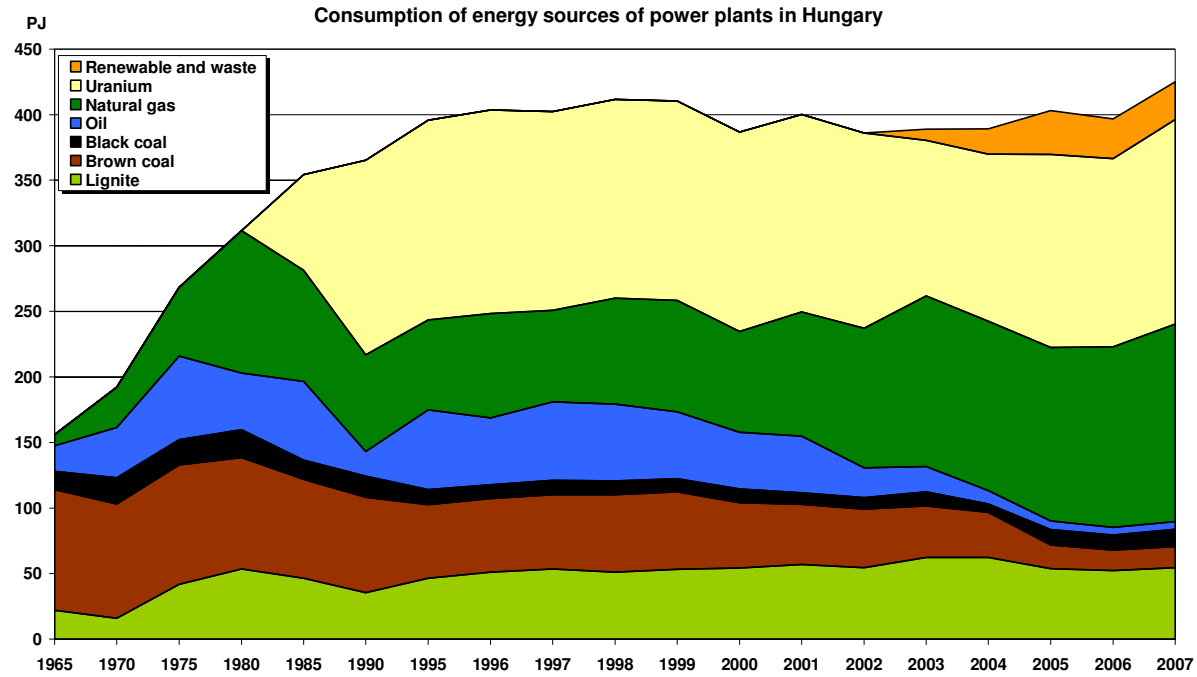
Source: IEA Energy Statistics

Graph 4



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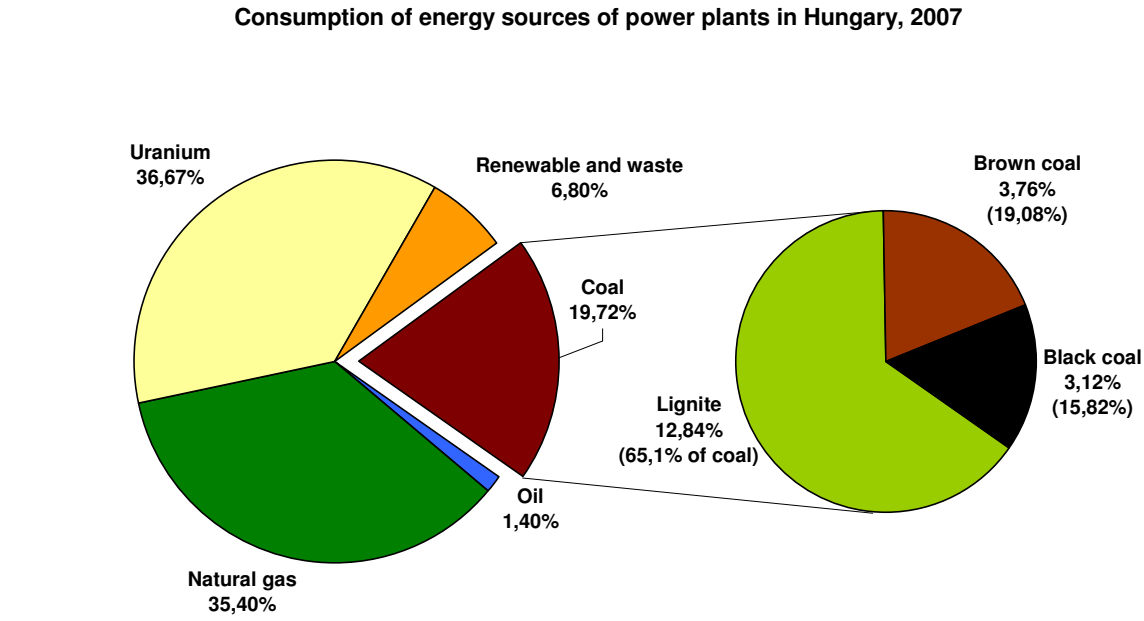
Sources: Statistical Data of the Hungarian Power System 2007; Electricity Statistical Yearbook 2006

Graph 5



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Sources: Statistical Data of the Hungarian Power System 2007; Electricity Statistical Yearbook 2006

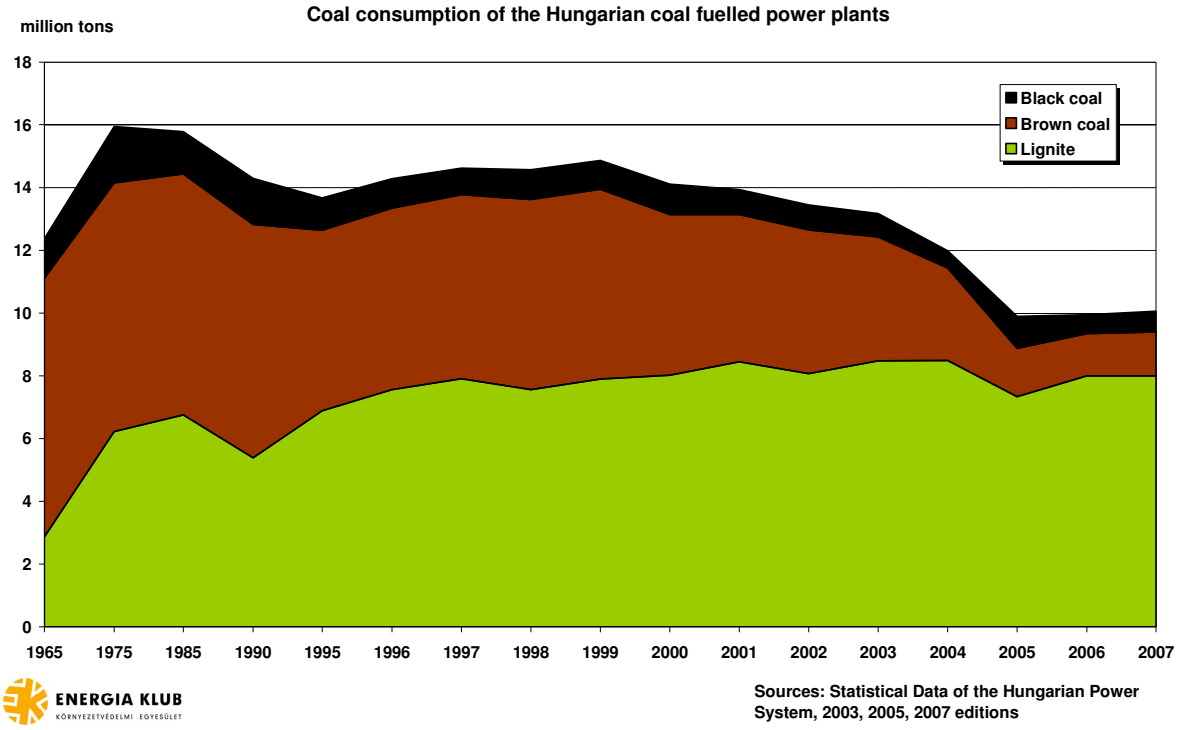
3.2. Coal consumption in the power plants

Coal consumption peaked at 16 MT around the middle to late seventies. The amount of coal consumed by power plants slowly decreased until 2003, and then, as old coal-fuelled units were shut down (or switched to biomass; more details in the textbox), there was a more rapid fall. Consumption now seems to have stabilised at 10 MT per annum. The composition of the

consumption has changed significantly: while the quantity of brown coal decreased to a quarter of that consumed in the seventies, the share of lignite doubled (from 39 to 79%).

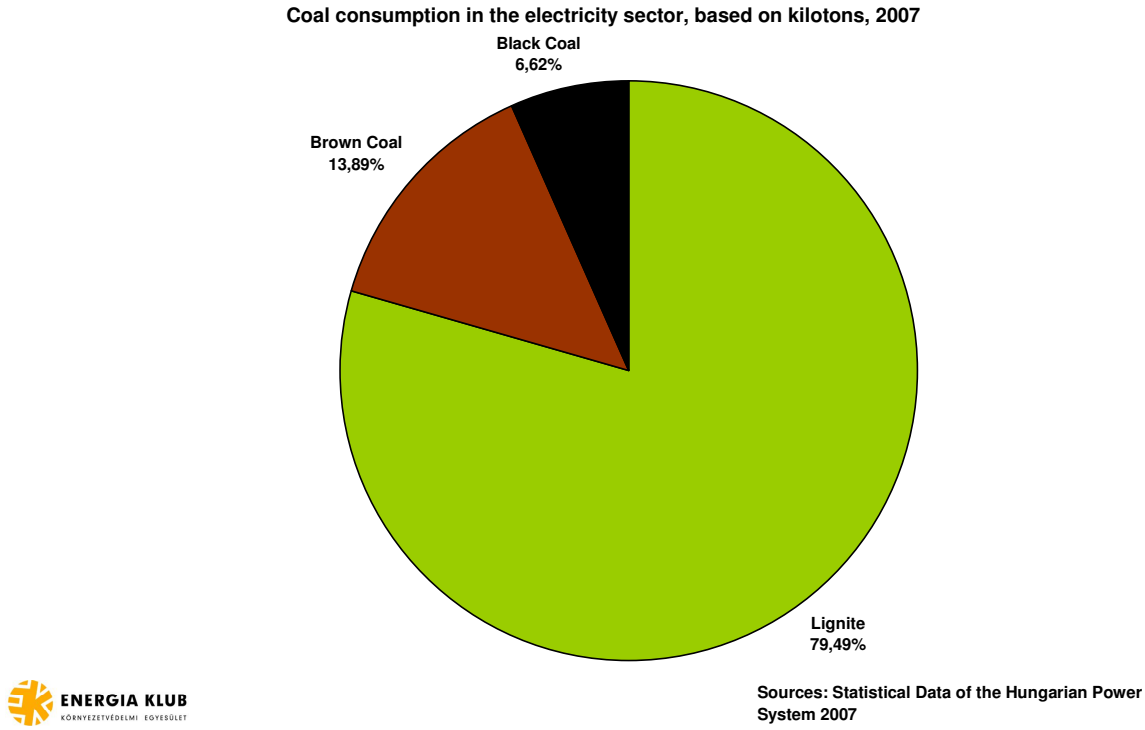
Combustion of solid biomass – which made it possible to surpass the 2010 EU target for renewables by 2005 – is at present mainly restricted to former coal power plants converted to biomass combustion or co-firing. These plants operate with a rather low efficiency, below 30%, as they do not utilise the heat that is produced along with electricity and instead of burning agricultural by-products, they mostly burn firewood.[1]

Graph 6



[1] Energia Klub: Renewable energy in Hungary – Status Report 2008

Graph 7

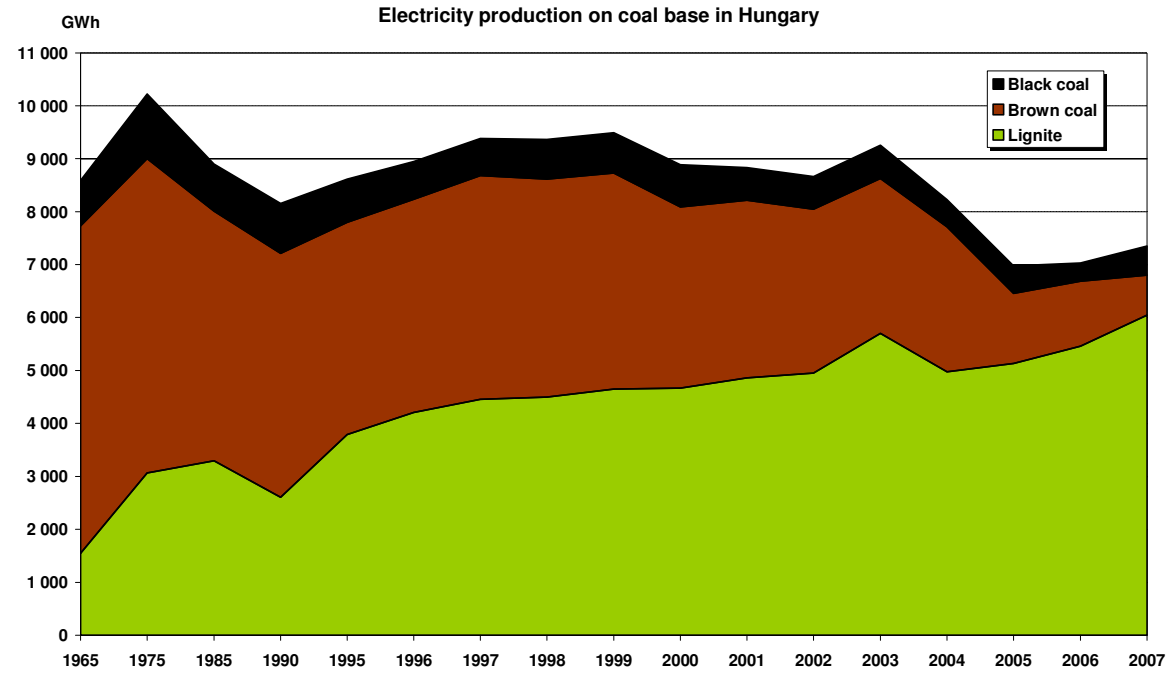


3.3. Electricity generation

With the lack of significant improvement to the power plants, electricity generation followed a similar course to coal consumption. After peaking at approx. 10 TWh p/a in the middle to late seventies, generation decreased to around 9 TWh by 2003, and then fell sharply to 7 TWh. In 2007, 82% of the electricity generated was based on lignite, while the share of brown coal decreased from 58% (in 1975) to 10%.

There are differences between data related to coal-based electricity and electricity production by coal-fuelled power plants. This can be attributed to the differences between different statistics, but, particularly during the last five years, the effect of co-firing is one factor behind this. However, there are no reliable data on the amount of the co-fired biomass and waste.

Graph 8



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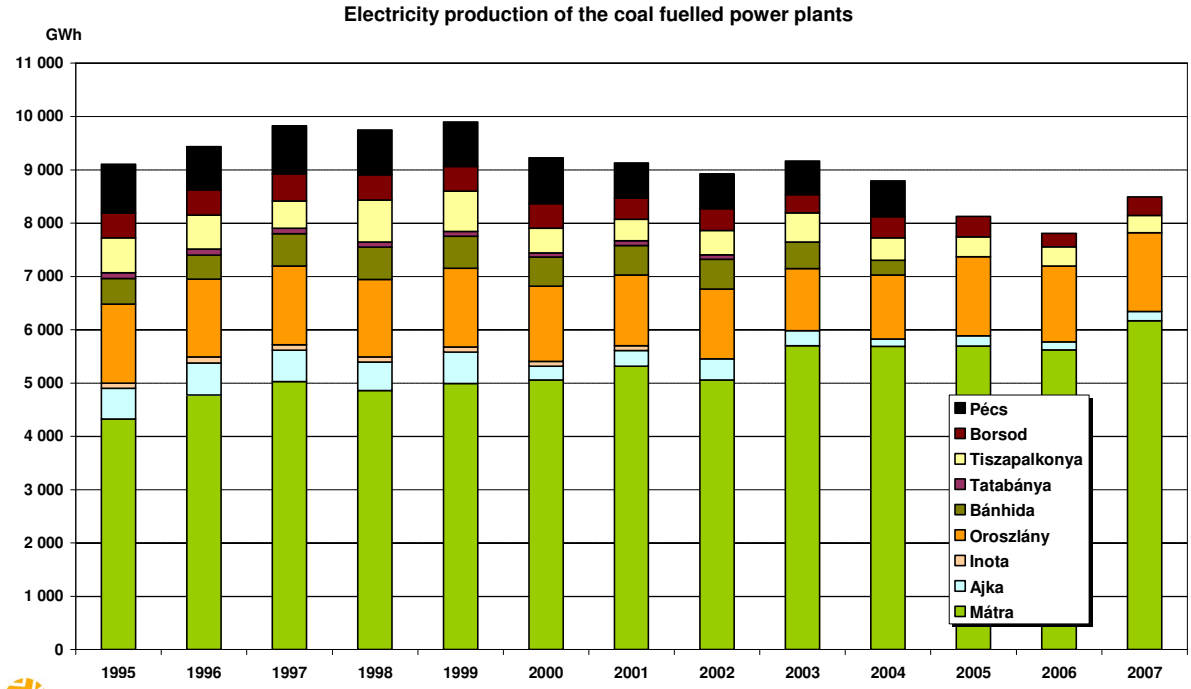
Sources: Statistical Data of the Hungarian Power System, 2003, 2005, 2007 editions; Electricity Statistical Yearbook 2006; Energia Klub's own estimates

Graph 9



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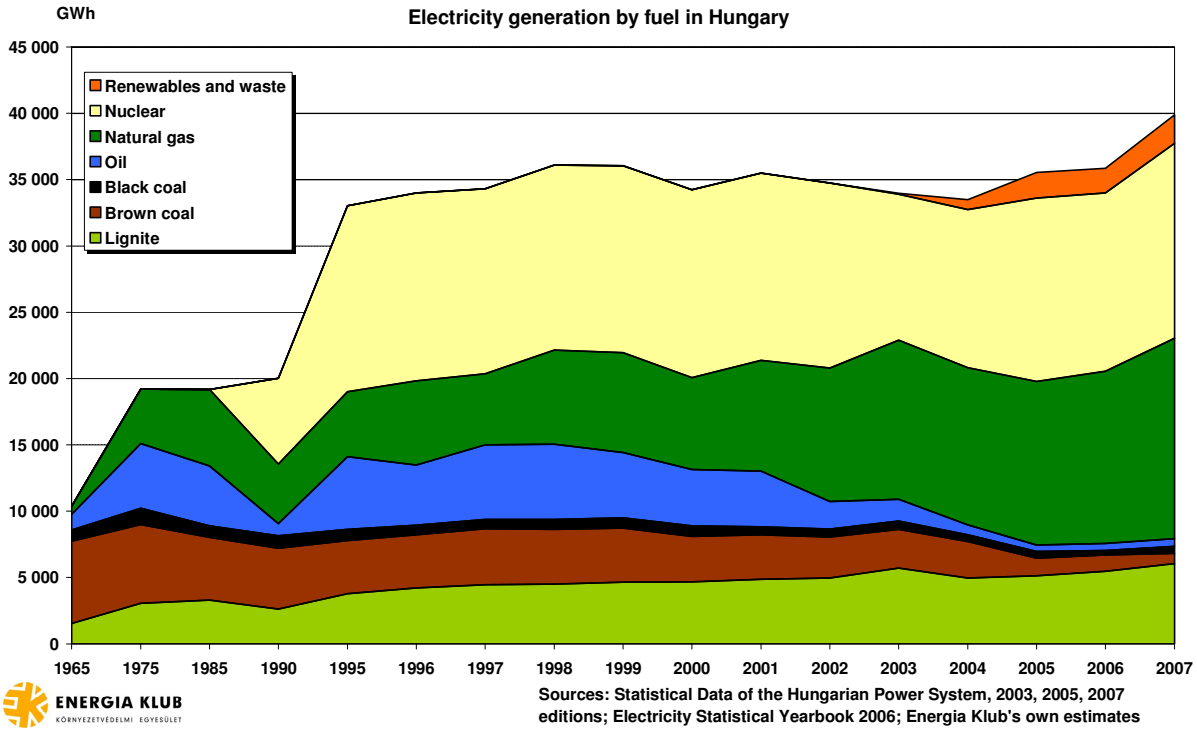
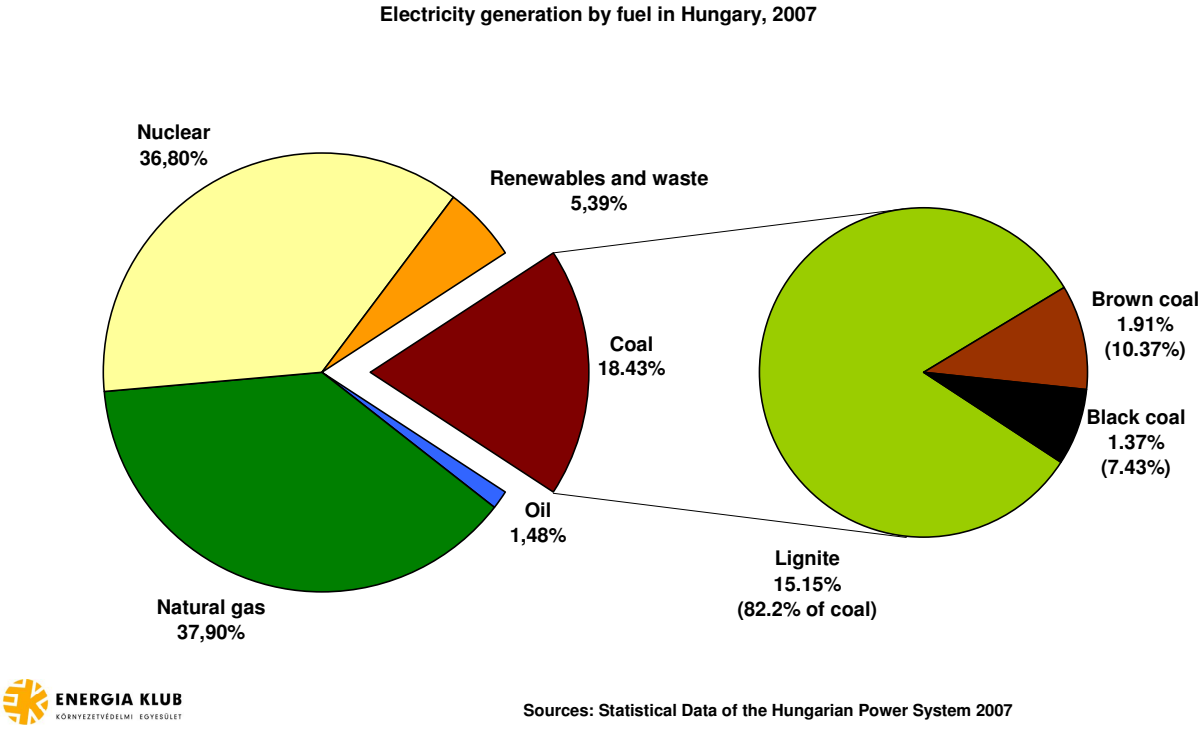
Source: Hungarian Energy Office (eh.gov.hu)

Graph 10



Graph 11



3.4. Carbon-dioxide emissions related to coal plants

Evaluating the historical CO_2 emissions of the energy sector is a difficult task: there is no data before 1995 and accredited data has only been available since 2005. However, since there have been no significant upgrades in the efficiency of the power plants, rough estimates regarding emissions before 1995 can be made on the basis of the 1995-2007 data.

Also, since a breakdown on CO_2 emission data is only available by power plant and not by fuel, only rough estimates can be made on the share of the emissions concerning the different kinds of coal. Making matters even more difficult, some power plants co-fire an unknown amount of biomass and waste.

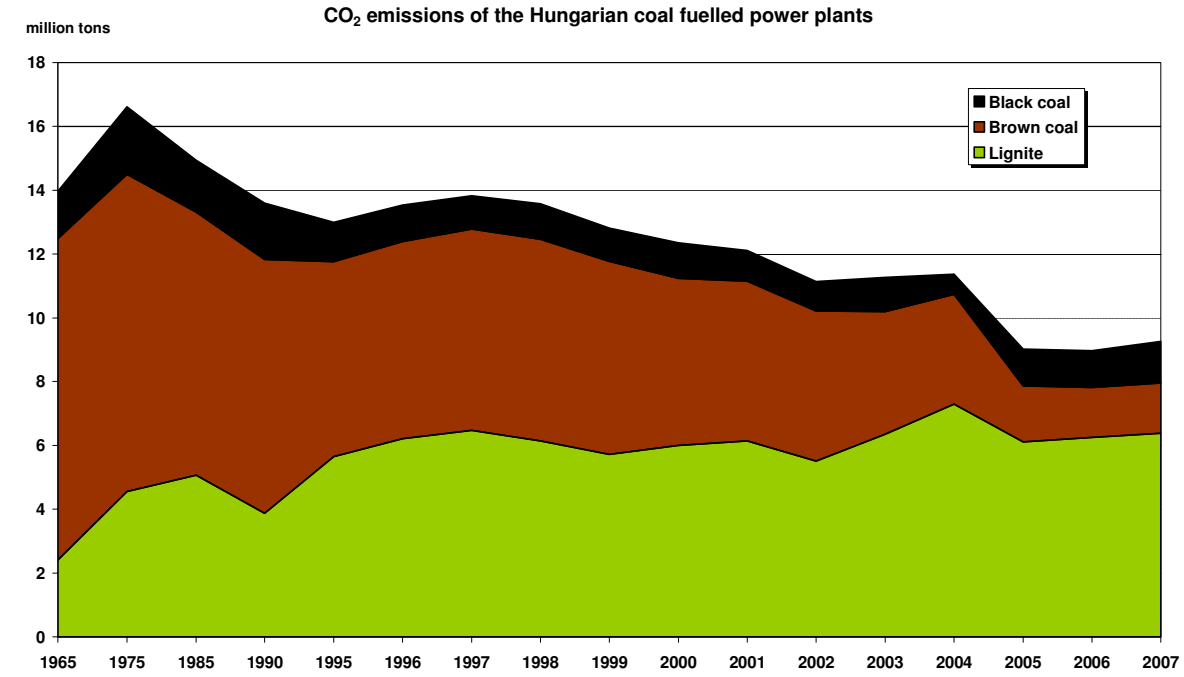
The unreliability of the official data is shown clearly by Graph 13, where the emission line goes in the opposite way at least three times (1998, 1999 and 2004) from those of the other parameters (which are also inconsistent with each other in 2003). The reasons behind the phenomenon remain unknown (more details in the textbox).

While officials claim that the accident-related, one and a half year long compulsory shut down of the second unit of the Paks nuclear power plant resulted in the increased use of coal plants in 2003 and 2004, and as a consequence, in higher CO_2 emissions, the produced electricity and other data of the coal plants do not clearly confirm this claim, as it is revealed by the graph.
The data on the increased amount of lignite extracted from the Visonta and Bükkábrány mines (see Graph 23) cannot give a full explanation, since the amount of lignite burned in the power plants was quite stable in those years (see Graph 6). However, electricity generation and the CO_2 emissions of the Mátra plant rose significantly, this by itself accounting for almost the whole increase of the entire sector (see Graph 9 and Graphs 20 on the performance and emissions of the power plants). Statistical uncertainty concerning co-firing makes the question even more complicated. This must be answered by officials, especially in the light of the fact that emission quotas are determined on the base of earlier emissions, and that CO_2 emissions are not accredited before 2005.

Nevertheless, measurement of the main trends is possible. The energy sector has made a decreasing contribution to the total national CO_2 emissions, which have remained stable over the last decade. In 2006, the energy sector accounted for a quarter of emissions, of which more than half (56.5%) was produced by coal fuelled plants; lignite is responsible for around 10% of the total national emissions.

Emissions peaked at 16 million tons in the middle to late seventies. Since then the continuing decline was interrupted only by the years 2003 and 2004. During 2005-2007, emissions seemed to stabilise at around 9 MT, of which 69% came from lignite.

Graph 12



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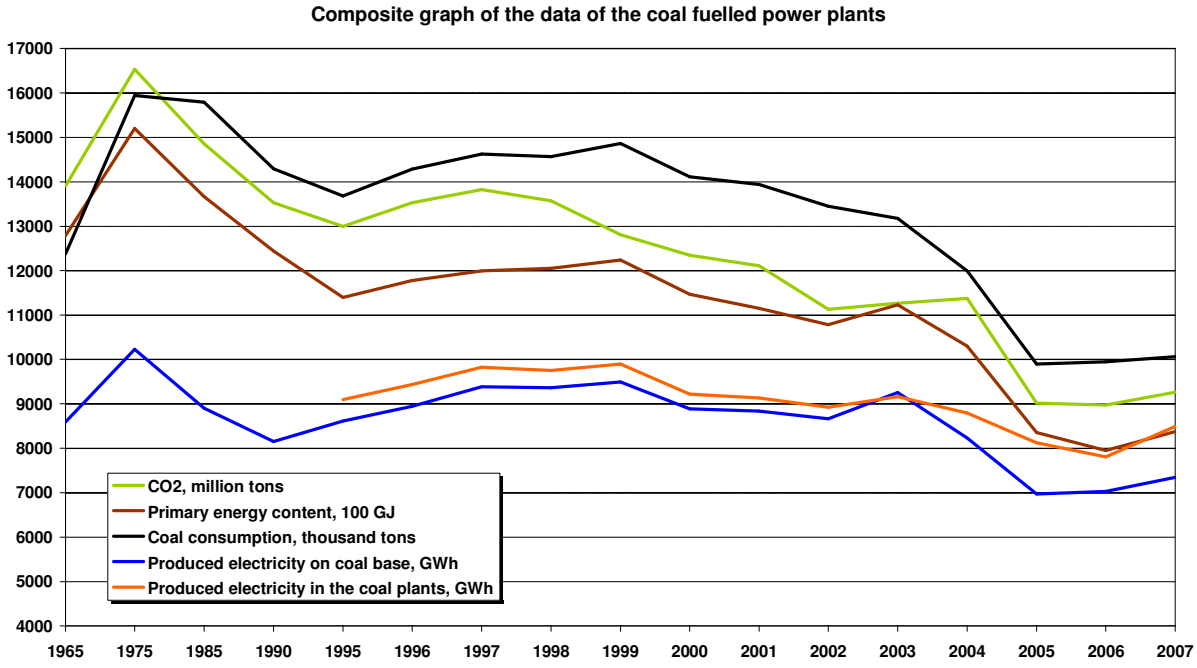
Source: Hungarian Energy Office (eh.gov.hu; Energia Klub's own estimates

Graph 13



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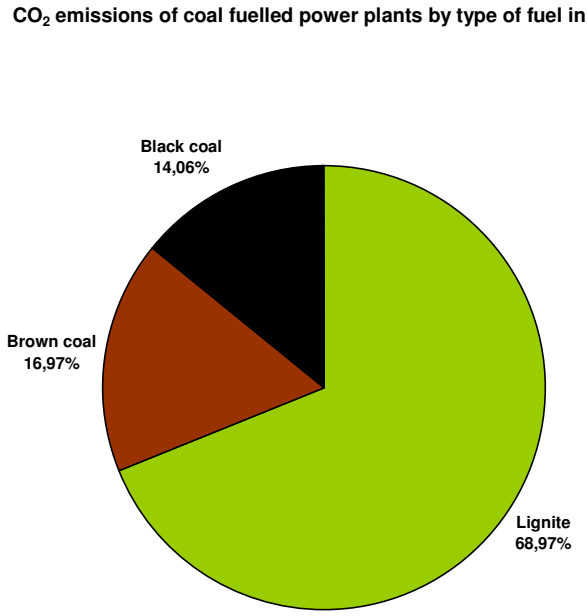
Source: eh.gov.hu; Energia Klub's own estimates; Statistical Data of the Hungarian Power System, 2003, 2005, 2007 editions; Electricity Statistical Yearbook 2006

Graph 14



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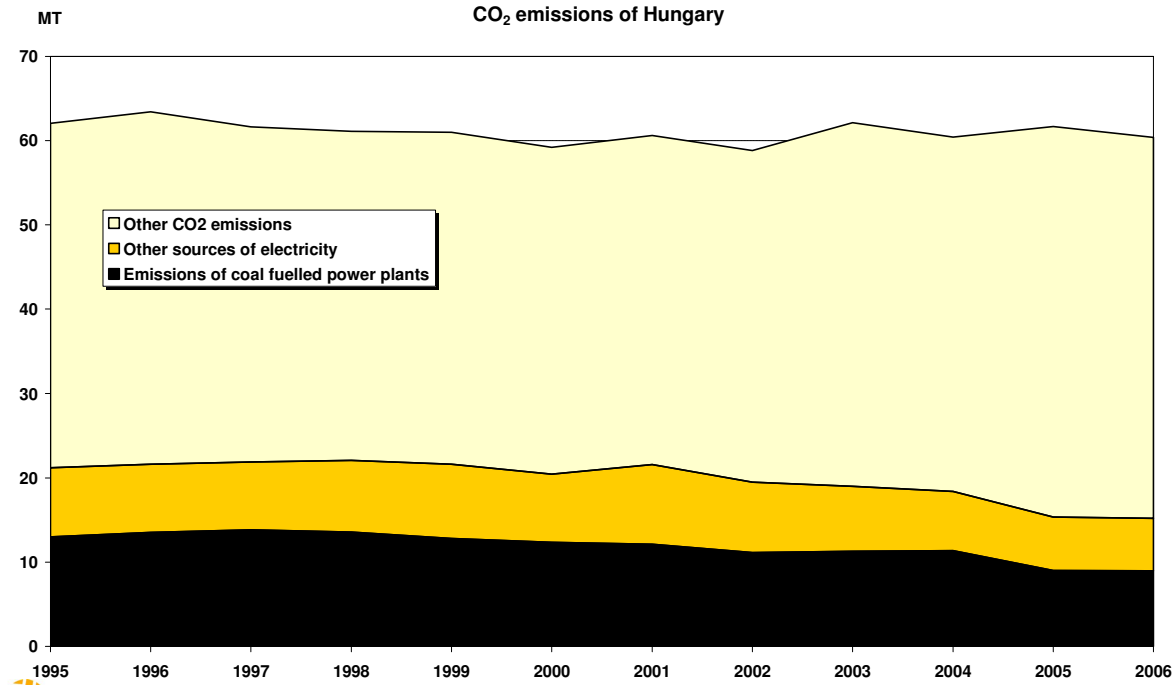
Source: Hungarian Energy Office (eh.gov.hu);
Energia Klub's own estimates

Graph 15



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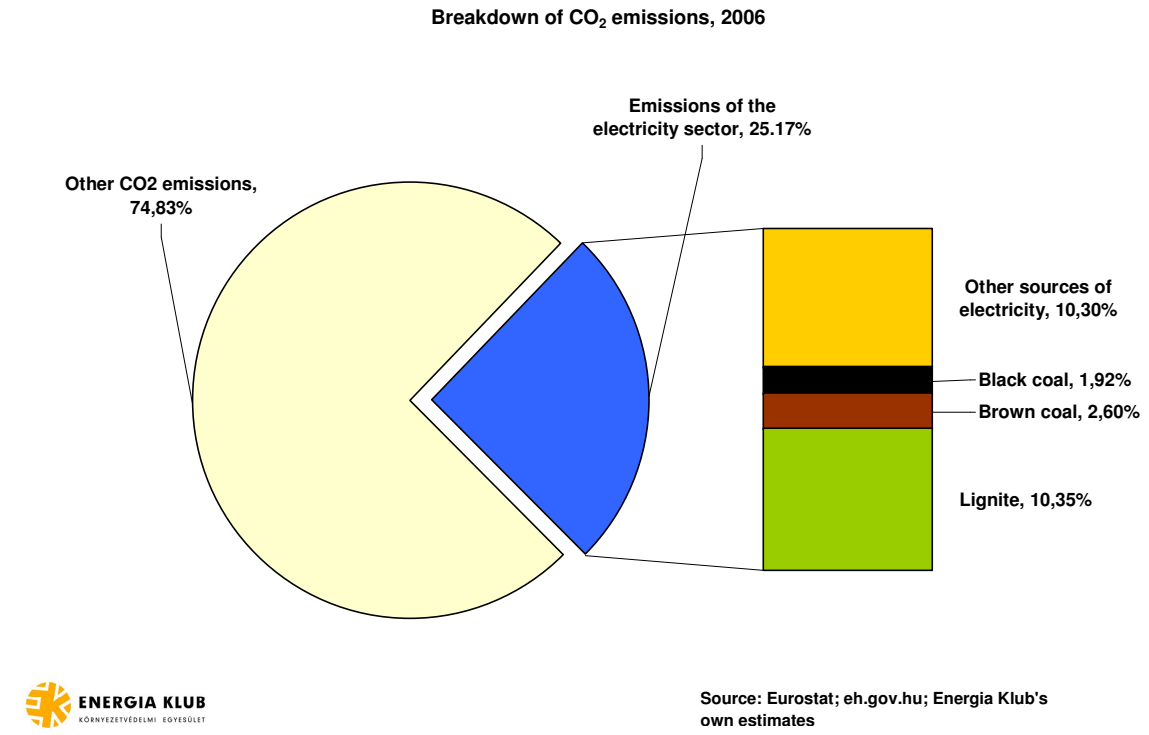
Source: Eurostat; eh.gov.hu; Energia Klub's own estimates

Graph 16



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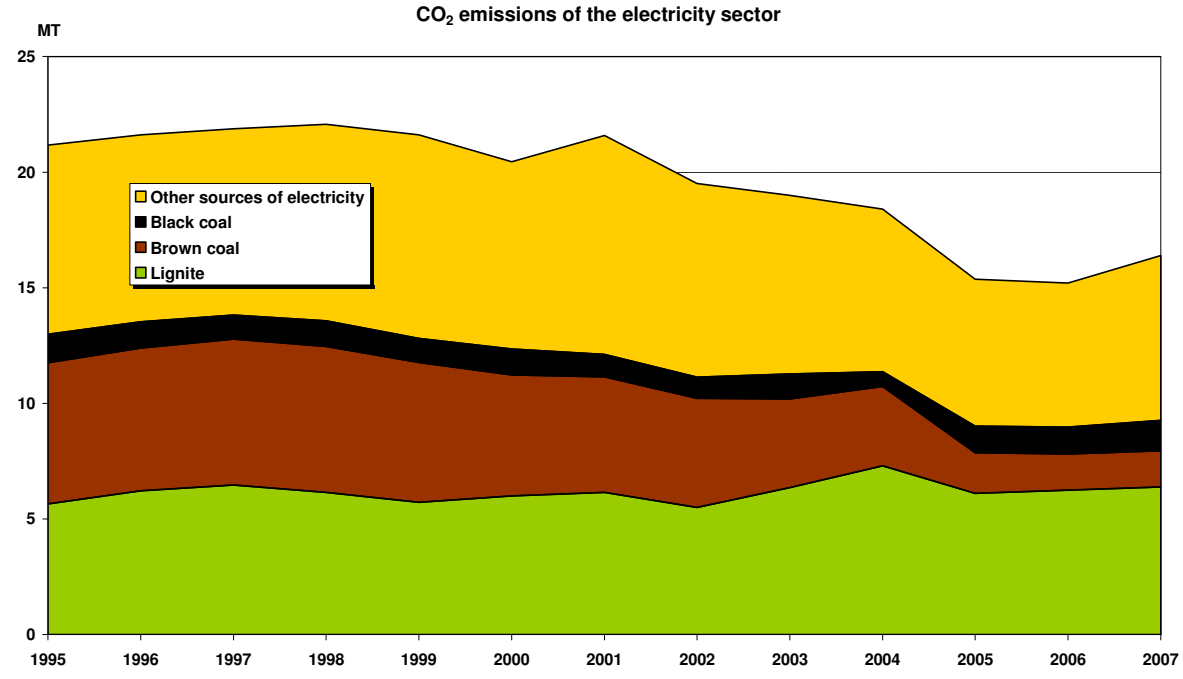
Source: Eurostat; eh.gov.hu; Energia Klub's own estimates

Graph 17



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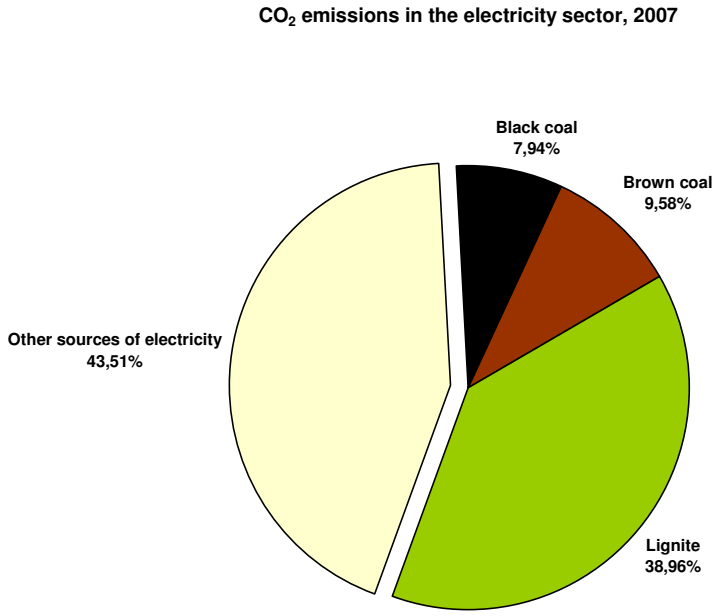
Source: Hungarian Energy Office (eh.gov.hu); Energia Klub's own estimates

Graph 18



Source: Hungarian Energy Office (eh.gov.hu);
Energia Klub's own estimates

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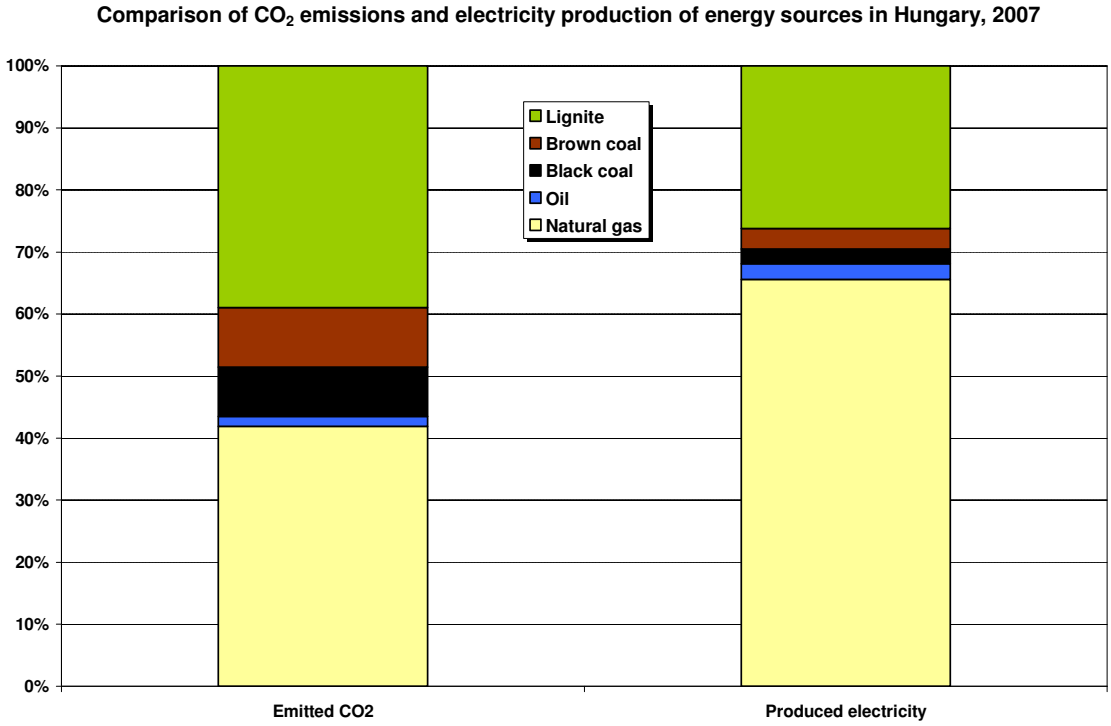
Graph 19



Source: eh.gov.hu; Statistical Data of the Hungarian Power System 2007; Energia Klub's own estimates

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4. Recent characteristics of lignite and coal use

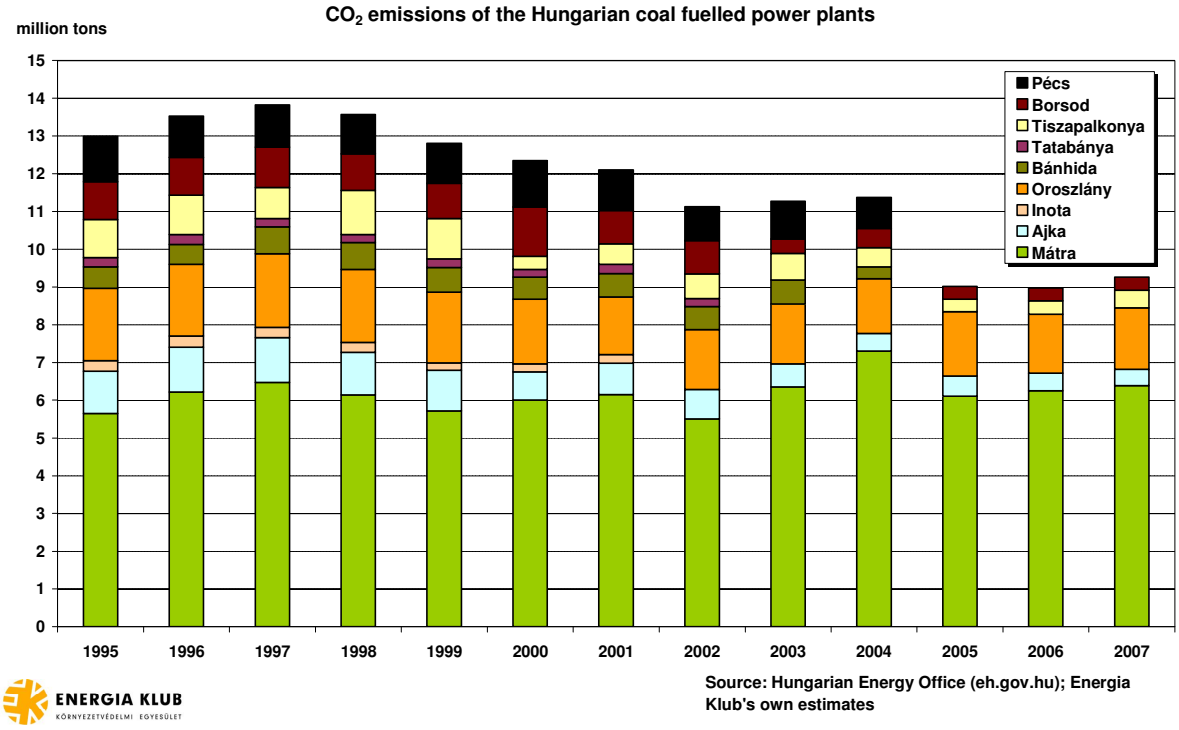
4.1. Power plants

Presently, five power plants are fuelled by coal. The capacity of the 27 units in operation is between 10-225 MW. The average efficiency of the units was 31.35% in 2007, ranging between 11-36%. Since practically all of the units were commissioned in the fifties and sixties, this low level of efficiency is not surprising.

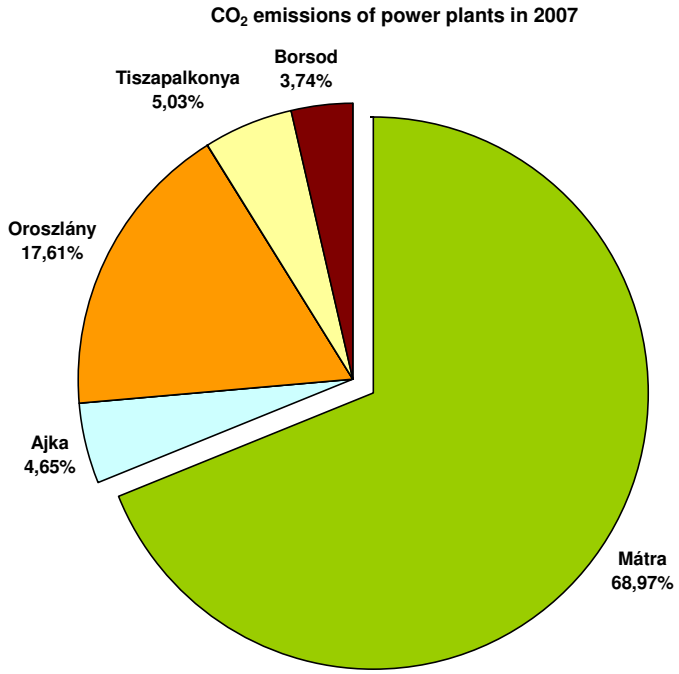
Several small units were shut down over the last decade, or their fuel was switched to natural gas or to biomass, specifically firewood. Further decommisionings are expected between 2011 and 2015.

The share of coal in electricity generation was 18.43% in 2007. The biggest power producer and CO_2 emitter is the Mátra lignite burning plant.

Graph20



Graph 21



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Source: Hungarian Energy Office (eh.gov.hu)

Table 1

Plant	Installed capacity, 2007 (MW)	Number of operable units	Fuel	Number (size, MW) of biomass units	Gross electricity production 2007 (MWh)	CO_2 emission 2007 (million tons)	Used primary energy 2007 (GJ)	Plant efficiency based on 2007 data	Commissioning (renewal or fuel switch)	Owner
Mátra	941	5	Lignite + biomass (+gas)	Co-firing	6 170 588	6 387 466	61 228 768	36,28%	1969-72 (1986-92, 2006-07)	RWE, MVM, EnBW AG
Oroszlány (Vértes)	240	4	Coal + biomass	1 (30% of 60)	1 473 884	1 630 500	17 750 630	29,89%	1961-62 (1985, 2006)	MVM
Borsod	137	7	Coal + biomass	1 (30)	349 243	346 519	7 428 429	16,93%	1951-57 (2004)	AES
Tiszapalkonya	200	6	Coal + biomass	n.a.	323 953	465 675	5 370 190	21,72%	1952-59 (2003)	AES
Ajka	132	5	Coal + biomass	1 (30)	172 943	431 000	5 713 714	10,90%	1957-61 (2004)	Bakony PP Co.
Together	1 545	27			8 490 611	9 261 160	97 491 731	31,35%		

4.1.1. Mátra Power Plant

Out of all the coal plants, Mátra is the biggest producer of power, as well as being the only lignite burning power plant. It supplied over 15% of total electricity, and over 80% of the coal-based electricity in 2007.

The five units (2 x100 MW, 3 x 225 MW, plus 2 x 33 MW gas turbine, equalling 941 MW total installed capacity) were commissioned over four years (1969-1972), and were renewed between 1986 and 1992. In the frame of a further retrofit program, a flue gas desulphurisation unit was installed (1999). In 2006-07, gas turbines were installed in two of the bigger units and other capacity-increasing developments were completed. The plant also uses biomass for co-firing. The amount of biomass is not known.

The power plant was privatised in 1995; its main owners are the RWE, EnBW and the state-owned Hungarian Power Companies Ltd. (MVM). The contract stated that the power plant can build two new lignite burning units (2*500 MW) by 2005. In 1999 it was revealed that the conditions cannot be met, and the state had to pay 26 million dollars and its interests for the RWE and the EnBW.

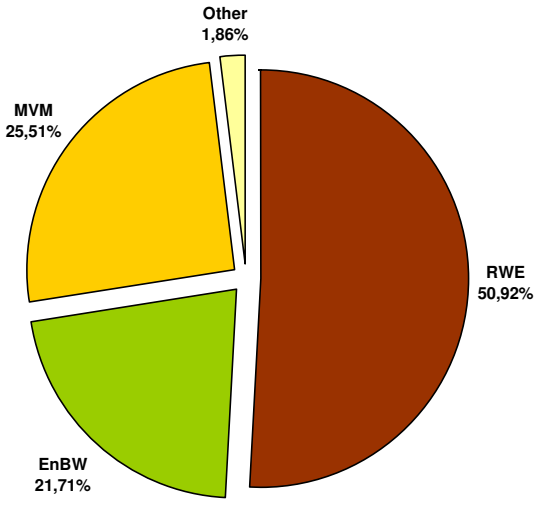
Mátra, with well over 6 MT emissions p.a., is the biggest CO_2 emitter out of all the power plants: increasing its emissions over the last decade, it alone represents 69% of the emissions of the coal plants (2007), and roughly 10% of the total national CO_2 emissions. The natural gas-fuelled plants' emissions are only slightly higher, while those produce around 2.5 times more electricity than the Mátra.

The plant operates two open-pit mining sites, Visonta and Bükkábrány. According to available data, their annual production is 8-8.5 million tons. The lower heating value of the fuel from Visonta is 7000-7500 kJ/kg, from Bükkábrány is 7500-8000 kJ/kg.

Taking into consideration the area's enormous, cheaply exploitable lignite reserves, significant opportunities exist for the plant to expand.

Graph 22

Owner structure of Mátra Power Plant



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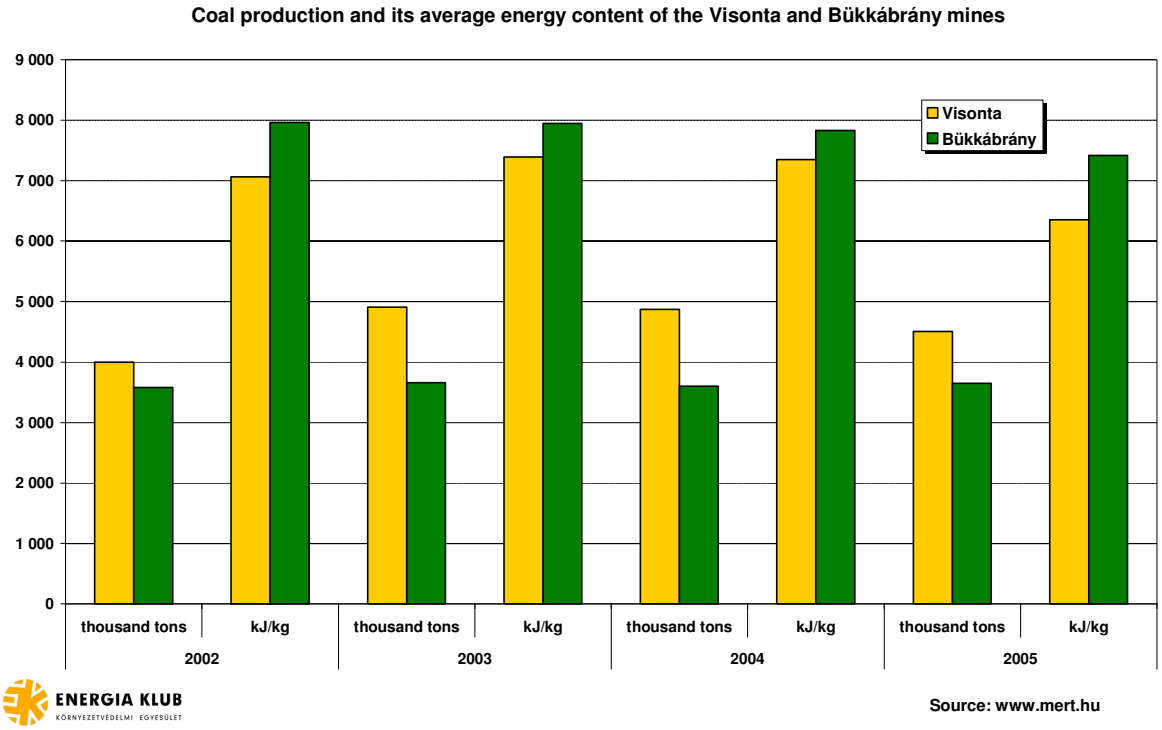
Source: www.mert.hu

Graph 23



Picture 2: Mátra Power Plant and the Visonta mine

Picture 3: The Bükkábrány mine

4.1.2. Oroszlány Power Plant

The Oroszlány plant is the Vértes Power Plant Company's last remaining power station. It is the second most productive coal plant, supplying 3.7% of the total electricity generated, and around 17% of the share of power generated by coal plants.

It's two other plants, Tatabánya and Bánhida were shut down in 2003 and 2005 respectively. The four units with 240 MW installed capacity were commissioned in 1961-62, and were renewed in the second half of the eighties. In 2006, one of the units was retrofitted for biomass combustion, constituting up to 30% of the heating value of the fuel.

The plant is owned by MVM, hence, apart from the Paks nuclear power plant, Vértes is the only power plant fully owned by the state. Keeping this uneconomically operating plant afloat is a political issue. Vértes, being the operator of the only remaining underground mine, is the last power plant which is still subsidised directly by the state: the restructuring of the coal industry stipulated that consumers should pay so-called "coal cents" in their bill. Although this amount is relatively small (roughly 0,08 euro cent/kWh), taking into account the amount of electricity consumed (import included!) in the country, the total amount of subsidy is quite high. Until 2010, the power plant receives 25-30 millions of Euros annually, with a declining forecast (see Table 2). The legislation background of the subsidy was established in 2007[2], and it determines the maximum amount that can be paid every year. Since the legislation is based on a European Council Regulation[3], the aid should be terminated in 2010. Even with

[2] Government Decree No. 278/2007
[3] Council Regulation (EC) No 1407/2002 of 23 July 2002 on State aid to the coal industry

the subsidy, Vértes continues to be in the red: according to recent news, the company's monthly losses are over 3,5 millions of euros[4]. While privatisation is permanently on the agenda, none of the attempts has yet been successful (the last one being last December). A recent government decision[5] – referring to employment and environmental(!) interests – orders the owner MVM to ensure the finance of the power plant, and calls the concerning ministries for analysing the possibilities how the subsidy can be extended after 2010.

Table 2

Year	Maximum amount (million €)
2008	30,38
2009	26,69
2010	24,85
Total paid 2008-2010	81,93

With over 1.5 MT annual emissions, Oroszlány is the second highest CO_2 emitter among coal plants. Its share was 17.6% of coal plant emissions in 2007, representing around 2.6% of the total national emissions.

The plant operates one mine, named Márkushegy, Hungary's last underground coal mine. Its average annual production is 1.2 million tons; the lower heating value of the coal is 16,000-21,000 kJ/kg.

4.1.3. Borsod Power Plant

Borsod is the oldest of all the Hungarian power plants in operation. Its seven units were commissioned in 1951-57. The total installed capacity is 137 MW. One 30 MW unit has been burning biomass since 2002.

The plant is owned by the AES Corporation. Its CO_2 emissions were 0.35 MT in 2007. Borsod, along with the Mátra plant, is the other one of the already existing plants which is planning to build new units.

4.1.4. Tiszapalkonya Power Plant

This plant is the other one owned by AES. The six units (200 MW installed capacity) were built in 1952-59. Some biomass is also burned. It emitted 0.47 MT CO_2 in 2007.

4.1.5. Ajka Power Plant

The Ajka Plant is the last remaining station of the Bakony Power Plant, after the units of the other site, Inota, were shut down in 2001. The total installed capacity of the five units is 132 MW. Since 2004 one 30 MW unit has been fuelled by biomass. The plant emitted 0.43 MT CO_2 in 2007. The plant is serving more as a heat production plant; this explains the extreme low efficiency data (11% in 2007).

4.2. Perspectives

[4] e.g. http://www.hirszerzo.hu/cikk.kormanyhatarozat_tovabb_kell_mukodtetni_a_vertesi_eromuvet.113254.html
[5] Government Decree No. 1097/2009

Taking into account the coal mining situation and the observable trends concerning coal plants in Hungary, not to mention the international efforts towards establishing global and European carbon markets for CO_2 emissions, no one would think that new coal plants would be in the planning phase at all. Despite all concerns, three projects have recently made it onto the agenda:

- a new unit in the Mátra Power Plant
- two new units in the Borsod Power Plant
- a new power plant with two units at Mohács

Table 3

Plant	Fuel	Fuel source	Capacity (MW)	Planned start	Owner
Mátra	lignite	Bükkábrány	440	2015	MVM, RWE, EnBW
Borsod	brown coal	n.a.	2*165	2012-13	AES
Mohács	black coal	import	2*600	2015-20	E.On

4.2.1. Enlargement of the Mátra Power Plant

The plans to enlarge the Mátra power plant are the ones at the most advanced stage. In 2008 a new company named Mátrai Power Producing Co. was set up by the state-owned MVM and the power plant itself. With its 74.9% share, MVM is the company-leader, as well as being a shareholder in the power plant itself; altogether its share is around 85% in the new company.

The company plans to build a 42% efficient, 440 MW lignite fuelled unit with 10% biomass capacity, with provision for Carbon Capture and Storage (CCS) built in. According to official claims, the new unit would substitute the two 100 MW units, so due to the higher efficiency of the new unit, the specific emissions will be lower and the total CO_2 emissions will not increase. However, closing the old units and building a new one are independent decisions, made by the Mátra Power Plant and the MVM respectively.

Representatives of the interested companies, MVM and Mátra Power Plant claimed at a forum in November 2008 that the necessary permits have been attained, but this is still in question. According to documents from the concerned environment authority, the environmental impact assessment process has not been carried out, so no environmental permission could have yet been granted (February 2009).

To supply fuel for the new plant, the enlargement of Bükkábrány mine, which has better quality lignite, is also planned. However, it would not be without problems: a main railway line would need replaced, and the village of Csincse is situated in the middle of the planned mining area. There are fears that sooner or later the village will be destroyed.

Since the MVM is a state-owned company, the participation of the state in the project raises questions, especially in terms of market distortion. However, it is claimed that the EU did not find any problem with the tax allowance which has allegedly been provided.

4.2.2. Borsod and Mohács

There is a lack of information available about these two other plans. Despite this, some references to these plans can be found in papers or presentations of MAVIR or MVM representatives.

The Mohács plant seems to have a better developed framework. The plant would be based on imported black coal, which would be transported on the River Danube. Although the 600 MW size is lower than the optimal-referred 750-850 MW, it is still higher than the capacity of the Paks nuclear units (each block 500 MW). As a result, one can hardly imagine that such an investment could be implemented economically, since the reserve capacities of the electricity system are to be sized to meet the capacity of the biggest unit in the system. Building a unit larger than 500 MW would require the investor to invest in reserve capacities, unless new unit(s) of over 1000 MW are built at Paks.

While it is not clear whether domestic or imported fuel would supply the new Borsod units, implementation is unlikely given the recent situation of coal mining.

4.2.3. Torony

As well as the aforementioned, more or less concrete plans, recent developments require that the other lignite site, Torony, should also be discussed in this report.

The reserves account for some 530 MT exploitable lignite, with an average of 7200 kJ/kg energy content.

While there were some mining activities in the areas in the 20th century, the first wider concept for utilising the resource was raised in 1979, in the framework of an agreement between Hungary and Austria. A power plant was to be built on the Austrian side of the border, to be fuelled by lignite mined in Hungary, starting the operation in 1988 at the latest. The plans were dropped in the eighties, firstly due to the economical problems, and then to the political changes in Hungary, as well as because of the activities of the Austrian environmentalists.

The idea to open a mine and to build a power plant in Hungary was raised then discussed extensively in 2003-2005. A Hungarian coal mining company (with an unidentified interest-group behind it) asked the mining authority for a permit for exploratory drilling. The plans soon raised objections among the affected villages, and the question rapidly became a political issue. The protesting municipalities expressed environmental concerns, worried about the effects of the investment on tourism, and started to modify their development plans to exclude lignite mining. Even the Prime Minister of the day assured his support, as well as Austrian municipalities which joined the protest.

Finally, the authority refused to grant permission, and the company went to court. Although it won the court case, it continued to the Highest Court, which ordered a re-trial. Finally, in an unconnected development, a liquidation process was started against the bankrupted company, and the idea of opening a mine at Torony was dropped from the agenda – at least for now.

5. Environmental and social effects

5.1. Subsidies to the coal mining and energy industry

5.1.1. Merging mines and power companies

After the politico-economical changes in 1990, the uneconomical coal mining sector, along with the related part of the energy sector, had to be reshaped. Between 1990 and 1993 the mines and the power companies were detached from the state and separate companies were established. The mines, based on their economic data, were divided into two groups, of which the allegedly better performing mines were contracted with the power companies.

With this solution, the integrated mines were guaranteed not only the price for the produced coal, but were also awarded a fixed price for their coal producing capacity. The other mines which were left out of the process became uncompetitive. However, the decommissioning of these mines was slow, lasting into the new millennium.

The integration led to 15 mines being contracted with 5 power companies. As a result of this, the power companies had to pay higher prices for the fuel, compared to import prices. The losses had to be compensated, so the higher fuel prices[6] were returned in the energy price paid by the customers. The prices were determined annually by the responsible minister, with the involvement of the Energy Office. It should be noted that while the power plants took all the assets of the mines, liabilities, arisen from the past mining activities, remained the burden of the state.

As a consequence, the process was financed by the taxpayers (in the case of the mines not integrated), and the energy consumers (in the case of the integrated mines). The process, even though it was overseen by the State Audit Office[7], was accompanied by transparency problems. The governmental decisions (3329/1990, 3530/1992, 3439/1993) that were made on the issue belong to the series of the so-called "three thousand decisions", which are automatically classified documents. In its 1997 inquiry the Audit Office pointed out that some of the mines that had been dropped from the integration at the beginning of the nineties, would have had better economic perspectives in a competitive market than some of the integrated mines at the time the inquiry was carried out, due to their better specific costs. Nevertheless, due to their given positions, they remained uncompetitive. This raises the question of what aspects played a decisive role during the process, what aspects determined which mine would be integrated and which would not.

To justify the related state expenses, social aspects were also raised, referring to increasing unemployment and other problems. It was typical to retire workers (as in the case of other industries) for diverse reasons (disability pension, the then established miners' pension, age preference etc.). According to the State Audit Office report, until 1997, some 40% of the workers living from the industry were retired, only 15% of whom had reached retirement age. The mass retirement can be understood as a further state subsidy. Its effects are still prevalent in the state budget and in the low employment rate.

5.1.2. Privatisation, long term contracts

[6] Technically, it appeared as the fee of the engaged capacity of the mines

[7] 9840 Report on the audit process of the implementation of the government programme for the restructuring of coal mining – http://www.asz.hu/ASZ/jeltar.nsf/0/AE5C2AF7FC80AEECC1256CB10044B1EF?OpenDocument

During the 1995-97 period most of the energy companies were privatised. The privatisation process was guaranteed the keeping alive of the out-of-date plants (as well as the Vértes Power Plant, which remained state-owned). Although all mines but one and some of the worst performing units have been shut down since, and the shutting down of the other outdated units is always projected in the five to eight years period in the future by officials, many of the plants are still being operated. This is particularly due to the administrative and financial subsidies, and in some cases due to the fuel switch.

There were two kinds of guarantees provided for the new owners in the privatisation process. Firstly, the purchasing of the energy produced was ensured in long term agreements; secondly, the profit was guaranteed in the privatisation contracts, calculated on the rate of the assets (8% per year). The scheme was again a burden on the consumers and the taxpayers. While the state-owned wholesaler (MVM) was forced to buy the electricity from the companies on a price determined by the Energy Office, it only took the interests of the power companies into account when it determined the prices of power on an annual basis. The losses that the MVM had to compensate for years were financed from the state budget. This practice lasted until the mid 2000s.

In the case of the Mátrai Power Plant and the Tiszai Power Plant, another form of subsidy was also planned to be implemented. Before signing the privatisation contract, the state promised in an agreement that the new owner can build new units, for which the same conditions would be applied as for the old ones. However, in 1999 it was revealed that there would be no need for new units. The state had to pay 26 million USD in compensation to the Mátrai Power Plant; in 2001 the owner of the Tiszai Power Plant, the American AES withdrew the lawsuits that it had launched.

The EU accession and the liberalisation of the energy sector in 2008 did not change the picture much. The long term contracts had to be terminated at the end of 2008 according to the EU market rules, but without having seen the contracts which, according to the interested companies, fall under business secrecy, there cannot be too many differences between the old and the renewed contracts, apart from the contract period, which was decreased from 20-25 to 5 years. Moreover, there is no apparent reason as to why not to repeat the signing of the contracts every five years.

It must be noted that transparency has always been a week point of the restructuring process of the energy sector. Since the details of privatisation and the long term contracts have been kept secret, no one apart from the interested companies and the representatives of the state can make too many clear statements about them.

5.1.3. Other forms of subsidies

5.1.3.1. Mining tax

According to the Act on Mining (1993), there is a huge difference in the taxes related to different energy sources, paid by the mining companies. The producers of hydrocarbon fuels have to pay much more than those of solid fuels. The calculated specific multiplication factor was around 108 in 2007[8]; the producers of hydrocarbon energy sources paid nearly 200 times more than those of solid fuels, practically speaking the Vértes and especially the Mátra plant!

[8] Based on the primary energy content of the fuel produced

5.1.3.2. Hidden subsidies related to the Kyoto process

Presently, the Kyoto process allows for a new type of subsidy to be provided for the power companies. This issue is discussed in Chapter 4.5.

5.1.3.3. Change in the rate of green electricity

A change to the rules concerning the proportion of green electricity and biomass co-firing was implemented last autumn, which is another subsidy for the Vértes Plant. According to the changes, units co-firing at least 30% biomass (instead of the earlier limit of 51%) are entitled to get the price for green electricity. Vértes has one unit which is retrofitted for biomass fuel, up to 30%.

5.2. Environmental and social impacts of lignite mines (Visonta, Bükkábrány)

Since the only coal mining activity with any prospects in Hungary is open-pit lignite mining, which can result in further harm to the natural and social environment, we set aside the examination of underground coal mining and focus on lignite mining in this section.

The harmful effects of open-pit coal mines (destruction of nature, disturbing the underground water table, dust and noise pollution, vibration, direct and indirect destruction of houses and entire villages etc.) are widely known.

All of these have already been or are likely to be observed in Hungary, with these effects being most apparent in those poor villages neighbouring the mines.

The mines operate as close to adjacent villages as possible. The distance is sometimes less than 200 metres. This leads to dust and noise pollution: the power plant admits that the noise in two vicinities, Detk and Halmajugra was over the legal limits in 2006; there is no data on the effects of the actions taken to reduce the noise level.

Disturbing the groundwater system has possibly contributed to another problem. In the nineties cracks appeared on the walls of the houses in the street of Halmajugra closest to the former mine, threatening collapse. According to the inhabitants, the ground lost its ability to hold the weight of the houses due to the lack of water in the geological layers under the village, which had been caused by the pumping of water out of the pit in the seventies. The power plant did not admit any responsibility but referred to a general compensation scheme from which some money would be available for the village through a foundation. However, they admitted that they did not follow the course of the money. Finally, the village council ordered a geological survey to be carried out. The survey was done but only fragments of information are known. The entire survey is not publicly available, although it was financed by taxpayers' money[9].

Although as yet no village's existence has been directly threatened, this situation could easily change. Mining sites' perimeters are always very close to neighbouring villages. This, however, does not mean that the underground lignite resource also stops at this perimeter line.

Recently, the village of Csincse on the Bükkábrány site has come under threat. Due to the planned enlargement of the Mátra plant, the extension of the Bükkábrány mine is also on the table. Csincse is in the middle of the area to be mined, where the best quality lignite can be

[9] http://www.amarodrom.hu/archivum/2005/04/3.htm

found. Although the official line is that only a main railway track will be removed, the future of the whole village is in question[10]. With the railways removed, being encircled by a pit over 10 metres deep, and having only one small road to the new railway line as an umbilical cord, the village would lose nearly all connection with the outside world and properties would lose their value. The deteriorating living conditions would seal the fate of the village.

All these and further anticipated environmental problems and social impacts were reflected in the protests of the mayors of the affected villages in the Torony-region in 2003-05, contributing to the abandonment of the application for permission to exploit the resources.

5.3. The energy policy and the Kyoto process

A 15 point list of tasks, generally referred to as the Hungary's new Energy Policy, was passed by the Parliament in 2008. The paper contains serious inconsistencies, treating the use of lignite resources and CO_2 emissions as two separate issues. Although it expresses the importance of decreasing emissions, it also declares that long-term Hungarian energy policy counts on lignite as the only fossil fuel available in Hungary in the long run. It also stresses that lignite gives an opportunity to decrease energy imports and Hungary's import dependency.

Contradictions also appear between the Energy Policy and the National Climate Protection Strategy. This is not a surprise. Although the Kyoto process is quite complete in Hungary and the necessary transposition of legislation into Hungarian decision making and regulation has been done (ratification of the Kyoto Protocol, Act on Greenhouse Gases, Order on Joint Implementation, National Climate Protection Strategy etc.), the seriousness of the intentions behind these steps have been questionable from the beginning.

Hungary's Kyoto target – 6% emission reduction by 2012 – is not at all ambitious. As the result of the Kyoto negotiations, Hungary is practically not forced to implement any measures to achieve an effective decrease in emissions. Contrary to the commonly used base year of 1990, relative to which the necessary decrease is calculated, another base year was bargained for Hungary: the average of the years 1985-87. Since heavy industry collapsed around 1990 and many of the main emitters were shut down and energy needs decreased, this provided a special opportunity for Hungary. Taking into account the effects of the unavoidable metamorphosis of the Hungarian economy, the prescribed decrease in emissions was over-achieved (with a further 26% over the 6% target) without any concrete measures. Hence, the country and its (energy) industry are not forced to implement any measures, provide any incentives towards improving efficiency or to invest in changing technologies at all. With this advantage, Hungary possesses about 70-80 million tons of AAUs[11] that can partly be put aside and partly be sold on the international market.

Naturally, Hungary also takes part in the European Emission Trading Scheme (EU-ETS). It is a well-known fact that the first trading period of the ETS (until 2012) was heavily over-allocated in the whole of Europe. Instead of the "polluter pays" principle, the "polluter profits" principle was applied: the largest emitters were given quotas for free, which can basically be regarded as a financial subsidy to these companies (in 2005 and 2006, energy

[10] At an energy forum in November 2008 in Budapest, the CEO of the Mátra Power Plant commented on the issue: "We will not harm Csincse… for the time being."
[11] AAUs: Assigned Amount Units – CO2 emission quotas that can be sold by countries out of the ETS, which is designed for companies.

companies got quotas of the value of around 60 million Euros[12]). Almost all energy companies had surplus quotas in 2005-2006 in Hungary, the biggest amounts being at the disposal of the Dunamenti, Mátra and Tisza Power Plants[13]. The National Allocation plan for the second trading period of ETS (after 2012) has not been approved by the European Council so far and has not been published.

A specific decision, in favour of the Vértes Plant, was made at the end of 2008. The government decided on the place and amount of allocations in the second phase of the ETS. A bigger CO_2 quota was given to Vértes than was justified. The justification of the decision was false[14], and there is suspicion that CO_2 emission data has been falsified[15].

The European Union's post-Kyoto targets (for the 2013-2020 period) and the "burden sharing" within the countries are presently being formulated during the 'road to the Copenhagen' (UNFCCC COP 15) negotiations, 2009. The proposed European target (a 21% reduction in EU ETS sector emissions compared to 2005 by 2020) is still fairly easily achievable for Hungary[16] and will most probably not be enough to force companies to make radical emission cuts and wean themselves off of fossil fuels, even over the medium term.

[12] Mezősi András: Analysis of the 2005 and 2006 European and Hungarian EU-ETS emission data; REKK, October 2007;
[13] ibidem; Dunamenti and Tisza are natural gas plants
[14] http://index.hu/gazdasag/magyar/vertes7045/
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6. Conclusions

Those directing Hungarian energy policy are in a difficult situation. While they bear responsibility for ensuring a secure energy supply, the conventional – fossil fuel – energy resources are being depleted. Oil and natural gas reserves are far from being enough to meet demand and coal resources can at best only be mined uneconomically. Only the easily extractable lignite is available in large amounts. It was among other things this lack of possible choices which pushed decision makers towards maintaining the practice of state support for the largely carbon based electricity system that had been developed to serve wasteful heavy industry prior to the change of political system in 1990.

The transformation that industry and patterns of energy consumption have gone through since 1990 have been in vain, the transformation of the coal sector (mines and power stations) has not satisfied all expectations; the majority of polluting power stations continue to operate today. This situation results from the fact that the obsolete power stations continue to receive subsidies, which, paradoxically, also use up the opportunities offered by those conventions designed to combat climate change. The administrative and financial support for the power stations results in the exclusion of sustainable alternatives from the market and the construction of the planned new power stations would further preserve this situation.

Decision makers have to realise that Hungary has a fundamental interest in making its energy sector sustainable as, according to the IPCC Report 2007, Hungary lies in one of the geographical regions most effected by climate change. A sustainable energy system would seriously take into account energy efficiency, energy conservation and renewables, which would not only be an appropriate response to the challenge of climate change, but at the same time, would help decreasing the Hungarian energy sector's import dependency. To this end the government must stop subsidising outdated energy producing technologies, must withdraw from the planned coal plant projects, and must initiate programs on behalf of efficiency, conservation and renewables.

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