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Electricity Import Opportunities for Hungary

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Introduction – why should Hungary import electricity?

Hungary is a net importer of energy and in particular, electricity. The country has comparative disadvantages in electricity production; a significant part of the generating capacity is becoming obsolete: power stations with some 4500 MW installed capacity need to be shut down until 2020. Increasing electricity demand will add further 1500 MW capacity requirement resulting in a need for 6000 MW of new capacities in the next fifteen years. The question is open: should Hungary build so many new power stations or could she rely on energy imports from neighbouring countries in the longer run? Is it feasible at all? If so, does it pose any risk to the security of supply?

Another question concerns competition in the supply of electric energy. The Hungarian electricity market has been partially liberalized in 2003 and opened further up in 2004. By now, all non-household electricity consumers are eligible to choose their own supplier in order to find their most suitable (and cheapest) electricity source. Potential demand is quite significant: the first evaluations of market opening suggest that companies who chose the market over regulated prices could enjoy significant cost advantages. However, supply on the liberalized market is far from sufficient. Power stations offer their capacities to the public utility wholesaler, MVM (Magyar Villamos Művek, Hungarian Electricity Company) at highly subsidized regulated tariffs. The MVM is obliged to accept these offers; on the other hand, it can only sell its energy to regional suppliers at a regulated price that is lower than its purchasing price. The dilemma is the following: the MVM is unwilling to supply energy to the liberalized market, because it can gain even less revenues there than within the public utility sector (by selling to regional public utility suppliers). Power stations are obviously hesitant to renegotiate their long term contracts with the MVM because of the subsidies they enjoy. It seems that both the MVM and the suppliers enjoy significant market power, and their vested interests prevent any change. Managers of the MVM defend their position by stating that regional suppliers – owned by foreign energy companies – are threatening the market, while they presume to defend Hungarian national interests against these energy giants.

In the end however, the electricity market is left without sufficient supply from domestic power plants. It has often been argued that electricity import could be a significant driving force of the market-building process. If a significant amount of domestic ('free' market) demand can be satisfied from abroad, Hungarian power companies would need to lower their prices and enter the free market; otherwise they could be forced out. (Domestic power companies consider this a threat to the security of supply – as well as a threat to their vested interests!) This would only be the case if free market prices were so low as to attract most public utility sector consumers – or if a new electricity regulation would oblige all consumers to enter the market. In this scenario the public utility sector would only act as a 'supplier of last resort' if a supplier goes bankrupt, etc. The first option seems unfeasible due to technical and external supply constraints; the second 'shock therapy' alternative could face serious popular resistance if market prices didn't fall and collides with the vested interests of market players.

The purpose of this paper is to investigate potential import sources in neighbouring countries to answer the following questions. Can Hungary become more reliant on electricity import? What is the impact of these imports on the Hungarian market: is their amount insignificant enough not to change prices; great enough to lower prices and trigger a healthy competition among Hungarian producers; or could it be too large resulting in the 'crowding out' of domestic power stations?

Electricity demand and generation in Hungary

The collapse of socialism left the Hungarian economy in a deep recession. During the early 1990s industrial energy and electricity consumption fell in line with the economic performance. Energy-intensive heavy industries – mining, steel, etc. – were amongst the greatest losers, their production diminished rapidly. When the economy rebounded after 1995 growth was no longer led by these branches but by less energy-intensive industries (manufacturing of machinery, electric installations, etc.). Other heavy industries – most notably chemical industry – survived the depression and could begin to modernize their equipment and reduce their energy use. Non-producing sectors also became more energy-efficient as up-to-date insulation techniques and materials, modern electric appliances became widespread. There is still much room for improvement however: energy consumption per GDP is still larger than in many Western European countries.

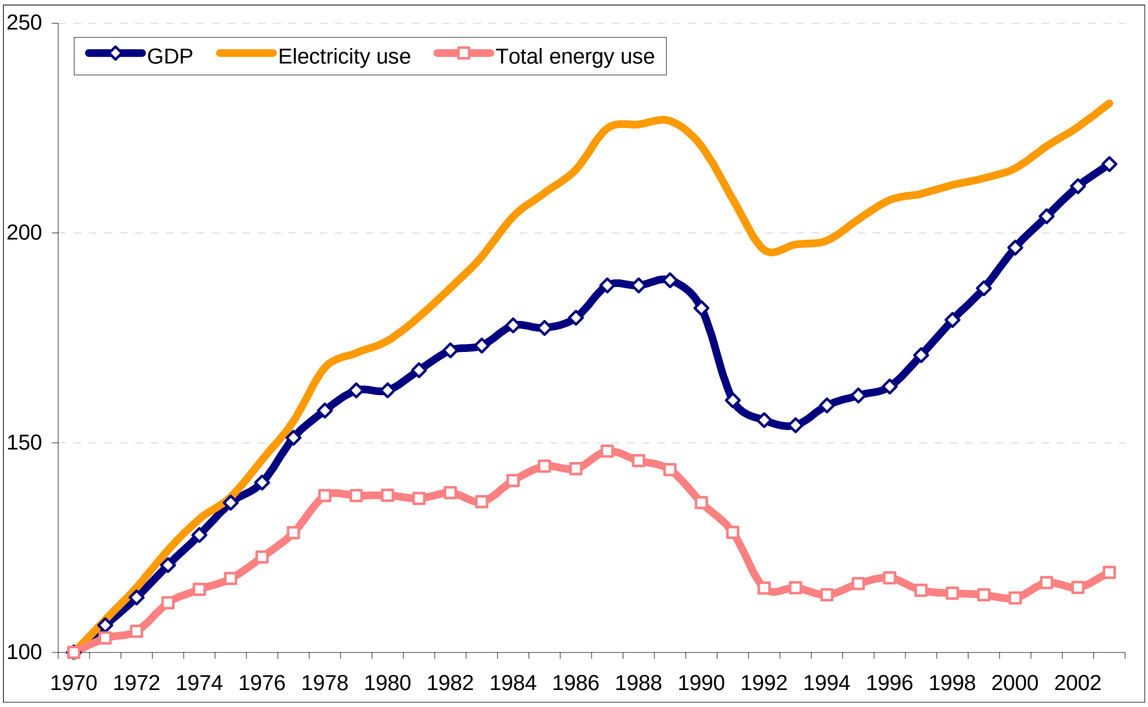
Table 1.
Energy consumption per GDP for selected countries (2002)

	toe/million USD
Hungary	141
Austria	120
Slovakia	187
Ireland	96

Note: GDP calculated at 1995 purchasing power parity
Source: Hungarian Energy Office

Chart 1.

Energy use in the Hungarian economy (1970=100)



Source: Hungarian Energy Office

Domestic electricity demand was around 33 TWh in 2003. In the following 10-15 years this is expected to grow on average by 1.9% year-on-year according to the GKI (Gazdaságkutató Intézet, Economic Research Institute). This rate is lower than the expected rate of economic growth: obviously this estimate predicts increasing energy efficiency in the future. Although the consumption of productive sectors will grow at a moderate rate, residential demand will rise more rapidly with the introduction of dishwashers, air conditioning, computers and other appliances to an increasing number of households. According to this estimate, electricity demand will increase to around 37-38 TWh by 2010, and to about 45 TWh by 2020.

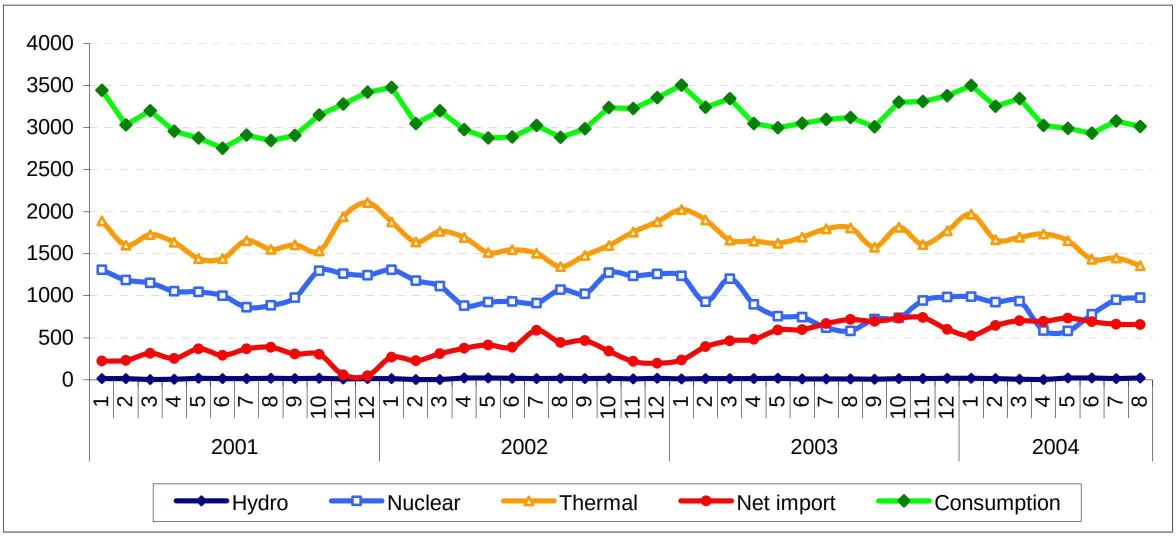
Installed capacity of the Hungarian electricity industry was 8435 MW in 2003. According to experts around 4500 MW needs to be shut down until 2020 due to obsolescence. These are mostly old coal-firing plants – precisely those who have disincentives to enter the liberalized market due to their high production costs. Increases in demand will add another 1500 MW making it a total of 10,000 MW needed by 2020. Some of these new capacities will be renewables: the regarding EU directive rules that by 2010 Hungary must increase its share within energy generation from around 2.4% to 3.6%. But, as Hungary does not possess enough renewable energy sources to cover much of its electricity consumption, new thermal power stations (at least one major plant providing base load supply) need to be installed.

The Paks nuclear power plant covers about one-third of domestic demand, it accounts for about 40 % of production. Hydro stations are insignificant; the rest of demand is covered by thermal stations (their share is around 40-50 %) and import. Electricity imports are rising, they are currently at around 700 GWh per month; there seems to be no seasonality in import trends, most inflows provide base load supply.

Electricity generating costs differ by power stations. Regulated wholesale prices in the first half of 2003 were around 9 HUF/kWh (36 EUR/MWh[1]) for the nuclear plant, 10.8 HUF/kWh (43.2 EUR/MWh) for the Mátra coal plant, 14.4 HUF/kWh (57.6 EUR/MWh) for the Dunamenti gas and oil plant, and can be even more for smaller, older coal units. On the free market, the Mátra and Dunamenti plants could sell their electricity at only 8.5 HUF/kWh (34 EUR/MWh).

Chart 2.

Electricity generation and use in Hungary (GWh)



Source: UCTE

Electricity imports are another possible source, but they are constrained by relatively scarce network interconnections and the supply and demand conditions in neighbouring contries. All these countries are members of UCTE (Union for the Co-ordination of Transmission of Electricity); a special case is Ukraine which connects only partly to the UCTE network with the so-called Burshtyn Island. Cross-border connections are established towards all neighbouring countries except Slovenia. The MVM plans to establish new lines towards Slovakia, Romania, Croatia and Slovenia, and there is a line towards Austria which has not been finalized by the Austrian counterpart (see Appendix 1 for a detailed list of current and planned interconnections). Net imports (scheduled and unexpected physical flows) currently amount to around 7.5 TWh. The main import sources are Ukraine (4.5 TWh in 2003), Slovakia (9 TWh) and to a smaller extent Austria (0.5 TWh). Hungary transits

[1] For the sake of simplicity 1 EUR = 250 HUF is assumed.

electricity towards Croatia (5.8 TWh) and Serbia and Montenegro (0,5TWh in 2003, but over 1.9 TWh in 2002), and exports a lesser amount to Austria (0.6 TWh).

The following sections examine the major potential sources of electricity import: Austria, Slovakia, Ukraine and Romania. These analyses focus on supply and demand trends and forecasts until around 2010.

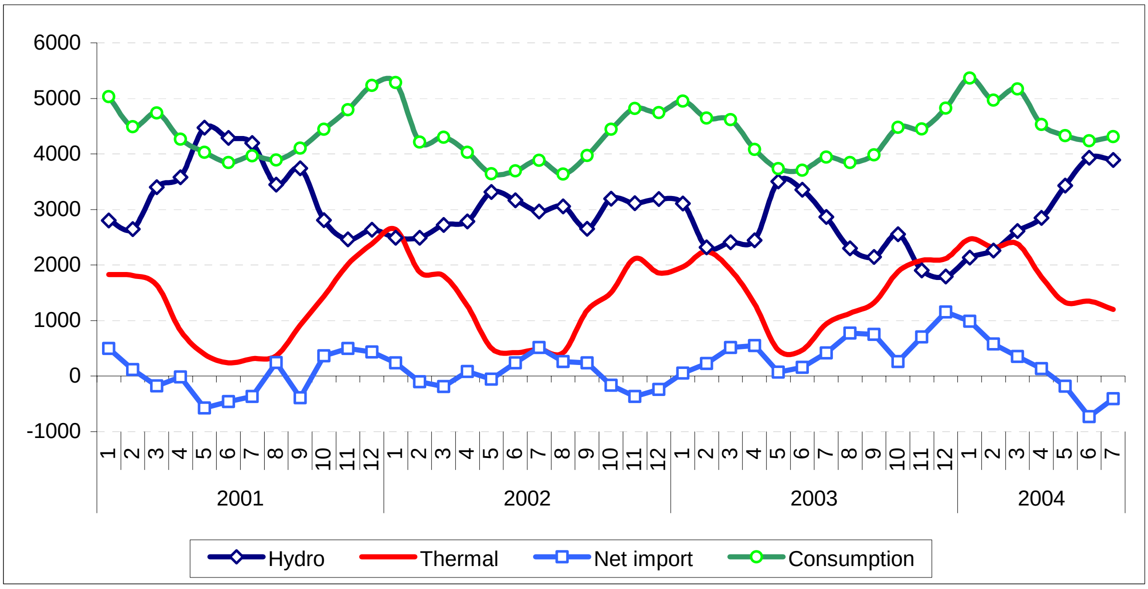
Austria

According to the Austrian economic research institute WIFO the Austrian economy can expect an annual growth of 2.3 % between 2003 and 2008. Electricity consumption will rise in conjunction; the World Energy Forum predicts a growth rate of 1.9 % per annum. Similarly the International Energy Agency (IEA) forecasts an annual 1.7 % rise in electricity generation. The Austrian economy is relatively energy efficient and Austrian citizens are environmentally conscious. Therefore the country aims to improve its energy efficiency even further and utilize even more renewable energy sources.

The Austrian electricity generating sector currently possesses 18 GW installed capacity, hydro power stations account for two-thirds of this amount. Thermal plants are mostly coal- or gas-firing units. Hydro units produce about 70 % of all electricity. The IEA predicts that 1 GW of gas turbines, 1.3 GW of biomass and waste-firing plants and 2.3 GW of hydro plants will be commissioned between 2000 and 2010. On the other hand the UCTE capacity adequacy forecast does not predict any increases in available capacity until 2010.

Chart 3.

Electricity generation and use in Austria (GWh)

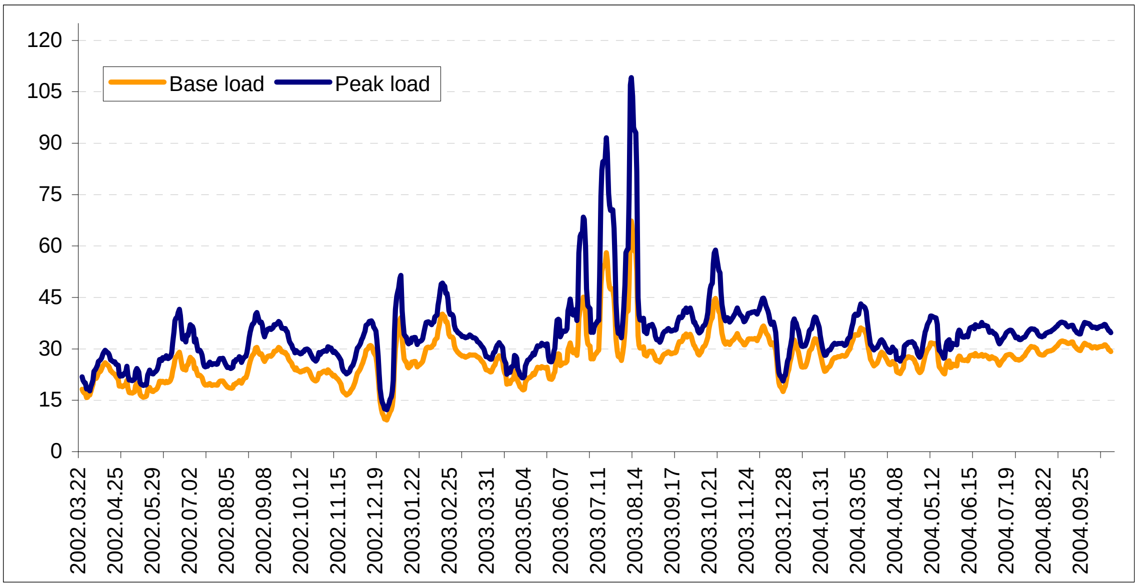


Note: Data only cover electricity producers and consumers connected to the UCTE grid. Source: UCTE

Due to the large share of hydro units thermal power plants play an auxiliary role: in the summer months water is abundant therefore their production is below 1 TWh per month; on the other hand, they generate more than 2 TWh in the winter. Austria is a net importer of electricity in the winter and a (potential or actual) net exporter in the summer. It seems that Hungary cannot count on Austria as a base load energy supplier. There is however a possibility of importing energy from either hydro or thermal units during the summer months (from May to August approximately). Renewable sources (apart from water) could also play a minor role in the potential supply to Hungary. Necessary network interconnections can easily be expanded if the Austrian transmission grid company chooses to install the second line of the 400 kV Győr – Wien Südost cable.

The Austrian power exchange provides a benchmark for Austrian wholesale electricity prices. Base load prices are steadily around 30 EUR/MWh, while peak load electricity costs 5 euros more steadily. Price fluctuations have dampened since the opening of the market in 2002, the only major price hikes were experienced during the summer and autumn of 2003. This was also a period of unusually low energy supply by hydro plants. During 2004 there has not been any significant price disturbance on the market.

Chart 4.
EXAA electricity prices (EUR/MWh)



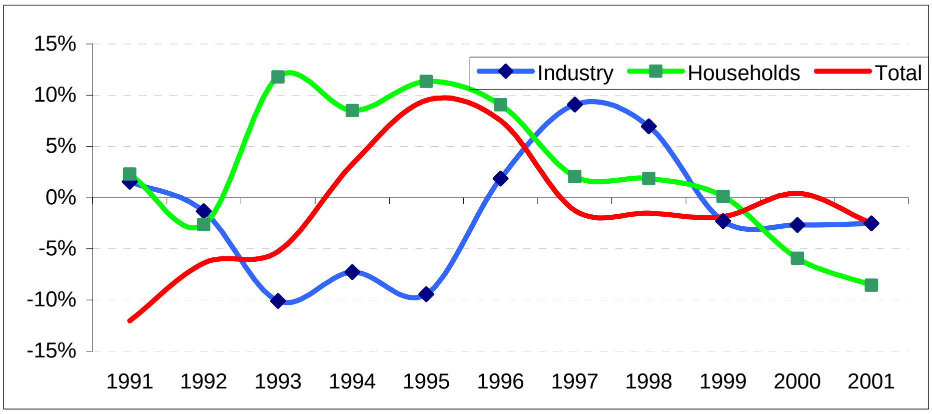
Note: moving average. Source: EXAA

Slovakia

Electricity consumption of the Slovak economy has declined steadily since 1996. This phenomenon is a result of two main factors. First, many households switched to electric heating during a period of cheap electricity in the early 1990s. After the reduction of price subsidies and significant price increases many households returned to other forms of heating. Second, the Slovakian economy is very wasteful of energy, partly due to the large share of heavy industries: the five largest industrial consumers use 3 TWh electricity per year, representing almost 15 % of total consumption. Improving energy efficiency holds back electricity consumption as well. Taking these into consideration, Slovak electricity consumption will rise by 30 % between 2002 and 2010.

Chart 5.

Yearly changes in Slovakian electricity consumption

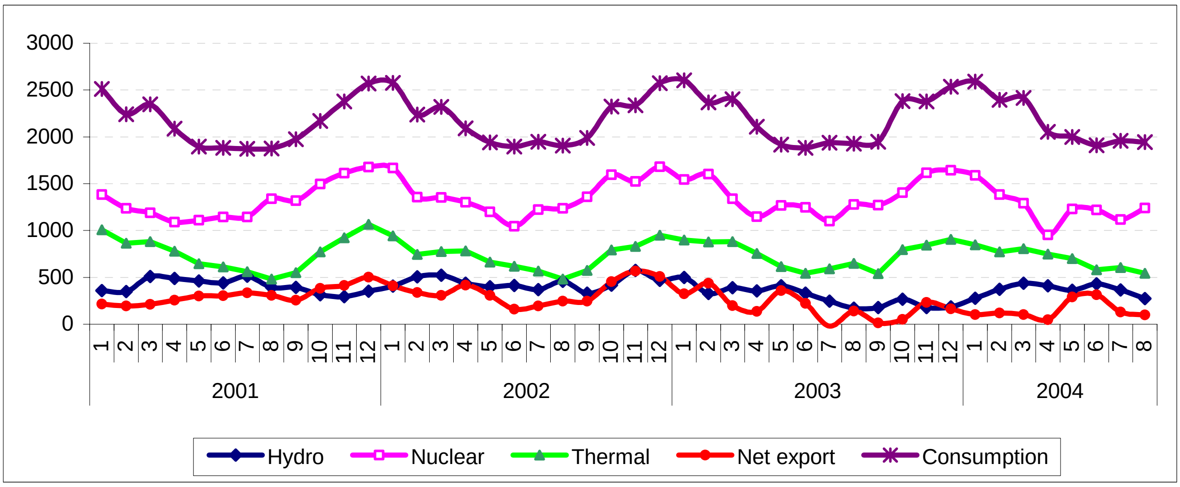


Source: EIA

Slovakia has a total of 7,8 GW installed electricity generating capacity. Total generation is around 30 TWh while consumption is only 24 TWh. Nuclear reactors accounted for 57 % of total generation in 2003. Thermal power stations produced 31 % while hydro stations 12 %. Since the completion of the nuclear reactor in Mochovce, Slovakia is a net exporter of electric energy. While the country imports 6 TWh electricity from the Czech Republic and Poland, it exports around 7,5 TWh to Hungary. Slovakia also seeks to export electricity to Austria but it has been met by the opposition of Austrian environmentalists.

Chart 6.

Electricity generation and use in Slovakia (GWh)



Source: UCTE

At the time of EU accession Slovakia agreed to dismantle two old nuclear reactor blocks in Bohunice in 2006 and 2008 respectively, although there is a political will to postpone it by two years. This would decrease generating capacity by 900 MW. The government would like to expand the Mochovce reactor to make up for these lost capacities. At present there are a number of gas turbines under construction or design with a total of about 600 MW installed capacity. Some of these (at least one plant with 385 MW capacity) may enter service by 2010.

The Slovakian electricity company Slovenské elektrárne (SE) is set to be privatized. The company owns 90 % of all electricity generating capacity in Slovakia including both nuclear plants. The Italian Enel is expected to win the race for the company; the deal could be finalized by mid-2005. While there is political will to build further nuclear capacities, investors are not interested in this. Electricity suppliers are on the verge of sale as well; one has already been taken over by E.ON, the remaining two are targeted by RWE and EdF respectively.

If the two old reactor blocks will be shut down and their replacements will be built, Slovakia will have just enough production capacity to cover its growing demand by the end of the decade, ruling out any significant long-term import opportunities for Hungary. This does not rule out imports in the short and medium run however.

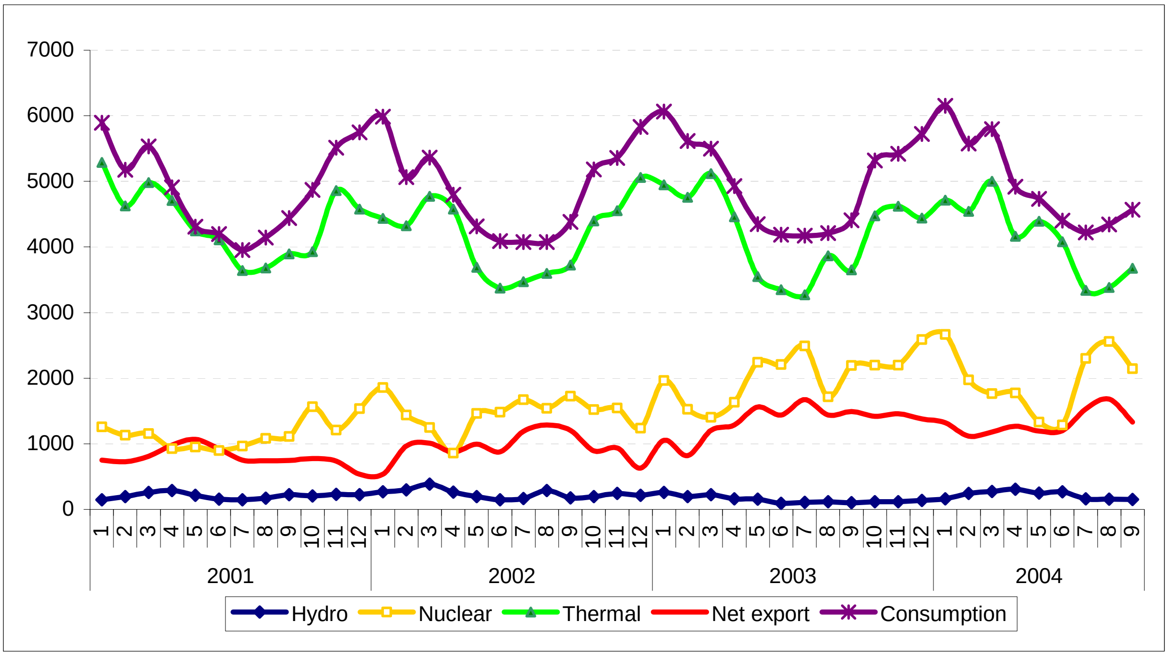
The Czech Republic and Poland

The Czech Republic and Poland are also potential sources of energy import; shipments from these countries could be feasible either through transfer via Slovakia or through swap deals exchanging flows from the Czech Republic or Poland to Slovakia with deliveries from Slovakia to Hungary.

The Czech Republic is and aims to remain a net exporter of electric energy and plans to make the state-owned electricity company Ceske energeticke závody (CES a.s.) a major player of the European electricity market. The Czech electricity industry also aims to rely more on nuclear energy, the new plant at Temelín increases the share of nuclear energy to almost 40 %. On the other hand, some old coal-firing plants are about to be shut down. The Czech Republic is able to supply significant amounts of base load energy, in the past years net electricity exports have been on the rise with monthly values well above 1 TWh.

Chart 7.

Electricity generation and use in the Czech Republic (GWh)

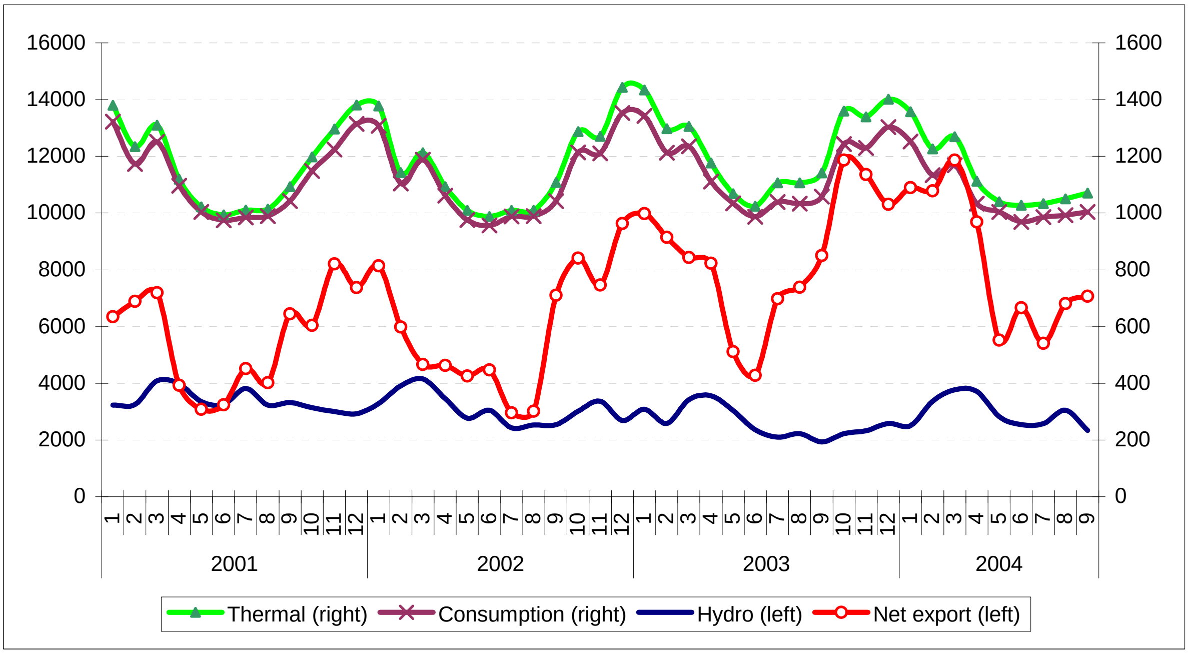


Source: UCTE

Polish electricity demand stagnated in recent years. Energy efficiency has improved steadily, energy consumption per unit of GDP declined by almost 35 % in the 1990s. Industrial consumption is stable while commercial and household consumption rises slowly. Privatization in the energy sector goes very slowly; the sector is dominated by coal-firing plants based on domestic coal reserves. In 2001 net electricity export was 6.7 TWh; the main buyer was the Czech Republic (71 % of exports). Exports are highly seasonal, ranging from about 4-500 GWh in summer months to as much as 1200 GWh in winter months. Average generating costs amount to 25 EUR/MWh with individual power stations ranging from 20 to 40 EUR/MWh. The Polish power exchange was launched in 2000.

Chart 8.

Electricity generation and use in Poland (GWh)



Source: UCTE

Ukraine

The Ukrainian electricity system is not interconnected with the UCTE system (including Hungary) except for the so-called Burshtyn Island in Western Ukraine. The UCTE membership of Ukraine is a long-term prospect but it is not expected to happen until the end of the decade.

The Ukrainian economy is highly wasteful of all energy including electricity. Post-Soviet heavy industry, lack of energy-saving investments, subsidized energy prices and the poor condition of the energy infrastructure all contribute to this. Energy companies are highly indebted partly due to the lack of payments by consumers. According to the World Energy Forum Ukrainian power stations lose as much as 32 % of their potential capacity owing to their obsolescence and poor maintenance. Energy consumption decreased considerably due to the economic crisis of the 1990s. Recent economic upturn saw electricity demand rise again, but the sustainability of this growth is questionable because it relies heavily on Russian exports, and the structural weaknesses of the economy may soon become an obstacle to further development. It is therefore difficult to predict the future energy consumption of the Ukrainian economy.

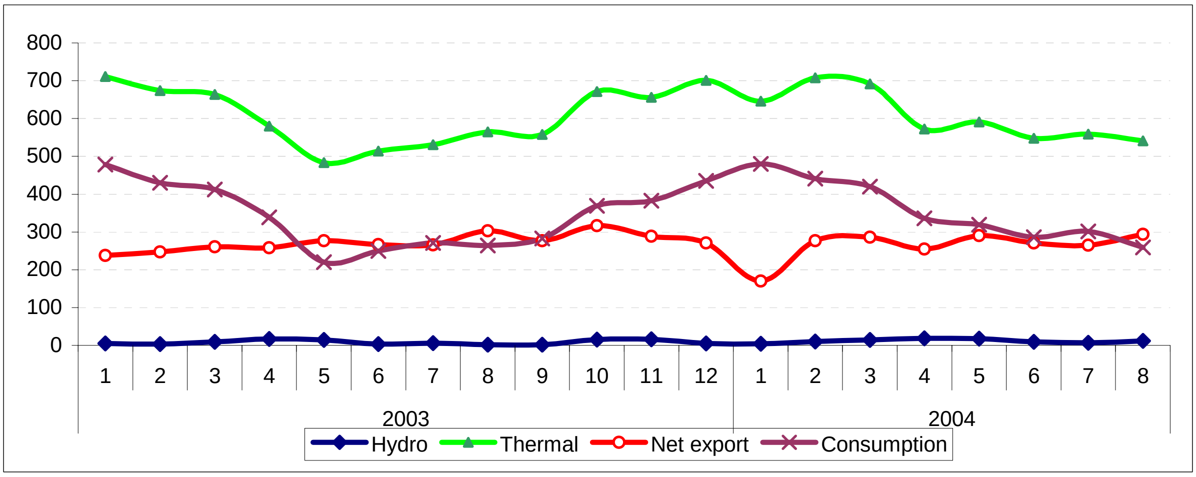
The country relies heavily on nuclear energy. At present 14 reactor blocks with an installed capacity of 12835 MW are in service. A new 1 GW block has been finalized in the Khmelnitsky power station during the summer of 2004; a similar unit is close to completion at Rovno. Two further units are scheduled to be commissioned by

2011. These nuclear capacities constitute a significant potential electricity export source. Russia is interested in electricity imports from the country; another natural target for exports is Central Europe, although concerns about nuclear safety may become a serious obstacle.

The main producer of the Burshtyn Island is the Burshtyn thermal power station, an old coal-firing plant with 2.3 GW installed capacity. As the station exports a significant amount of its production (almost half in summer months, to Hungary among others) for 'hard currency', there is great interest in the renovation of the plant. Russian energy companies recently attempted to purchase a share in the firm, which has been firmly opposed by the opposition party in the Ukrainian parliament. Other foreign investors could be attracted to the reconstruction of the plant as well.

Chart 9.

Electricity generation and use in the Burstyn Island area (GWh)



Source: UCTE

Electricity consumption in the Burshtyn area peaks in the winter months. Net exports are fairly stable at around 200-300 GWh per month. According to various estimates and data provided by the company, the production costs of Burshtyn power station are between 23-27 USD/MWh. The station can provide base load energy for Hungary at a lower cost than domestic production. However, as this energy comes from outside the European Union, importers are charged additional fees.

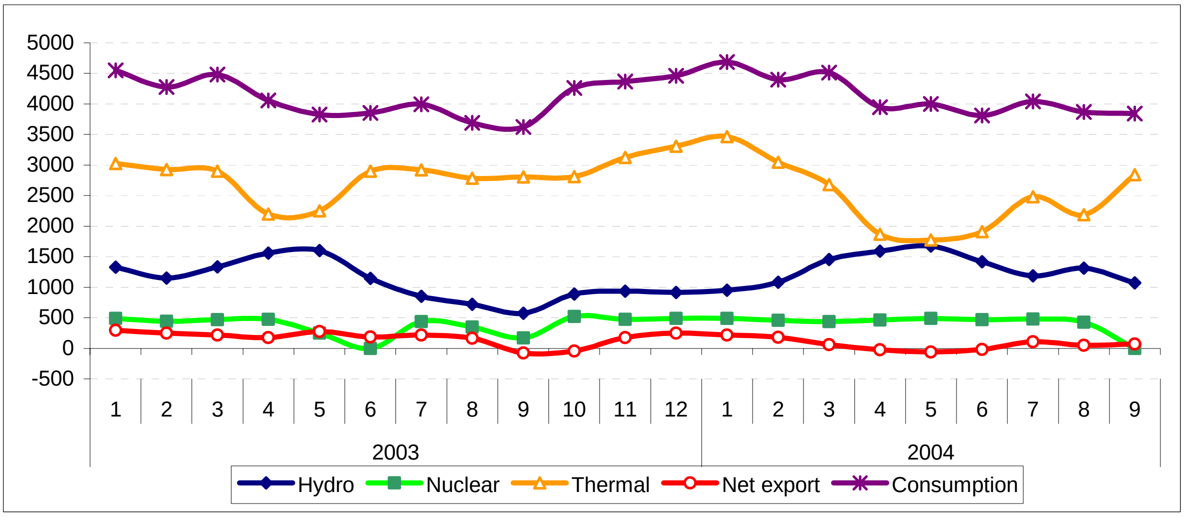
Romania

After a slump in electricity consumption in the 1990s Romanian electricity demand is on the rise again since 2000, although it is still well below the 1990 level (47 TWh in 2002 as opposed to 65.8 TWh in 1990). The Romanian economy can grow dynamically in the coming years; with a favourable economic upswing of EU countries the annual growth rate can reach 5 %, in the longer run, 4 %. However, there are still significant structural problems that need to be tackled (loss-making state-owned companies, large share of agricultural workers, lack of regulation). Long-term estimates forecast 2.5 % per year growth in electricity demand by 2025; until 2010 this will mean an increase of about 20 %.

The country has a total electricity generating capacity of 22.4 GW. A quarter of these are being shut down; a total of 8 GW need replacement by 2010. Many thermal stations need investments to comply with European emission standards. Nuclear energy from the Cernavoda reactor accounts for 10 % of total production; thermal stations produce 56 %, while hydro plants 34 %. Cheap lignite mining provides ample primary energy for electricity generation; the mountain regions offer opportunities for building further hydro stations. Wind and biomass are additional available renewable sources. Gas turbines are expected to gain share in electricity production; Russian import can cover the increment in gas demand. The Cernavoda nuclear station is expected to be extended, a second block is about to be finalized by 2006 while a third block is expected to be built in the next decade.

Chart 10.

Electricity generation and use in Romania (GWh)



Source: UCTE

Local electricity supplier companies are being privatized, and a small number of power stations are about to be sold as well. Large-scale sale of production capacities has not begun yet. Privatization goes hand in hand with liberalization; subsidies of electricity prices have gradually been removed, and the market is expected to be opened up by 2007 for all consumers. As a negative side-effect 1200 industrial and public consumers were switched off in 2000-2001 due to their inability to pay the increased energy bills.

According to the most pessimistic views Romania could even need electricity imports in the short run; in the longer term however it will have significant electricity export potential. The transmission system operator Transelectrica S.A. aims to become a major electricity exporter towards neighbouring countries and the Eastern Mediterranean region (including Greece, Turkey and even Italy). The country gained UCTE membership in 2003; this, the coming EU membership of the country, and plans for the establishment of a regional electricity market can give the Romanian electricity industry a central role in the area.

Currently Romania exports electricity only to Serbia and Montenegro from the hydro station at Portile de Fier (Iron Gate) on the River Danube in relatively minor quantity. The only interconnection towards Hungary (the Sándorfalva – Arad line) was transformed from 220 kV to 400 kV in 1998. The Rosiori – Mukachevo 400 kV line towards Ukraine adds another potential connection to the UCTE, specifically to Hungary and Slovakia. A new 400 kV line between Békéscsaba and Oradea is under construction; its completion in 2006 will double the export capacity of Romania towards Hungary. Taking into consideration that Romania aims to become an electricity exporting country in the long run, Hungary could look towards the East for energy in the coming years.

Conclusions

Hungary is surrounded by countries with electricity export potential. These supply sources will be available on different time horizons. While Slovakia can be a significant exporter in the shorter run, its free capacities could gradually diminish by the end of this decade. Romania on the other hand can export an ever increasing amount of electric energy in the longer run. Projects are under way to increase Hungarian cross-border capacities towards both countries. Ukraine can supply a steady amount of energy at least until the end of the decade. The 'cleanness' of electricity could be a concern in the cases of Romania and Ukraine however – the upcoming EU membership of Romania might ease this problem. Austria can become another additional supplier, chiefly in the summer months, especially when water supply is abundant. Whenever prices or cost estimates are available, these data indicate that electricity generation in neighbouring countries usually costs less than in Hungary. Regulated wholesale prices are poor indicators of true costs (because of their regulated nature), but if they can be taken as a benchmark, Hungarian electricity generation is not competitive.

Hungary could (and should) take advantage of these opportunities. While import is constrained in the short run by scarce cross-border interconnections, the 2006 opening of a new line towards Romania will boost potential import supply. Therefore electricity import could be ‘used’ to break the (explicit or implicit) resistance of Hungarian electricity producers against liberalization. There could be just enough imported energy to drive down domestic wholesale (and end-user) prices. This will pose a significant challenge for the Hungarian electricity industry: the whole supply and pricing mechanism will have to accommodate cheap electricity import. As the ‘last’ supplier with the highest marginal cost determines the equilibrium price, there are two basic possibilities.

First, if import sources are scarce, high-cost domestic units will determine market price. In this case, extra profit is realized by electricity importers. Second, if import sources are abundant, they can crowd out domestic producers with higher production costs. In the first scenario the government must intervene (or quit intervening?) to let domestic production costs fall. This might result in the closure of some power stations. On the other hand, profits from imports could be taxed, and these revenues could be utilized to improve domestic energy efficiency and facilitate investments in the Hungarian energy industry. Note however that if it is used to subsidize domestic electricity producers, this intervention can seriously distort competition and create further vested interests. In the second scenario there is even more chance for Hungarian producers to be forced out of the market. Their chance for survival would be either cheaper production or transformation into peak load units; however, both options are limited.

The long run consequence of our analysis is that there are many countries around Hungary which are much more suited to electricity generation. Some of these are already (or will soon become) EU members, subject to the market opening and integration process within the Community. Competitive domestic power generators as well as renewables and system operating reserves could and should endure. But scarce state resources are much better spent on energy-saving investments and integration into a regional energy market than on subsidizing uncompetitive domestic producers. Overall, security of supply should be viewed on the international scope rather than strictly within the national borders.

Appendix 1

Network interconnections of the Hungarian electricity system

Country	Frontier substations	Number of lines	Voltage (kV)	Thermal transmission capacity (MW at 35°C)	Transmission capacity limitation (MW)	Year of commission
Austria	Győr – Wien Südost	1	220	305	480	1968
	Győr - Neusiedl	1	220	305		1973
	Győr – Wien Südost (only Hungary)	1	400	1514		1992
Slovakia	Göd – Levice	1	400	1509	1330	1988
	Győr - Gabćikovo	1	400	1779	1108	1992
	Sajóivánka – Rimska Sob.	1	400			2007
Ukraine	Albertirsa – Zahidno Ukr.	1	750	4000	2146	1978
	Sajószöged – Mukachevo	1	400	1635	1385	1977
	Tiszalök – Mukachevo	1	220	312	305	1981
Romania	Sándorfalva – Arad	1	400	1246		1998
	Békéscsaba – Oradea	1	400			2008
	Békéscsaba – Arad	1	400			2013
Serbia and Montenegro	Sándorfalva - Subotica	1	400	1246	1050	1988
Croatia	Siklós – Donji Miholjac	1	120	134	65 (winter), 55 (summer)	1994
	Lenti – Nedeljanec	1	120	82	50	1958
	Hévíz - Tumbri	1	400	1246		1999
	Pécs - Ernestinovo	1	400			2007
Slovenia	Hévíz – Cirkovce	1	400			2007

Source: CENTREL Annual Report, MVM