The aim of the Regional Centre for Energy Policy Research (REKK) is to provide professional analysis and advice on networked energy markets that are both commercially and environmentally sustainable. We have performed comprehensive research, consulting and teaching activities on the fields of electricity, gas and carbon-dioxide markets since 2004. Our analyses range from the impact assessments of regulatory measures to the preparation of individual companies’ investment decisions.

Key activities of REKK:

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Geographically, our key research area is the Central Eastern European and South East European region:
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- CO₂ allowance allocation and trade
- supports for and markets of renewable energy sources
- security of supply
- market entry and trade barriers
- supplier switching

Consultancy services
- price forecasts and country studies for the preparation of investment decisions
- consultancy service for large customers on shaping their energy strategy on the liberalised market
- consultancy service for regulatory authorities and energy supply companies on price regulation
- consultancy service for system operators on how to manage the new challenges

Trainings
Our training programmes:
- summer schools
- courses for regulators
- trainings and e-learning courses in the following topics:
  - price regulation
  - electricity markets
  - market monitoring
  - gas markets
- occasional trainings for companies based on individual claims

Nowadays, due to market opening, energy markets cannot be analysed without taking into account regional environment. We monitor the market situation and developments of the countries of the Central Eastern and South East European region. We have built a regional electricity market model including 15 countries to forecast regional electricity prices.

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Regulatory authorities and ministries
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Energy companies and large customers
Mavir, E.ON, MOL, MVM, ELMŰ, Főgáz, Alcoa, DRV

International organisations
DG TREN, USAID, ERRA, CEER, NARUC
Dear Reader!

We proudly present to you issue 3 of volume 3 of our Energy markets report. We honestly hope you have been satisfied with the earlier issues of the report.

This is the first time we have made a brief summary about natural gas market developments taking place in Hungary as well as developments that affect our country. In the future - similarly to the Electricity market developments chapter – this chapter about developments in the specific quarter will be an integral part of our Report. The reason for its inclusion is that there have been such market developments recently that put an end to the contract-based, single player wholesale market, which is trivial for market analysis, facilitating competition and the use of various market strategies. Another reason for its inclusion is that recently such essential market data have become publicly available, without which no analysis could be made earlier. Increased transparency is primarily due to the fact that FGSZ ZRt now provides data to the EU. We hope you find this new section useful. We appreciate any feedback or suggestions you may have.

In addition to analyzing wholesale markets we also publish four other analyses in this issue.

In our first study we look at the 2011/2012 allocation of the HAG pipeline, which is of primary importance regarding domestic gas prices, look at the important stages in the history of capacity distribution, and evaluate the result.

Our second analysis looks at the effects of the nuclear moratorium implemented in Germany on Central European – especially Hungarian – wholesale prices through the changes in the German power plant portfolio and cross-border trade.

Our third article summarises the more significant regulations of the quite hectic 2010/2011 natural gas year.

Our working paper looks at what macroeconomic effects of an increase in the greenhouse gas emissions reductions target to 30% of the current levels would have on Hungary. We hope you will find a lot of useful information in this issue.

Péter Kaderják, director
ELECTRICITY MARKET DEVELOPMENTS

In the second quarter of 2011 the price increase on the factor markets that started in March continued and levelled off, and then around the middle of the quarter it started to decrease. The price of crude oil decreased by 10 USD/barrel during this period, the price of coal fell by 4-5 USD/ton. The long-term trend of natural gas increase seems to have been interrupted; the futures natural gas market price did not change significantly during the quarter. The price of wholesale electricity products traded on the German market stagnated until mid-June, and then it started to fall. The June decrease of electricity-product prices is due to the drop in emission allowance prices: by the end of June the price of CO2 credits dropped under 13 EUR/ton from the previous trend of 16-17 EUR/ton.

The adjusted electricity consumption in the quarter was no different from the figures of the same period last year; the share of imported electricity was 20% like during the summer of previous years. It was announced in May that in the first quarter of 2012 Hungary would integrate its wholesale electricity markets with the Czech and Slovak market, which have already been integrated. The futures Hungarian baseload was more expensive than the German, while the price advantage of Czech and Slovak markets became even bigger.

International price trends

At the beginning of the quarter the price increase observed in factor markets in the previous quarter continued: the price of Brent crude oil peaked at over USD 120 in April, and then dropped suddenly to USD 115 in May and June. The price of coal futures levelled off at USD 130/ton, only a slight increase was observed at the beginning of May and June. With the price decrease prices reached the March level, before the sudden increase. There were no significant changes in natural gas futures prices. The price was about the same as in March: EUR 26.5/MWh, and the closing the quarter at this price at the end of June.

On the German energy exchange the price of futures products 2012 stagnated and slightly declined during the summer months. The baseload...
price was between EUR 58-60 until the middle of June, closing at EUR 56 in July. Peak load stayed between EUR 70-75 during this period, being at the lower end of this range on the last days of June. But the wholesale futures prices were still EUR 5-6 higher than at the beginning of March.

The price of emission allowance (EUA) with December 2011 delivery levelled off at the higher end of the range by the end of March, and then fell below EUR 13. The unexpected drop may have been the result of the new draft energy efficiency directive, which would shift the emphasis from ETS to energy savings through energy efficiency schemes. On the days of the drop in prices over 30 million tons of credits were traded.

**Overview of the electricity market in Hungary**

In the second quarter of 2011 the monthly temperature adjusted domestic power consumption, excluding seasonal impacts, was approximately the same as the value for the same period the previous year, exceeding it only by 1%. During the quarter it was only the May consumption that was higher than that of May 2010.

During the quarter one fifth of domestic consumption was supplied from imports, the large share of net imports is typical of the summer months. This share is 5% higher than the net imports in 2008 and 2009.

Prices of monthly cross-border capacities did not exceed EUR 1 at any border. In this quarter, like before, the highest prices were at the Romanian-Hungarian, Serbian-Hungarian and
Hungarian-Austrian borders. In May 2011 representatives of Czech, Slovak and Hungarian transmission system operators (TSOs), regulatory authorities and organising bodies of electricity markets signed a memorandum of understanding about creating an integrated Central European wholesale market. According to the plan the Hungarian market will be coupled with the already integrated Czech and Slovak electricity markets by the second quarter of 2012.

The spot price of electricity traded on regional markets increased by 3-4 percent on the German, Czech and Hungarian exchanges, and by as much as 6 percent on the Romanian exchange. The volume of baseload traded on HUPX doubled compared to the previous quarter: 0.94 TWh of electricity was traded during the quarter.

The wholesale price of electricity is influenced by balancing energy prices, the costs of settlement of deviations from the schedule. The financial costs of balancing for the balance circles are determined by the spreads between the balancing energy prices and the spot price of electricity in the settlement period. The higher the price of positive balancing energy is compared with the spot price the more costly it is to purchase the shortage from the balancing energy market, and the lower the price of negative balancing energy compared with the spot price, the higher the loss incurred from selling the surplus to the system operator (instead of selling it to the market) is.

The average hourly positive balancing energy price during the period was 29.9 HUF/kWh, procurement of negative balancing power cost HUF 0.95/ kWh on average.
The baseload price for 2012 in the quarter remained at an elevated level from March till mid-June, and then fell sharply by EUR 4. The Hungarian baseload was on average 60 eurocents higher than the German one, while on the Czech and Slovak markets one MWh cost EUR 2.5 less than on the German exchange.

MVM held its first annual electricity auction, where 1.3 TWh baseload for 2012 was traded, at the average price of EUR 58/MWh, which was equivalent to the typical exchange prices of the period.

**Overview of the gas market in Hungary**

First we would like to give an overview of the main figures of the 2010/2011 gas year. In this gas year the consumption was 12.3 billion m³, 1.8% higher than in the 2009/2010 gas year, one reason being that it was somewhat colder than in the previous year. Natural gas consumption depends very much on the weather. If the daily average outside air temperature is below 16°C, the total gas consumption in Hungary goes up at the same rate as the temperature goes down, however above 16°C natural gas consumption is not directly proportionate to outside air temperatures. This base value is used to define the so called heating degree day (hdd), which on days of below 16°C average daily temperature is equal to the difference between the two values, otherwise equal to 0, and which is equal to the sum of daily hdds for a longer period, e.g. a month.

The 2010/2011 gas year was slightly colder than average. The figure shows the gas consumption by month, and how
On the supply side of the gas market interesting tendencies could be observed this year, especially in January and February. Gas storage facilities played a more important role in meeting domestic demand, as the volume of gas imports from the east dropped significantly. With regard to the structure of sources, these two months were like 2009, the year of gas crisis, when due to the import gas supplies from Russia were disrupted, domestic demand could only be met by withdrawing large volumes of stored gas. This year’s developments may have been shaped by the unprecedented high level of stocks piled last year. By September 2010 – i.e. the end of the injection or stockpiling period - there were 4490 million m³ of gas stored in commercial gas storage facilities, which is approximately 1 billion m³ more than at the same time in previous years. So it is likely that the wholesaler with high levels of stock decided at the beginning of 2011 to import less even if it meant that it would fail to meet its TOP obligations.

This year the injection period began very slowly for Hungarian storage facilities. In the second quarter only 750 million m³ of gas was injected into storage facilities, which was much less than last year or any previous years. This volume is too low, especially since according to futures oil price estimates, the oil indexed gas prices can go up from the current USD440/em³ to USD555/em³ by the beginning of the withdrawal period. The reason why they are less willing to store gas may be that a lot of gas was left in the storage facilities by the end of the previous withdrawal season. At the end of March 2011 the mobile gas level of commercial storage facilities was 1770 million m³, which is lower than the record of 2320 million last year, but it is still much higher than the usual level at the end of the withdrawal period.

Currently imports make up for much of the heating degree day of the months of the gas year compare to the heating degree day of the same months last year, as well as to the average of previous years.

The biggest difference upwards compared to consumption in the previous gas year was in September, October and December, and it can be seen that these months were much colder than the same periods last year. Similarly, the decline in consumption in January and April is explained by the heating degree day difference. So, while in the 2009/2010 gas year consumption peaked in January, in 2010/2011 the peak was in December.
cross-border gas transmission in Hungary. The figures below show the cross-border volume for the 2010/2011 gas year at the two main points of entry at the Ukrainian-Hungarian and Austrian-Hungarian borders. It can be seen that since gas was cheaper at our Western neighbour during the period, natural gas supply was uninterrupted - with a short break lasting a few days - from the Baumgarten natural gas hub throughout the year. At this border crossing the uninterruptible capacity is 12.138 million m³/day. In addition, FGSZ trades with interruptible capacity as well, which, as shown, many market players have already booked, and although it is not clear from the gas flow what percentage of it is from interruptible capacity usage rights, it is clear that between November 2010 and March 2011 interruptible capacity rights were used intensively. 7.26% of all annual gas imports from the west are like this, i.e. 12.138 million m³/day in addition to the uninterruptible capacity. This means that the total import from Baumgarten in the 2010/2011 gas year was 4.65 billion m³.

In comparison at the Ukrainian border during the same gas year only 45.8% of available uninterruptible capacities were booked by market players, and although capacity booking increased in the spring quarters, even then only 41% of booked capacities were actually used, and very irregularly too. Our total imports from the East in 2010/2011 were only 3.85 billion m³.

During the year the new tendency in the gas market, which started in 2009, continued, i.e. that the gas coming from the west is cheaper than oil indexed natural gas purchased from Russia with long-term import contracts. It is true that compared to the initial price difference, which could be as high as 50%, the difference between the oil indexed natural gas price and the price of spot natural gas from the west became much smaller, but the difference has lasted. Figure shows not only the oil indexed and Baumgarten spot prices (CEGH) but the mixed import price - based 60% on the oil indexed gas price and 40% on the Dutch energy exchange (ENDEX TTF Gas) - according to the decree regulating universal service prices as well. As can be seen, while in the second half of 2010 the difference between oil indexed and Austrian spot prices was HUF 26.3 m³ on average, in the first half of 2011 this difference decreased to HUF 12.6 m³. And if we compare the Austrian price with the mixed import price, the difference is merely HUF 6.7/m³. The difference between
the oil indexed import price and the CEGH prices started to go down from HUF 29/m³ in December 2010, i.e. 36% of the oil indexed price, then after bottoming out in March, it levelled off at around HUF 12-14/m³, i.e. at 15-17% of the oil indexed price at the end of the gas year.

The figure below shows our forecast for international and domestic gas prices in the next six months. The oil indexed gas price forecast is based on the futures oil price estimates, while Western European exchange prices are based on the futures issue prices of Dutch energy exchange. The figure shows that for futures prices the price difference between oil indexed and Western spot natural gas prices is likely to increase to HUF 27.2 m³ on average in the next six months.

**Figure 15** Past changes and forecast for international and domestic wholesale gas prices

* The 60:40 percent weighted average of oil indexed and ENDEX TTF exchange gas prices.

** The price difference between oil indexed and CEGH for past prices, and oil indexed and corresponding quarterly forward ENDEX TTF prices for future gas prices. The spread between spot prices at Dutch and Austrian exchanges has become very small recently. This is why futures ENDEX gas prices were considered relevant for the Austrian market as well.
The Baumgarten Saga

In our 2010/2 issue we analyzed the medium-term effects of global natural gas markets on Europe and Hungary. Our forecast that western spot market prices would remain lower than the long-term oil indexed contract prices for a few (2-3) years to come seems to have been correct. As our natural gas market price analysis in the Gas market developments section shows, eastern gas supply based on long-term contracts is still more expensive than the spot prices of hubs to the West of Hungary, and based on forward market prices this is expected to be so in the next six months as well.

It is still a question how and to what extent domestic consumer can benefit from the gas market developments in Western Europe, and what can stop these favourable trends from reaching Hungary.

As we pointed out in last year’s analysis, there are three main channels through which lower prices can reach consumers. First, if the natural gas supplier allocates the cross-border capacities required for cheaper imports, for which there is over-demand at the moment, by auction, the auction price will reflect the price difference between the two (the Austrian and the Hungarian) markets. This way the supplier can scoop off most of the margin between the two markets, and the extra profit can be passed from the supplier onto the consumers in the form of reduced tariffs. Another way consumers can get gas at lower prices is through increased competition, which may cause domestic wholesale gas prices to approach western gas prices. Finally, the third way to reduce prices would be through the direct regulation of prices, i.e. if the regulator set a regulated price for providers enforcing western prices and the obligation to sell (short call). This way, however, based on the EU regulatory framework, only consumers eligible for universal service could get cheaper natural gas, and its implementation jeopardizes the competitiveness of industrial consumers.

Of course, the above three options are connected. The way cross-border capacities are allocated determines how stiff gas market competition will be, since if several players have a chance to import cheaper western import gas through competitive auction, they too will be able to offer the competitive prices that the incumbent wholesalers offer, increasing the competition for consumers in the retail segment. Likewise, the allocation of cross-border capacities also limits the price regulation of universal service providers; and the only way to get incumbent service providers to incorporate reduced western prices in their end-user prices is if the regulation also ensures that the wholesalers who supply them from such sources also have access to these cross-border transmission capacities.

It can be seen that the capacity allocation at the entry point from Baumgarten determines how the lower price of natural gas from western imports can trickle down to consumers, and to what extent it will influence prices in Hungary. So, in order to address this issue we focus on the allocation of the HAG entry capacity starting in the 2011/2012 gas year, and look at the different stages of its development as well as the outcome.

HAG capacity allocation 2011/12

Our article from last year summarized how the original plans to hold partial capacity auctions
turned into first come first served type allocation in a non-competitive environment, which was partial to the incumbent wholesaler. At that time it seemed that the first capacity auction would be held in the 2012/13 gas year at the earliest. So it is quite a big change now that some part of the capacity in the now starting gas year 2011/12 - even if not a very big amount - was sold by FGSZ at an auction.

The first significant moment in the Baumgarten saga - which did not directly affect the current year - was the forecast of demand for long-term capacity booking, based on which FGSZ concluded that for the next three gas years of 2012/13, 2013/14 and 2014/15 - there would be over-demand for free capacities. So it was decided to hold a capacity auction for January 28. However, this auction was cancelled by the Hungarian Energy Office on 27 January, who argued that provisions of the Operational and Trade Code (ÜKSZ) applicable to long-term contracts were under review for amendment at the time, so no auction for the allocation of capacities could be held until the review was completed.

The next development that had an effect on the current year came unexpected. The 13/2011 decree issued by the National Development Ministry on 7 April, as amended by the 14/2011 decree provided natural gas from strategic storage facilities to E.On at cost price in order to supply gas to MVM and ESZ which in turn could supply district heating plants. At first glance it seemed that with this move the government wanted to stop rising prices for ESZ and district heating consumers in the short run, which could be done from cheap gas sources stored in strategic storage facilities. The amount that was „released“, i.e. the 285 million m³ of natural gas that could be withdrawn in the 2011/12 gas year, was split by the decree between E.On and MVM who got 30% and 70% respectively. On the other hand the decree also stated that the strategic storage should be filled up again, for which the two wholesalers could book annual capacities at the two entry points at the Austrian and Ukrainian borders. According to the 13/2011 decree the maximum total capacity they could book at the two borders was 137 million MJ/day (~4 million m³/day) for MVM and 68 million MJ/day (~2 million m³/day) for E.On, but the amendment 14/2011 issued a week later raised the capacity for E.On to 137 million MJ/day as well. The capacity fee payable was set as the regulated network usage fee. The fees payable by the two players are still different, but only because the current regulated fee for consumption supply for ESZ is lower than the regulated fee of other consumption supply capacity usage.

Of course both wholesalers wanted to book capacities at the entry point from Baumgarten to the maximum amount allowed. This meant that the decree which was primarily about the releasing of strategic storage also gave 2/3 of the cheap natural gas source to two players without competition. This means that if these two players use all their booked capacities, they can import a total of approximately 2.9 billion m³ of cheap natural gas during the current gas year. This is ten times the 285 million m³ of natural gas that was released by the decree. With the current transmission capacity the amount required to fill up strategic storage facilities can be imported by MVM, the company responsible for filling up most of the storage facility, alone in just 50 days, leaving 315 days when the two players can use their capacity right at their own will. If on the remaining days they use the import opportunity they have to supply cheaper gas to eligible consumers, the government will be able to keep gas and district heating prices low for whichever consumer segment they want. However, this means that other consumer segments will have to pay the price for this.

The third phase of the saga is the amendment to the Gas Energy Law (GET) entering into force on 1 July, 2011, which decreased the uninterruptible capacity that must be maintained short term, i.e. for less than a year, from 20% to 10% (70/A§), this way increasing the capacity that can be offered for one-year contract. As a result of this amendment long-term contract capacities at the Austrian entry point with the small amount that remained after the allocation of capacity by the above NFM decrees made up 4% of the total capacity, that is 16.9 million MJ/day (490 thousand m³/day), which was sold by the system operator at an auction.

The final moment ending the capacity allocation at the entry point from Baumgarten was therefore an auction for competitors. At the multiple rate auction held on 13 May, with an eight-to-one oversubscription the lowest bid that won capacity was 4.5 times the regulated price (paid by E.On and MVM). Although the bids have not been disclosed, winning bidders at the auction paid on average six times the regulated price, which means HUF 13.8/m³ capacity right fee if the capacity is used fully. This also shows that in May traders estimated this much difference in price between the Austrian and Hungarian markets for the 2011/2012 gas year. So the auction was a success, as some traders could get western gas at a fair competition, and natural gas transmission company FGSZ, the owner of the
transmission pipeline had at least HUF 1.2 billion extra revenue, which can in turn benefit consumers by reducing tariffs. This is how the annual allocation of the gas coming from the Baumgarten entry point changed for the gas year 2011/2012. Figure 16 shows the allocation of capacities, and the fees payable by rightholders.

Expected effects on consumers

On the whole the allocation of Austrian transmission capacities for the starting gas year shows a mixed picture. Most part of the capacity was allocated by administrative means, only a small portion of it was allocated through competition. Supplying consumers with natural gas from cheaper western import is quite complex, and the mechanisms required to do this are not yet in place. However, both allocation through auction and allocation by administrative means can benefit consumers, provided that they are followed by careful regulation.

Allocation by administrative means can ensure that lower prices „trickle down“, if the two preferred companies, MVM and E.ON make full use of the capacities they have booked, and they sell the natural gas they have acquired at a low price either as a result of price competition on the market or as a result of price regulation by an authority. However, a key market player – according to our sources it is MVM – does not seem to make use of the valuable capacities that have been allocated to it at the moment, or at least is not making as much use of it as it could. Gas import data gathered since 1 July, seem to support this, as they show that in July daily 132.5 million MJ (~3.88 million m³) was not used of the total uninterruptible capacity booked. This is about the same as the capacity booked by each of the „big two“. Since 25 July the amount of physical import has increased, but around 19% of uninterruptible capacities still remain unused. These import data should be compared to those of the same period last year, when the capacity right-holders were different companies. Figure 17 shows that with the new gas year and new capacity right-holders the use of interconnection capacities fell dramatically, which cannot be explained by the price difference between the two markets.

This means that some part of the gas import capacity allocated by administrative means and valued high at the auction will be wasted. What makes things even worse – and we find no reasonable explanation for – is that this capacity is not even used as interruptible capacity rights, i.e. only 2/3 of the maximum capacity of western natural

![Figure 16. The allocation of the uninterruptible capacity of the entry point from Baumgarten for the gas year 2011/2012](image)

![Figure 17. Turnover at the border entry point from Baumgarten in relation to booked uninterruptible capacities between 1 July, 2010 and 31 July, 2011](image)
gas that could be imported—and which is cheaper than natural gas coming from the East—is actually imported into Hungary (and at the end of July it was even less: 3/4). As a result average purchase prices will be higher than if we used all our import capacities. The loss, or unrealized profit, amounts to around HUF 1.4 billion in July, a calculation based on the difference between forward western prices booked in May—the month of capacity auction—for July and the estimated Hungarian wholesale price, which was HUF 12.7/m³. (However, if we calculate with Baumgarten spot prices for July, this price difference is even bigger, 20.9 Ft/m³.)

Having unused capacities that were allocated by administrative means is definitely bad for consumers, as cheaper western price will not get to them by direct price regulation: since the trader did not import the gas, its price cannot be regulated. And it cannot trickle down to consumers through the extra profit of FG SZ either, as the regulated tariff payable for them does not reflect the price difference between the Austrian and the Hungarian markets, and reselling them as interruptible capacities is not as profitable as if it had been auctioned as uninterruptible by the transmitter. Finally, the lower price cannot trickle down to consumers through competition between wholesalers either, as the gas did not even come into the country. Furthermore, since capacities were booked, and therefore the opportunity was taken from others, not using these capacities means sources have become limited. So in the end this will benefit those players who got their gas from more expensive sources.

This development is especially unfortunate since the objective of the NFM decrees was to keep gas prices low in certain consumer segments or not let gas prices increase as much. But the allocation of 2/3 of the import capacity rights at the Austrian border by administrative means, and the fact that some of that capacity have not been used will actually increase prices in the next gas year.

However, we still hope that the import capacities at the western border will be used fully, and (as a last resort) the controller will make it possible for other market players to use this part of the capacity, at least by providing them additional interruptible capacity rights, and average import prices will be closer to western prices. The best development in the HAG saga is that the allocation of cross border capacities through auction has started and it has been successful. With the 4% capacity sold through auction the transmitter realized great extra revenues, which may trickle down to consumers by the regulation of network usage fees. On the other hand more traders got capacity rights, which may facilitate competition for consumers between them, and the difference between retail prices and cost prices will be smaller.

**The impact of the shutdown of German nuclear power plants on Central European prices**

The nuclear energy policy of Germany has undergone a sea change, causing serious upheaval on European markets. Many studies have been written about the consequences of the phase-out, but most of them focused on German system security, and what effect the phase-out will have on wholesale electricity prices. What started out as a nearly 8.4 GW temporary reduction in generating capacity in March, and became a permanent reduction of 8.4 GW in June caused significant price increase in wholesale electricity futures prices in Hungary. Our study looks at the possible causes, and the mechanism of the price increase. First we draw up a supply curve reflecting German power plant capacities and the cost of generation, and show what consequences the reduction of nuclear power sources have had on the wholesale electricity price in Germany. After that we briefly look at how the decision about the shutdown affected Central European wholesale markets, and then look at its short-term effects on Germany and Hungary through the development of cross-border flows.

**The background of the shutdown and its consequences**

Three days after the Fukushima disaster, on March 14 the German government decided to close down the Krümmel power plant, a facility built before 1980, temporarily. Then on March 30 the government announced that the power plant would be shut down for good. The eight oldest power plants had a capacity of nearly 8.4 GW, or 40% of the total German nuclear power, and 6% of the total energy produced by German power plants. Since 2007 these capacities have made up only 5-7% of the total electricity generated and 22-23% of electricity generated by nuclear power plants. The reason is that three of the power plants in question have not been running for three years for strategic reasons: the government limited the operational life of nuclear power plants to 32 years in 2001. For this reason the energy generation of power plants that have been running for 30 years was reduced, and major maintenance operations
were started at these plants. This way some nuclear power blocks (Biblis A-B, Brunsbüttel, Isar I, Neckarwestheim I, Unterweser) that were 32 years old or older could still be running in 2010. Their owners were hoping that the government would expand the lifespan of these power plants, and it was worth the wait: in September 2010 nuclear power plants built before 1980 got an 8 year extension, while power plants that started their operations after 1980 were given a 14 year extension by the government of Germany. This is why only 5.3 GW of the 8.4 GW were phased out.

Markets reacted quickly to the news about the shutdown: electricity futures prices, the price of fuel used to generate electricity in fossil-fuel power plants offsetting the lost capacities and the price of carbon credits increased until mid-June. Its effects reached beyond the borders of Germany: price changes were reflected in electricity futures prices in the Czech Republic, Slovakia and Hungary. Interestingly, the price of 2012 futures base load products for the Hungarian market increased more than the prices of Czech, Slovak and German base load products: while the former cost EUR 6-6.2/MWh more in June than in February, the price of Hungarian futures base load products increased by EUR 7.4.¹ To find a logical explanation for this we have looked at two mechanisms – the power plant portfolio development in Germany and cross-border trade.

**Effect of the development of the power plant portfolio**

Wholesale prices in Hungary and Germany have been moving in tandem for years, meaning that any changes in the German wholesale price would be reflected in the Hungarian wholesale price. So if the power plant supply side changes – modifying the supply curve – can be used to explain the price increase in the German market, it would imply that the same could be used to explain any increase in price in Hungary as well. The direct effect of the closing down of power plants on production can be quantified by drawing a wholesale supply curve.

To determine the supply we set up a database of nuclear power blocks and their corresponding capacities, then we assigned the cost of one MWh electricity based on the type of fuel used and the age of nuclear power block. The marginal cost was calculated from the cost of fuel, the price of carbon credits, energy tax and operating costs. We have used February 2011 fuel prices to draw up the original supply curve, and June 2011 data to show the post moratorium situation. The generation of renewable energies has been adjusted by actual 2010 utilization data, and generally accepted rate of utilization. ² The supply curve after the moratorium only differs from the original one in that the power plants in question were simply left out, and June fuel and carbon credit prices were applied. In addition to the two supply curves figure 18 shows the peak system load and average system load as well, 80 and 55 GW respectively.

The price increase resulting from the development of the power plant portfolio was EUR 3.8-4.8/MWh. The price increase is mainly due to the development of factor prices, the capacity reduction in itself – assuming that fuel and carbon credit prices remain the same – would only cause EUR 1.5-1.8/MWh increase in prices. The assumption that the prices of raw materials had a strong effect seems to be supported by the fact

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¹ For more information on this see the section on Energy market developments.
² The utilization rate is 40% for hydropower, 20% for wind power, and 8% for photovoltaic capacities.
that March electricity spot prices did not increase significantly.

The development in the generation mix explains a EUR 3.8-4.8 increase, not the actual price increase which was EUR 6.2/7.4. Note that when we looked at the German supply side we modelled the country as an isolated market, without considering the country’s import opportunities. With the current transfer capacities international electricity trade can increase electricity demand by exporting 18 GW or decrease electricity demand by importing 15 GW for domestic electricity generators. The EUR 6.2 difference in wholesale price can occur if Germany utilizes 10 GW of its import capacity, which would reduce domestic demand. In June the net import was 2300 GWh at the borders of Germany, which is equal to 3.2 GW import capacity: this only increases the difference to EUR 4.88/MWh. This means that of the EUR 6-7 price increase we can provide an explanation for around EUR 4-5.

Below we will show how the effect of the shutdown of German nuclear power plants could reach Hungary through cross-border flows. This phenomenon can be understood if we look at the actual physical flows at the borders of Germany in the given year and compare it to those that took place at the borders of Hungary.

**Cross-border trade**

Germany is a key player in the electricity market of Central Europe. From an export-import perspective Germany is a net exporter – with the notable exception of the summer months of recent years. However, since the moratorium was imposed, the usual net imports that typically occurred in the summer months of previous years started as early as April-May, and imports in June were also significantly higher than imports for this month in previous years. While in the spring months of 2010 Germany mainly exported to neighbouring countries, in the same months of 2011 it had to import, and in those months when in previous years Germany imported electricity, import levels were higher this year than before. The increase in imports can only be explained by supply side factors. The electricity generated in Germany was 4-5 TWh lower in April and May, 2011 than in the previous year. The change in the balance of trade was not the same at every border. Import from France increased significantly over the first quarter, and instead of exporting to Denmark, Sweden and Austria, Germany had to import electricity from these countries in April and May. Interestingly, imports from the Czech Republic dropped. The export to Switzerland and the Netherlands also

![Figure 19](image1.png)

**Figure 19** The development of (net) electricity export and import in the first six months of 2009-2011, physical flows GWh

![Figure 20](image2.png)

**Figure 20** German exports and imports at German borders, physical flows between January and June 2011, GWh
In general exports were lower and imports were higher at most borders of the country. The increase in imports cannot be explained by the increased demand in the spring and summer months alone.

On the basis of the physical flows we can conclude that the German imports increased significantly as of the middle of March, while its exports dropped. The difference was especially high at the German-French and German-Swiss borders, while at the eastern borders of Germany, the borders relevant to Hungary it remained virtually the same as before.

This means that Germany offset its loss of energy from French imports. The majority of French generation capacities, nearly 50% come from nuclear power plants. French data about electricity generated by nuclear power plants show that since March 14 1-3 TWh more electricity was generated each month than in the same months of previous years.

The developments in Germany affect Hungary from the demand side when we experience real change at the borders of Hungary as well. However, based on physical flows no significant changes relevant to Hungary have occurred: the changes at the Austrian-German and Czech-German borders were insignificant, which implies that it is unlikely that the increased German demand took electricity supplies coming from Austria and the Czech Republic – transferred via Slovakia – which were originally meant for Hungary.

The developments in cross-border trade in the past six months seem to point to this conclusion. No changes have occurred at the Austrian-Hungarian and Slovakian-Hungarian borders since March; the only border where any change has taken place was the border with Croatia, where exports decreased by 100 GWh – a development that is also contrary to the price increase.

A plausible explanation for the increase in Hungarian wholesale prices would be that the price of some factors required for the generation of electricity has increased, making the generation of electricity more expensive. This way the price increase resulting from the phasing out of German power plants is not felt directly, through the depletion of certain import energy sources, but through factor prices.

Figure 21. The development of cross-border trade between January and June 2011, physical flows GWh

In this essay we have tried to explain the price increase that followed the closing down of 7+1 nuclear power plants in Germany. We have tried to find a plausible explanation for the price increase through two mechanisms, the development of the German power plant portfolio and cross-border trade. The development of the capacity mix and the resulting factor price increase provided a plausible explanation for a EUR 5 increase, while the price increase could not be explained by cross-border flows.

**Regulation changes in the natural gas market in 2010/2011**

There have been a lot of changes in legislation in the past gas year which have had and will have a profound effect on the workings of the natural gas market. This article gives a brief, factual overview of regulation changes affecting the 2010/2011 gas year. The first part of this article shows what changes have taken place in regulation, while the second part of the article is about the measures that are to help Magyar Villamos Művek Zrt. (Hungarian Power Companies Ltd., MVM) enter the natural gas market.

The motive behind the changes in price regulation is to exert stricter state control over end-user (universal service) prices in order to reduce price levels. This is a fundamental departure from the original idea prevalent at the time when universal service price regulation was introduced in the first part of the gas year 2009/2010, which aimed at reducing the involvement and control of the state...
and the regulatory authority, and let the market decide about suppliers’ prices. Before the general elections the price of natural gas – once again became a hot topic in politics, increasing the demand for stricter state control to reduce prices. After the current government took office at the beginning of 2010 a completely new approach was adopted. The setting of universal service prices which had been the responsibility of the Hungarian Energy Office until then was handed over to the minister in charge of energy (the Minister of National Development).1 Beyond its symbolic meaning this move had other implications as well: it legalized the accepted practice that the minister in charge of energy from time to time attempts to put pressure on the regulatory authority in charge of universal service prices. Once the power to set prices was transferred to the government the minister in charge imposed a price moratorium and as of Q3 of universal service natural gas prices were fixed at the level set in April 2010 – and approved by the regulatory authority.2

Simultaneously with the fixing of consumer prices measures were taken to reduce the purchase price of universal service providers, which had been approved by regulators. By the second half of 2010 the approved purchase prices of service providers were reduced by ad hoc measures. But for 2011 a new universal service price regulation replacing the moratorium – considered to be only a temporary measure to regulate prices to begin with – was set. The first measure taken by the minister was to set a maximum price of USD 8.95/GJ (USD 304/1000 m³) for natural gas offered for (obligatory) purchase to universal service providers for Q3 2010.3 In Q4 2010 – in addition to maintaining the moratorium – the price of natural gas offered for obligatory purchase was once again set using the oil-indexed formula, but a constant factor was also added to it. As a result the price for eastern imports became USD 60/1000 m³ lower than the import price set using the earlier formula.4

In December 2010 a new universal service regulation was implemented, which was to regulate prices once the price moratorium would be over. According to the new regulation the approved purchase price of universal service providers is based 40% on the price of the futures price of quarterly ENDEX TTF of the Dutch ENDEX energy exchange, and 60% on the oil-indexed eastern import pricing formula, which was used earlier (using ENDEX prices in the formula reduced the approved purchase price of service providers). The decree also changed the established practice in the pricing of natural gas extracted in Hungary and empowered the Minister of National Development to set prices. This decreased the wholesale price of natural gas extracted in Hungary – which had previously been tied to oil-indexed import prices – significantly. The decree granted universal service providers specified amounts of natural gas extracted in Hungary at reduced prices.5

The exchange rate of the euro and US dollar were fixed in the relevant decree6, and network usage fees, which had been a standard fee until then, were split into two categories: fee for consumers eligible for universal service and fee for the competitive market segment. In addition, the yield factor of the cost of capital of universal service was set at 4.5% in the whole industry, while for competitive market services it was set at 8.78% for natural gas transmission, 8.29% for natural gas distribution and 10.05% for natural gas storage.7

In January 2011, with the new regulatory system entering into force the price moratorium was lifted. For those consumers to whom universal service is provided and had a total annual consumption of over 1200 m³ of natural gas there was a price increase, while under 1200 m³/year consumption the price remained the same, while a support scheme for families was introduced. Theoretically no real changes – only minor adjustments – were made in the pricing practice and network usage fees. The network usage fees including distribution, transmission and storage for consumers eligible for universal service started

1 Law LV. of 2010 amending law XL. of 2008 on the supply of natural gas and law LXXVI. of 2007 on electric power.
2 Ministry of National Development (NFM) decree No. 3/2010 (VI.30.) on the cost based pricing of natural gas offered to universal service providers for purchase.
3 This replaced the oil-indexed formula set by the Ministry of Transport, Communication and Energy (KHEM) decree No. 19/2009 (IV.7.) on the pricing of natural gas universal service.
4 Ministry of National Development (NFM) decree No. 3/2010 (VI.30.) on the cost based pricing of natural gas offered to universal service providers for purchase.
6 Ministry of National Development (NFM) decree No.18/2010 NFM (XII.3.) amending ministerial decrees on natural gas regulations.
to decrease in the first quarter of 2011, so the suppliers could charge consumers the increased import natural gas prices to the extent of this decrease, and against the decreased revenues of network operators. In addition, it was necessary to reduce the offer price of natural gas extracted in Hungary in order to keep prices for end-users with consumption not exceeding 1200 m³/year at the level of the previous quarter. According to the amendment to the decree issued in July 2011 by the minister transmission fees increased by 7.5% and fees at entry and exit points increased by 15-40%, meaning that natural gas prices can be kept at the current level only with the further reduction of the offer price of natural gas extracted in Hungary.

The new government’s objective – in addition to keeping residential natural gas prices stable – was to increase state involvement as owner in the natural gas sector, which the government wanted to achieve by helping the Hungarian electric power company MVM enter the market. In the following we will show what amendments were introduced to increase the role of the government.

The National Energy Strategy adopted by the government says the following in the chapter entitled „Increasing the role of the state“: „Maintaining the coherence between legislative and economic conditions in itself is not a sufficient measure to ensure the common good and national interests effectively. In the electricity sector the state can exercise its control directly over the market through state-owned MVM Zrt. and Paks Nuclear Power Plant Zrt., and the same should be achieved in the natural gas and oil sector as well, especially with regard to the long-term natural gas agreement between Hungary and Russia expiring in 2015. This can be done by providing new permits to MVM Zrt., setting up a new natural gas trading company, or buying a controlling stake in a company having significant market share.”

Attempts by the state to increase its ownership can be seen in the natural gas trade and infrastructure segment as well. The first step taken that would help MVM enter the market was when the company got the licence for natural gas trade at the beginning of 2010. This was later followed by some statements implying that MVM would take part in the transmission, and then regulation changes facilitating this, and finally legislation changes required to continue commercial activities, which allowed for the purchasing of natural gas sources.

The increased role of the state in operating the infrastructure was confirmed by statements made by government officials as well as by international agreements and legislation changes that followed. The Hungarian government joined the Azerbaijan-Georgia-Romania Interconnection (AGRI) project in the autumn of 2010, a project many believe is merely a foreign affairs strategy tool, designating MVM as the partner company. A couple months later, at the beginning of 2011 the prime ministers of Slovakia and Hungary signed a deal to build a pipeline connecting Slovakian and Hungarian networks. After the above statements were made those parts of the gas energy law (GET) of Hungary that deal with the transmission of natural gas were amended. The amendments made it possible for more transmission pipeline owners as well as pipeline operators to enter the market (Note: system operation is still licensed to only one company), and the rules of issuing a licence were also slackened. Once the amended GET entered into force the National Powerline Company (OVIT Zrt.), a member of the MVM group applied for a licence, which was granted to OVIT within 6 days. So now OVIT has a transmission licence for the Hungarian section of the pipeline joining the Slovakian and Hungarian networks, the construction of which is to be completed by 2015, i.e. the natural gas pipeline between Balassagyarmat and Vecsés and the entry and exit points of the pipeline.

In addition to legislation paving the way for the changes in the ownership and operation of the infrastructure of natural gas transmission several amendments were made to help natural gas trade activities as well. In April 2011 the minister responsible for strategic natural gas reserves decided to release 285 million m³ natural gas from the reserves. According to the ministerial decree 200 million m³ of the natural gas taken from the reserves should be made available to district heating consumers to ensure „supply security” (i.e. to ensure that the price moratorium in district heating is maintained). In addition the decree also granted some cross-border transmission capacities to MVM – officially to fill up the strategic reserves with 200 million m³ natural gas, the amount given to district heating consumers – by the beginning
of the 2012/2013 gas year. The 4 million m³/day capacity allocated free of charge (making it possible to import 1.5 billion m³ natural gas) provided transmission capacities from the Austrian HAG and Ukrainian Beregdaróc border entries.

The amendment dated June 2011 also aims at increasing the natural gas trade activities of MVM since it is the organized electricity market licence holder owned by the system operator – and a member of the MVM group – that the amendment appoints to set up a natural gas exchange.

HUPX shall set up a natural gas exchange for the trading of natural gas, capacity and balancing gas by January 2013. Currently this trade activity takes place at the Daily Natural Gas and Capacity Market (NFKP) operated by the Földgázszállító Zrt. (Natural Gas Transmission Company, FGSZ), but the new amendment transfers this function of NFKP to the new organization. (With the starting of the new organized natural gas exchange the NFKP will cease to exist, but the amendment provides 10% share in the new organization for FGSZ.

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Law LIX. of 2011 amending law LVII. of 1990 on the remuneration of the members of parliament* (VI.10.)

**Abbreviations in the report**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>APX</td>
<td>Amsterdam Power Exchange</td>
</tr>
<tr>
<td>ARA</td>
<td>Amsterdam-Rotterdam-Antwerpen</td>
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<tr>
<td>ANRE</td>
<td>Autoritatea Națională de Reglementare în domeniul Energiei</td>
</tr>
<tr>
<td>CEGH</td>
<td>Central European Gas Hub</td>
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<tr>
<td>CER</td>
<td>Certified Emission Reduction</td>
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<tr>
<td>ECX</td>
<td>European Carbon Exchange</td>
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<tr>
<td>EEX</td>
<td>European Energy Exchange</td>
</tr>
<tr>
<td>ERÜ</td>
<td>Energetický regulační úřad</td>
</tr>
<tr>
<td>EUA</td>
<td>European Union Allowance</td>
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<tr>
<td>HAG</td>
<td>Hungary-Austria Gasline</td>
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<tr>
<td>HEO</td>
<td>Hungarian Energy Office</td>
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<tr>
<td>OPCOM</td>
<td>Operatorul Piete de Energie Electrica</td>
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<tr>
<td>OTE</td>
<td>Operátor trhu s elektřinou</td>
</tr>
<tr>
<td>PSE</td>
<td>Polskich Sieci Elektroenergetycznych</td>
</tr>
<tr>
<td>PXE</td>
<td>Power Exchange Central Europe</td>
</tr>
<tr>
<td>SEPS</td>
<td>Slovenská elektrizačná prenosová sústava</td>
</tr>
<tr>
<td>UCTE</td>
<td>Union for the Coordination of Transmission of Electricity</td>
</tr>
<tr>
<td>ÜKSZ</td>
<td>Operational and Trade Code</td>
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</table>
The effects of a stricter climate policy on economy of Hungary

For some years now there has been a heated debate in the European Union about whether it is enough to reduce emissions of greenhouse gases by 20% from their 1990 levels by 2020, or should they be reduced by 30%. With the publication of Roadmap 2050 the debate about the reduction target for GHGs by 2020 seemed to have died down, as Roadmap sets no target values to be achieved by 2020. However, it presents the idea of a 25% reduction target for the first time, also providing a possible scenario for increasing burdens placed on member states gradually.

The proposed 25% abatement was approved at the meeting of environment ministers of European Union member states, but Poland declared it would block the process, arguing that the European Committee’s decision is not in accordance with the principle of proportionality, and that emissions targets could be achieved through other, more cost-effective ways. Furthermore, Poland argued that favouring natural gas over coal goes against the non-discrimination principle of the European Union and is an intervention in the energy policy of member states. Note, that currently the only country blocking the process of European climate policy is Poland.

This study looks at what effects a stricter European Union GHG emission reduction policy would have on the economy of Hungary, i.e. what would happen if the reduction target to be achieved by 2020 were raised from 20% to 30% of 1990 levels. We look at the costs and the benefits of this in the various sectors of the economy. We also look at the 30% target proposed earlier, for this might be set as the official target in the EU, provided that an international treaty with developed countries outside the EU is concluded.

Current EU regulation categorizes the economy into two sectors: companies within the so called ETS1, where emissions levels are decided at EU level. These companies either buy emission credits equal to their emissions at auctions or credits are allocated to them free of charge. In other sectors of the economy (collectively refered to as non-ETS sectors) the national governments have to ensure that emissions targets are met. The carbon market of this segment is called ESD2 market, on which only governments are allowed to trade, i.e. they earn the revenues and incur the expenses.

ETS sector study findings

Although some major industrial and district heating power plants are in the ETS sector, our study focuses on the electricity sector which is responsible for 60% of emissions. We studied the effects of a higher carbon price using the regional model of Regional Centre for Energy Policy Research (REKK). Our basic assumption was that as of 2013 the majority of credits will be sold at auctions to the eligible companies, and the revenues will be distributed between the member states. Our key findings are the following:

- On the one hand, with a stricter EU target, the price of carbon credits would increase, but on the other hand the amount of credits that can be sold would decrease. This would mean that while the revenues of Hungary from carbon credits with the 20% target would be EUR 150-250 million per year, with the stricter target, revenues of the country could be as high as EUR 380-460 million, i.e. the state would earn HUF 60 billion extra in revenues.

- With a stricter target the natural gas consumption of power plants would increase, as other, more carbon-intensive coal-fired capacities would be reduced due to their increased carbon costs.

- A 30% reduction in GHG emissions would result in a significant increase in the wholesale price of electricity as well, which could be as high as 15%, increasing the total amount billed to electricity-consumers by EUR 450-500 million.

Non-ETS sector study findings

In our analysis we looked at the GHG emissions abatement scenarios by 2020 in four ETS sectors in detail, for other non-ETS sectors we made a simplified forecast. The four non-ETS sectors studied were transport, building energy (residential and public buildings), agriculture and waste management (municipal solid waste and sewage

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1 ETS: Emissions Trading System
2 ESD: Effort Sharing Decision
The evaluation of total economic effects

We have to look at the effects of the EU target on the two sectors (ETS and non-ETS) together as well in order to make valid conclusions. The figure below shows the aggregate values corresponding to the economic effects. Some of these values are monetized (figures in bold in the table), while other indices (employment, development of natural gas consumption) show the effects in physical volumes.

The above table shows the consequences of a stricter climate policy, which can be evaluated from various aspects. From the national economy aspect (the revenues and expenses of all players) we can see a breakeven in the balance. Increased expenses were balanced by credit revenues and energy savings. If we focused only on the „energy bill” of the national economy, we could see a zero balance: while the electricity bill increases the expenses of electricity-consumers by EUR 450-500 m, and in theory the savings on heating energy consumption compensate this (EUR 476 m). The picture becomes more complicated if we look at it from other aspects (budget, residential/service, or other energy consumers). Consumers fall into two categories. Lower expenses due to savings in heating energy partly compensate the increase in electric energy expenses in the residential and service sectors where the building energy system was renovated. For this group electricity costs increased by EUR 225-250 m, and investment-related expenses increased by EUR 340 m. Even if we take into consideration the benefits of the resulting lower energy consumption (EUR 476 m), the stricter climate policy would increase expenses by EUR 100-120 m. Note that building engineering investments savings only appear in the long run, which means that the balance for one specific year may not be relevant.

Greater GHG emissions abatement would “only” mean higher prices for other electricity consumers (especially industrial ones), which might result in lower employment rate and lower production. However, this will only happen if the price increase in electricity is higher for companies in Hungary than in other EU countries, or there is stiff competition with non-EU countries.
From the aspect of the central budget, a stricter commitment may seem a very favourable opportunity, as figures seem to prove that building energy schemes (costing EUR 226 million) can be covered from the selling of ETS credits (EUR 190-250 million) and ESD credits (EUR 341 million). These provide the financial resources that can compensate the increased costs of above mentioned consumer groups. Note that the positive effects of building energy programs on the budget (e.g. increased employment) are not even included. (The building energy scheme used for the purposes of our calculation would create 15-23 thousand new jobs.)

It is important to point out the uncertainties in the estimate. Of these, the most important is the development of ETS and ESD credit prices on the market. Our credit price projection is based on the PRIMES energy system model, which EU decisions are based on. If the credit price is lower than the price in the forecast, the calculated revenues will also be reduced of course. However, expenses will also be reduced, since with lower credit prices, the price of electricity will increase only at a lower rate, and the volume of GHG mitigation will also be lower. This means that supposedly the total (cost-benefit) ratio of greater emissions reduction is not sensitive to credit price changes. On the other hand, it can also be understood that in building energy, representing the most important non-ETS segment, it is not the carbon price that is the most important. Energy saving renovations show a strong correlation with energy prices. This means that even if revenues from selling ESD credits decrease, the effect of energy saving does not decrease.

In conclusion, we can say that a stricter EU climate policy may even be beneficial for Hungary, if increased electricity prices can be offset from credit revenues, while the energy consumption of the residential and tertiary sectors decrease. This latter creates a lot of jobs through the renovation of building energy systems. However, according to our calculations, a stricter climate policy would increase our natural gas consumption, which would further increase our dependence on natural gas sources.

### Table 1. The annual economic effects of increasing emission targets from 20% to 30% by 2020.

<table>
<thead>
<tr>
<th></th>
<th>Electricity sector</th>
<th>Non-ETS sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD/ETS carbon credits revenue, m€</td>
<td>190-250</td>
<td>341</td>
</tr>
<tr>
<td>Value of heating energy savings, m€</td>
<td>-</td>
<td>476</td>
</tr>
<tr>
<td>The increased cost of electricity consumers, m€</td>
<td>450–500*</td>
<td></td>
</tr>
<tr>
<td>Residential investment rate in building energy investments, m€</td>
<td>-</td>
<td>340</td>
</tr>
<tr>
<td>State investment rate in building energy investments, m€</td>
<td>-</td>
<td>226</td>
</tr>
<tr>
<td>Natural gas savings, million m³</td>
<td>(-2000)--(-2300)</td>
<td>718</td>
</tr>
<tr>
<td>Energy savings in the buildings sector, PJ</td>
<td>-</td>
<td>31.4</td>
</tr>
<tr>
<td>Employment increase, thousand people</td>
<td>-</td>
<td>15-23</td>
</tr>
</tbody>
</table>

*Costs are split between the ETS and non-ETS sectors*