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An Initial Investigation of the EU's 2020 Climate Change Package and Its Potential Domestic Impact

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SUMMARY

As the world's premiere supranational political and economic organization, the European Union's (EU's) symbolic power with respect to action on climate change and global warming is immense. In this regard, the EU's *2020 Climate Change Package*, introduced by the European Commission on January 23rd, 2008 represents an important and historical step in the direction of responding to the climate challenge and potentially even in the direction of renewing the original *Kyoto Protocol* signed by the EU and several other states in 1997.

At the same time, the EU's 2020 Climate Change Package represents a genuine challenge to the economic, political and social resources of individual EU member states. In particular, for the EU's less advanced new member states (NMSs), the 2020 Climate Change Package effectively raises the question whether the goals of economic convergence with the more advanced EU member states are compatible. Given the record of the more advanced EU member states under the Kyoto Protocol framework, very few of the old member states (OMSs) have so far been able to demonstrate any effective "decoupling" of economic growth and rising greenhouse gas (GHG) emissions. More distressing still, in seeming disregard of the EU's Kyoto Protocol, the former "cohesion" countries (Greece, Ireland, Portugal and Spain) along with Austria, Italy and the Netherlands have all dramatically increased their CO_2 and/or GHG emissions through 2005.

More troubling still, for the countries of Central and Eastern Europe, many individual features of the EU's 2020 Climate Change Package seem ill-suited to the goals of reversing climate change or fairly representing NMS interests. For one, the adoption of the new 2005 base year completely erases the previous good "performance" of the NMS and rewards those OMS noted above who failed to make real progress over the period 1990–2005. For another, the 2020 Climate Change Package ultimately disposes of one of the few mechanisms providing states with genuine incentives to make real progress in reducing GHG emissions outside the EU emission trading system (ETS) sector. Without more flexibility across EU ETS and non-ETS sectors and without more state-centred control of the distribution, sale and resale of unused carbon allowances, it is less likely that states will provide adequate incentives for reducing building and transport-related emissions. Such incentives are of particular interest to the NMS who currently exhibit far greater emission-reducing potential in this area. Finally, the guarantee of origin (GO) green certificate system currently proposed as a model for trade across states in renewable potential requires modification in order to ensure it will promote the development of a diverse range of renewable resources.

As an exercise in Community-based decision-making, the EU's 2020 Climate Change Package exhibits serious flaws. Principal among these is the failure to provide an adequate framework for real public policy consultation and discussion. The most serious policy transgression in this regard is the failure to provide full public disclosure of all the available data and calculations used to arrive at the proposed GHG emission and renewables targets and that also build the substance of the Commission's *Impact Assessments* of the 2020 Climate Change Package. Based on proprietary data and mathematical formulae, all background analysis and data remains unavailable to the public. Though such practices are not unheard of concerning high security measures and policy-

making, the decision not to make this data available for public scrutiny and discussion concerning the EU's 2020 Climate Change Package of policy proposals seriously undermines both the adequate and meaningful discussion of public policy strategies and goals, as well as the sufficient building of public consensus and legitimacy both at the member state level and in the European Union at large.

Such obstacles not-withstanding, this report endeavours to provide a thorough analysis of the EU's 2020 Climate Change Package. The general conclusion on the potential effectiveness of the EU policy package – in its current form – is not favourable. As suggested above, though the general intent of the European Commission's policy proposals is commendable, elements of the individual policy proposals still require significant adjustment before they will respond adequately to the needs and requirements of individual member states. In what follows, the main conclusions of this report are briefly outlined and summarized.

The *first main conclusion* concerns the shift from the 1990 to the 2005 base year. While the choice of the *2005 base year* is logical from the perspective of providing a sound and reliable statistical foundation from which to calculate progress in GHG emission reductions, this policy choice has the most negative impact on the NMS (except for Slovenia). Though many are inclined to pass of the "past performance" of the NMS as merely the result of the collapse of heavy industry, this observation ignores all the positive changes that have occurred in these countries since 1989. To enumerate a few of the more positive changes, the switch from coal to natural gas use for heating purposes, the conversion from coal to biomass in some power plants, the decommissioning of the least efficient coal-based power plants, the stronger regulation of new production plants, the introduction of some renewables and the regulation of large combustion plants – all of these changes have had a very positive impact on reducing GHG emissions in Hungary and elsewhere.

The decision to adopt the 2005 base year and base new GHG reduction targets on this number explicitly disadvantages the NMSs who have made the most progress in reducing GHG emissions over the period 1990–2005. Moreover, this decision inexplicably advantages those countries that have made the least progress over the same period, thereby rewarding them for policy failures during the first Kyoto period. Though this decision is, in part, influenced by international negotiations – other countries such as Japan are also promoting the 2005 base year as a means of making GHG emission reduction targets more credible – the European Union has thus far relied on an internal burden-sharing agreement across member states in order to meet a Community-level commitment to the international community. This framework provides ample room – even with the choice of a 2005 base year – for adjusting individual member state targets for previous performance. Countries that have a strong interest in economic convergence – and every right to achieve it – should presumably not be indiscriminately disadvantaged by the EU policy-making process.

The *second main conclusion* concerns the structure and framework of the EU's Emission Trading Scheme (ETS) and the potentially related goal of reducing energy use by 20 per cent by 2020. The EU's three principal tools for promoting the reduction of CO2 and GHG emissions in the 2020 Climate Change Package are a 20 per cent reduction in GHG emissions by 2020 – primarily through the EU emission trading system, reducing energy use by 20 per cent and increasing the share of renewable energy production by 20 per cent by 2020. The 2020 Climate Change Package also introduced a biofuels target of 10 per cent in the fuel-mix; however, this last target has come under increasing scrutiny and is not likely (at least in its current form) to survive the legislative process.

The general weakness in the EU model is its peculiar emphasis on electricity-generating and ETS sector firms. Though in some respects this focus has predominated across the Kyoto Protocol and post-Kyoto Protocol periods, two important changes will result from current policy efforts related to the 2020 Climate Change Package: First, the decision to require the auction of all carbon allowances going to electricity-generating installations imposes a far heavier burden on the electricity-generating sector. Second, the failure to reach a Kyoto II-type agreement will result in the fact that states no longer retain the right to sell unused carbon allowances. This right was (and still is) permitted under the original Kyoto Protocol. So-called AAUs (assigned amount units) or carbon allowances that remained unused by individual states could be sold on the international trading market. Without the ability to sell or redistribute AAUs, states will face dramatically reduced incentives to promote GHG-reductions outside the ETS sector. The result will be to focus – even more than was previously the case – most efforts at GHG emission reductions on electricity-generating firms and other ETS sector firms.

Due in part to these changes, two weak points in the EU's 2020 Climate Change Package can be easily identified. First, and potentially the most important among these, is the failure to extend the EU ETS system to include all aspects of national emissions (in particular buildings, transport, forestry and agriculture) and to allow for far greater flexibility across the EU ETS and non-ETS sectors. One reason for this sharp separation between ETS and non-ETS sectors has been the relative simplicity of accurately recording and verifying emissions. However, EU member states currently report relatively small margins of error in the reporting of total CO2 and GHG emissions. Thus, while under the original Kyoto Protocol "hot air" threatened to diminish carbon prices, under the 2013–2020 phase, such threats are greatly diminished. However, the potential failure to negotiate and sign a replacement to the Kyoto Protocol has unintentionally resulted in the loss of the option to sell unused carbon allowances resulting from emission reductions outside the ETS sector. Thus far, no mechanism has been established to replace it.

As argued herein, the EU's ETS framework should be conceived far more broadly than is currently the case. Ideally, the EU ETS system should encompass all segments of member state national economies, including not only current ETS sector firms, but also buildings, transport and ultimately forestry and agriculture. A number of EU-wide and also national-level observations provide the justification for this shift. At the domestic level, for one, due in no small part to the rapid rise of energy costs associated with the transition to a market economy, many or most of Hungary's ETS sector firms have already undertaken considerable investments in energy efficiency. For another, a very significant share of the potential for making energy saving investments lies in reducing building-related energy use. For the most part, however, this segment of energy-use lies outside the officially defined ETS sector. At the EU level, rather than imposing the brunt of the emission-reducing burden on electricity generation and ETS sector firms, such an extension of the policy structure would facilitate the promotion of those policy strategies most suited to individual countries.

The second weak point concerns the fact that the target of reducing energy use by 20 per cent by 2020 is not formally integrated into the 2020 Climate Change Package. The supporting legislation – in particular EU Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services – operates primarily as a guideline for member states to follow. The only way in which member states will be be required to bear the costs of failure to comply is presumably through sanctions imposed on the failure to reduce overall GHG emissions by the required 20 per cent between 2013 and 2020. Thus far however, the relevant sanction mechanism has not been identified. Moreover, past efforts to impose ceilings on rapidly growing EU member states have failed miserably, as witnessed by the case of Spain, Portugal and Ireland. Some states, for example Germany, have already called for a more rigorous inclusion of the 20 per cent energy efficiency goals into the 2020 Climate Change Package. Without renewed international cooperation on some type of Kyoto II agreement, the AAU-piece of the international trading scheme will go missing, EU member states will not be permitted to sell or re-distribute unused carbon allowances within or across borders and they will ultimately face far weaker incentives to promote emission reductions outside the ETS sector.

As a general strategy, the EU ETS system is well-designed to reduce GHG emissions, both from electricity generation and from ETS sector firms (*e.g.* cement, steel and other high emitter firms). The full auctioning of carbon allowances in the electricity-generating sector that will presumably be introduced from 2013–2020 should have a significant impact on raising the price of fossil fuel-based (including natural gas-based) electricity generation and reducing the price of renewable and nuclear power-based electricity generation (in relative terms). Moreover, these incentives will be strongest for those power plants (and ETS sector firms) that are the most carbon intensive: these firms will have to purchase the largest number of carbon allowances, thus creating powerful incentives to reduce emissions. Assuming there are no further collapses in carbon prices, this tool provides an excellent mechanism for promoting GHG emission reductions in the electricity-generating and ETS sectors.

The great weakness in the EU's 2020 Climate Change Package then is not the ETS sector model *per se*, but rather the failure of the policy package to provide an adequate mechanism for incentivizing states to promote emission reductions outside the ETS sector. Given that some 40-50 per cent of EU energy use (and thus GHG emissions) is related to building use, this fact cannot be ignored. Moreover, the more countries have successfully reduced the relative carbon intensity of electricity generation (Iceland or Sweden, for example, emit almost no $CO2$ or GHG's from electricity generation due either to their exclusive use of renewable or renewable and nuclear power-based or energy sources, respectively), the less important electricity generation becomes a policy target. The remaining targets (building energy use, transport, agriculture and other ETS sector firms) on the other hand become increasingly important. For Hungary, the relative carbon intensity of electricity generation (ignoring variation in the relative thermal efficiency of electricity generation) is lower than that the relative carbon intensity of natural gas use, suggesting that a focus on the reduction of natural gas use could have a significant impact on Hungary's total GHG output.

Though natural gas – which accounts for some 70-85 per cent of building-related energy use – is considered the "clean fuel" it is not well recognized that heat generation from natural gas can ultimately be more (sometimes significantly more) carbon intensive than the national average carbon intensity for electricity generation. Heating oil – similar in many of its uses to natural gas – is even more carbon intensive. Though much depends on the relative thermal efficiency of the heat-generating installation (power plant, industrial smelter, hot water heater or household furnace), significant reductions in natural gas use can likewise bring significant reductions in CO2 and GHG emissions. More importantly, where the relative carbon intensity of electricity generation is low (as for example in the Swedish and Icelandic cases), investments that reduce the use of natural gas (or heating oil) are potentially far more "efficient" (in terms of total GHG emission reductions) than further reductions of the relative carbon intensity of electricity generation. Though such a strategy is not meaningful for all countries or segments of the economy (Sweden, for example, uses almost no natural gas), for Hungary and other Central and East European countries, there is reportedly far more room for emission-reducing investments in the non-ETS sector, related in particular to natural gas use.

The EU's emphasis on electricity-generation and ETS sector firms distracts attention from the role of building-related natural gas use. Moreover, while the EU ETS model, in part, functions by raising the price of electricity, thereby sending appropriate signals to consumers to reduce energy use, no such signal is generated with respect to building-related natural gas use. While ETS sector firms that are significant natural gas users will of course feel the pinch from the carbon price-setting mechanism, no such "carbon price" is established for building-related natural gas use. Why this is so is not immediately obvious. One simple answer, of course, is that it is more difficult to impose a carbon price on natural gas in the same way it is imposed on electricity: natural gas distributors are not high GHG emitters and thus cannot easily be required to purchase carbon allowances. But the consequence of the current EU policy structure creates perverse incentives to ignore building-related natural gas use and focus primarily on the reduction of electricity use. This fact represents a potentially serious policy failure and requires attention.

The EU's 2020 Climate Change Package, at least in its current form, thus fails to promote truly efficient energy saving investments, in particular where the non-ETS sector and building-related energy use is concerned. In order to rectify this situation, the EU would need to introduce a model that (re-)incentivizes states to actively promote energy efficiency and GHG emission reductions in the non-ETS sector. This report argues that the best way to do this is to give EU member states the right to sell and redistribute unused carbon allowances from the non-ETS sector to other member states or ETS sector firms. Currently this is only permitted for unused carbon allowances in the ETS sector. This model has few disadvantages and many advantages. For one, it would permit states to reap potential benefits from promoting energy efficiency investments in building energy use. For another, it would allow states to pursue energy saving investments where these are most efficient (*i.e.* in the ETS or the non-ETS sector or both).

The increased flexibility resulting from this type of arrangement would permit states to re-allocate some carbon allowances from the non-ETS to the ETS sector where this is meaningful. While many ETS sector firms compete fiercely in the international marketplace, thus limiting their potential to undertake GHG reducing investments (except where these result in significant cost-savings), the non-ETS sector for the most part is not subject to the same competitive requirements and thus is better able to assume at least a share of the costs of reducing GHG emissions. Moreover, to the extent that the room for energy saving is greater in the non-ETS sector, such investments are likely to have a significant cost-saving impact on this sector as well.

The failure of the EU policy strategy to promote energy saving investments in the non-ETS sector – in particular without the conclusion of any Kyoto-II type agreement – is likely to have a negative impact on the overall efficiency of the EU's 2020 Climate Change Package. Not only will it then promote energy saving investments where these are potentially less advantageous, it will further create negative incentives for states to promote energy saving investments in the non-ETS sector and lead to potential diversions or misallocations of funds toward the ETS sector. More importantly however, as long as electricity generation remains the principal target of GHG-reducing policy in the EU – and in particular as long as there is no carbon price on natural gas – a significant share of EU GHG emissions will be neglected. Given the relative degree of energy dependence resulting from natural gas use – and not only in Hungary – this strategy makes little sense.

The *third main conclusion* concerns the promotion of a GO (guarantee of origin) green certificate system and the introduction of a new renewables target in the EU's 2020 Climate Change Package. This report argues that, as currently conceived, the EU's GO green certificate system will fail to promote the required diversity of renewable resources and will favour the development of the cheapest renewable resources wind power and biomass – in particular in Hungary. Oddly, the Commission's proposal for a GO green certificate system is at odds with its own recommendations appearing in document SEC(2008)57 – *The Support of Electricity from Renewable Energy Sources* – which argues in favour of the feed-in tariff systems currently in place in a good number of EU member states.

On the other hand, a large number of EU member states strongly support the introduction of some kind of certificate trading system at the EU level. If successful, it could ultimately have the impact of favouring renewables investments in those locations where they are likely to have the greatest potential return. Thus the emphasis in this report is not on rejecting the green certificate system *per se*, but rather on providing a model that would facilitate both the goals of certificate trading at the EU level and of preserving the potential to promote a diversity of renewable resources both at the national and EU-levels. In this regard, the feed-in tariffs systems present in Germany and other EU member states provide a good foundation upon which to build. This report thus proposes a GO green certificate system that allow for the sale of green certificates based on varying amounts of energy produced by different types of renewable energy sources. For example, a far smaller share of electricity produced by solar power could be required for the right to sell one green certificate, while a much larger share of wind power would be required.

Several important advantages emerge from the model proposed in this report. For one, no initial interim periods (such as the 2-year periods currently proposed) would be required for firms or private individuals to be able to sell green certificates. Second, and perhaps most importantly, such a model would neither threaten national level incentive systems (the principal concern of states using feed-in tariffs systems), nor would it require that states themselves adopt any one specific national-level strategy for promoting renewables. States would remain free to choose their own national-level incentive systems and these could diverge from the EU level model wherever necessary. Thus this model would allow individual countries to promote tidal, concentrated solar or other forms of electricity/energy production wherever necessary.

With respect to the renewable resource targets proposed by the European Commission, this report argues that 13 per cent (or even more than this) is not an insurmountable target for Hungary. For the most part, this report argues that the principal obstacles to achieving this share of renewable energy production result from national level strategies that are not optimal and potentially also from the overly "bundled" structure of state ownership and close ties to privately-owned power producers in the Hungarian energy sector. Thus this report argues that Hungary should adopt a far more differentiated feed-in tariff system similar to the one used in Germany and recently exported with great success to a number of other EU member states (*e.g.* Portugal and Spain). This system currently amounts to a very small share of energy costs but has been by far the most successful at promoting renewable energy use across a wide range of renewable energy resources. Moreover, a differentiated feed-in tariff system offers the opportunity to favour the use of some renewable resources over others where this is potentially beneficial.

For Hungary and most other European countries, the particular advantage of a more differentiated feed-in tariff is the opportunity to develop not only wind power, but also a more diverse range of renewable energy sources. There are many reasons why this should be done: For one, the need to balance wind with more constant forms of base load power raises important questions about how this can be done with renewable energy sources. Though not so frequently discussed, several forms of renewable energy can and do create viable sources of base load power: geothermal power plants, hydropower, tidal power and biomass power plants. While tidal energy is not available in Hungary, all three of the remaining sources of base power are available. Given the cost differences across these technologies however, a comparatively undifferentiated feed-in tariff structure will favour the cheapest sources of renewable energy – in particular wind and biomass – thereby ignoring Hungary's geothermal and hydropower advantages. For another, differentiated feed-in tariffs can be used to promote reduced demand on the energy grid by favouring more decentralized forms of energy production – *e.g.* local, municipal or building-based electricity generation based in particular on solar or wind energy. Differentiated feed-in tariffs are an effective and comparatively inexpensive way of promoting such investments and rapidly pushing individual consumers to shift to more renewable energy use and generation.

Additional problems emerge however with the current structure of the energy sector in Hungary. These domestic issues also need to be resolved in order to make it possible for the EU's policy strategy to have a positive impact on Hungarian GHG emissions. As supported by a recent conclusion from the European Commission, the energy sector in Hungary exhibits overly strong ties between private power producers and the principal state-owned managers of the electrical network (MVM and MAVIR). In this regard, the combination of the European energy sector liberalization and the EU's 2020 Climate Change Package offer an explicit opportunity to rethink the overly monopolistic structure of much of the Hungarian electricity (and ultimately natural gas) sector(s) and to unbundle all or most of the existing binding relationships across firms.

In particular, this report argues that Hungary should immediately divest from the existing long term power purchasing agreements (so-called LTAs or PPAs) between the Hungarian-owned MVM and privately-owned power producers.

The principal reason for this arises from the structure of the EU's ETS system, which essentially imposes a price or tax on carbon-based emissions. This system will *only* push power producers to reduce GHG emissions under specific conditions: *as long as* the resulting increased price of production has a potential effect on the profit margins of individual power producers. Under the existing LTAs, however, this is not possible for the following reasons: 1) the LTAs guarantee explicit 8 per cent profit margins to those power producers who still enjoy such contracts, and 2) there is inadequate competition or energy market liberalization in Hungary to allow for adequate price competition across power producers. In fact, the LTAs operate as direct disincentives to a further opening of energy sector competition, since in any reduction in the competitiveness of the existing domestic LTA producers must be compensated by the MVM (or the state budget).

Without the dissolution of the remaining LTAs in Hungary and the further liberalization of the Hungarian energy sector, the effect of the EU's ETS system is likely to be substantially dissipated. The reason is that the imposition of a carbon price on fossil fuel-based energy generation will either be passed along to consumers or absorbed by the state but will have no notable effect on the bottom line of the more carbon intensive power producers. Unless the explicit profit guarantees in the LTAs are effectively neutralized and greater competition in the Hungarian energy sector is both permitted and facilitated with appropriate improvements in the existing infrastructure to facilitate access, the EU ETS system will have only a marginal impact on GHG emissions.

The structure of the Hungarian energy sector further imposes potential limitations on the adoption of renewable energy sources. The principal reason for this is the fact that increases in the share of energy supply threaten to reduce prices. Limiting the growth of energy supply to the grid (whether from new renewable energy sources or other fossil fuel sources) keeps the price of electricity high and reduces the potential cost of the LTAs to the MVM (and thus the state). Though the 330 MW ceiling imposed on wind power in Hungary by the MVM is hotly contested, this is at least one possible explanation for why there is such resistance to further raising the ceiling.

Finally, this report further argues that the state ownership "bundle" of the MVM, MAVIR and Paks is not conducive to stronger support for renewable energy use in Hungary. The principal reason for this is that the link of state-ownership is likely to favour the purchase of energy from Paks rather than from other energy sources – in particular once (and if) the LTAs are dissolved. This is likely to be true for a number of reasons. For one, other than renewable energy producers, Paks is the only state-owned carbon-free energy producer in Hungary. For another, the EU's ETS agreement only permits the sale of unused carbon allowances in the ETS sector. There is a danger that – due to potentially strong ties between state-owned firms – the principal way to do this will be to draw as much energy as possible from Paks and only secondarily from the remaining renewable energy producers. This report recommends that Hungary use the EU's energy liberalization initiative as an opportunity to further "unbundle" the Hungarian energy sector and reduce the potential for collusion across energy generation and transmission networks. Furthermore, 100 per cent purchase guarantee for all renewable energy should be immediately introduced.

The *fourth and final conclusion* of this report concerns the economic impact of the EU's 2020 Climate Change Package. This is clearly the most complicated and difficult part of the package to assess – in particular because so much of the final outcome depends entirely upon which model or models are finally agreed. As has been argued throughout, just how favourable and efficient the EU policy strategy is depends quite dramatically on whether or not many of the individual elements of the policy package are adequately amended. How Hungary and other states will react to the range of issues raised in this report and whether the resulting consensus will support the changes recommended herein is unknown. In many senses, far greater economic risks to the economy stem from such factors as changing oil and other energy sector prices, budgetary imbalances associated in particular with election-year spending, austerity policies linked to the drive for Economic and Monetary Union (EMU), mismanagement of the electricity market and the threat to economic stability arising from the turmoil in world credit markets.

In general, this report argues that there are potentially significant and positive multiplier effects resulting from expenditure on the promotion of energy efficiency and the greater adoption of renewable energy. These arise in particular from the improved productivity resulting from more efficient energy use, from the positive impact on jobs resulting from additional public and private sector expenditure and from the incentives for the development of new technologies created by increased expenditure on renewables and energy efficiency.

This does not mean that the overall impact of adjustment to the EU's 2020 Climate Change Package will be neutral. In particular, this report suggests that if the current EU policy strategy is adopted without amendment, the costs could be substantially higher and the benefits of the EU policy strategy significantly less in terms of actual GHG emission reductions. The disadvantages of the current model include, in particular, a less efficient focus on the ETS sector and the failure to adequately promote potentially advantageous reductions in natural gas and building-related energy use more generally in Hungary and elsewhere. Moreover, the failure to pursue adequate energy sector liberalization and to create the appropriate setting for increased renewable energy use in Hungary is further likely to have a particularly negative impact on energy costs in the Hungarian economy. Without appropriate changes in the structure of the Hungarian energy sector, the EU ETS system is likely to lead to further cost increases and to a generally negative impact on international competitiveness – both with respect to firms in the ETS sector and beyond.

That said, a number of observations can also be made about the potential impact of the EU's 2020 Climate Change Package on ETS sector firms. For one, if the base year issue is not resolved, it is likely to have a negative impact on the Hungarian position. For another, the lack of flexibility across the ETS and non-ETS sectors has direct implications for the share of the burden placed on ETS sector firms. Given that these firms face direct competition in the international marketplace, any inefficiency in the allocation and structuring of GHG targets will weigh most heavily on these firms. For another, all of the arguments made so far about building-energy use in general and the reduction of natural gas use in particular also apply to the ETS sector. However, it remains unclear to what extent the ETS sector model takes such emissions into account (this requires some verification). In any event, to the extent that such emissions are not included in the ETS sector model, firms are potentially constrained to focus on energy and emission-saving investments that may not be the most efficient.

In particular for those ETS sector firms that encounter strong international competition, several concerns result from the changes being introduced with the EU's 2020 Climate Change Package: rising energy (in particular electricity) costs, rising direct costs related to requirement to purchase a gradually increasing share of carbon credits, limited room for further energy saving investments and the threat of carbon leakage. In particular, full-auctioning in the electricity-generating sector is likely to have a significant impact on the already significantly high cost of electricity in Hungary. Further, the ETS sector requirement to purchase 20 per cent (increased annually by 1.74 per cent after 2013) of required the carbon allowances represents a significant shift that will further heighten competition with firms beyond the borders of the EU ETS. Given that many or most firms in the ETS sector have already undertaken considerable energy saving investments and are already comparatively energy efficient, remaining room for improvement is limited. This means that many firms will be required purchase the required carbon allowances, leading to a substantial increase in costs. In the long run, particularly in that part of the ETS sector that fiercely competes in the international marketplace, the potential for carbon leakage (the relocation of GHG-producing plants and firms beyond the borders of the EU) is a serious concern.

In closing, many things could be done to improve the quality and overall efficiency of the EU's 2020 Climate Change Package. Considering the timeframe within which the EU member states – in particular in order to be prepared for the Copenhagen negotiations on a renewed Kyoto-II type agreement in November 2009 – the EU and its member states must act quickly. If they succeed, the EU's 2020 Climate Change Package could indeed ultimately represent a significant step in the direction of combating global climate change. However, a significant amount of work and a considerable number of amendments to the current policy package are required before it will represent an optimal solution for Hungary and many other EU member states.

INTRODUCTION*

This report responds to a request from the Hungarian Ministry of the Economy and Transport (GKM – now the Ministry of Transport, Telecommunication and Energy, KHEM and the Ministry of National Development and Economy, NFGM) for a review and critique of the European Commission's *2020 Climate Change Package* introduced on January 23rd, 2008 and its related Impact Assessments. As is well known, the EU's climate change package calls for a 20 per cent reduction in GHG emissions by 2020 (30 per cent with the support of a renewed international *Kyoto Protocol* extending until 2020). In addition, the climate package calls for a 20 per cent increase in the use of renewable energy sources and a 20 per cent reduction in energy use (potentially from increased energy efficiency). Finally, the climate package calls for a 10 per cent increase in the use of biofuels.

As the world's premiere supranational political and economic organization, the European Union's (EU's) symbolic power with respect to action on climate change and global warming is immense. In this regard, the 2020 Climate Change Package represents an important and historical step in the direction of responding to the climate challenge and potentially even in the direction of renewing the original Kyoto Protocol signed by the EU and several other states in 1997.

At the same time, the EU's 2020 Climate Change Package represents a genuine challenge to the economic, political and social resources of individual EU member states. In particular, for the EU's less advanced new member states, the 2020 Climate Change Package effectively raises the question whether the goals of economic convergence with the more advanced EU member states are compatible. Given the record of the more advanced EU member states under the Kyoto Protocol framework, very few of the old member states have so far been able to demonstrate any effective "decoupling" of economic growth and rising greenhouse gas emissions. More distressing still, in seeming disregard of the EU's Kyoto Protocol, the former "cohesion" countries (Greece, Ireland, Portugal and Spain) along with Austria, Italy and the Netherlands have all dramatically increased their CO2 and/or GHG emissions through 2005.

More troubling still, for the countries of Central and Eastern Europe, many individual features of the EU's 2020 Climate Change Package seem ill-suited to the goals of achieving real climate change or a fair representation of NMS interests. For one, the adoption of the new 2005 base year completely erases the previous good "performance" of the NMS and rewards those OMS noted above who failed to make real progress over the period 1990–2005. For another, the 2020 Climate Change Package ultimately disposes of one of the few mechanisms providing states with genuine incentives to make real progress in reducing GHG emissions outside the EU ETS sector. Without more flexibility across EU ETS and non-ETS sectors and without more state-centred control of the distribution, sale and resale of unused carbon allowances, it is less likely that states will provide adequate incentives for reducing building and transport-related emissions. Such incentives are of particular interest to the NMS who currently exhibit far greater emission-reducing potential in this area. Finally, the guarantee of origin green certificate system currently proposed as a model for trade across

* This is a revised and mildly updated English version of Ellison and Hugyecz (2008). The authors would like to thank Tamás Fleischer for helpful comments.

states in renewable potential requires modification in order to ensure it will promote the development of a diverse range of renewable resources.

As an exercise in Community-based decision-making, the EU's 2020 Climate Change Package exhibits serious flaws. Principal among these is the failure to provide an adequate framework for real public policy consultation and discussion. The most serious policy transgression in this regard is the failure to provide full public disclosure of all the available data and calculations used to arrive at the proposed GHG emission and renewables targets and that also build the substance of the Commission's Impact Assessments of the 2020 Climate Change Package. Based on proprietary data and mathematical formulae, all background analysis and data remains unavailable to the public. Though such practices are not unheard of concerning high security measures and policy-making, the decision not to make this data available for public scrutiny and discussion concerning the EU's 2020 Climate Change Package of policy proposals seriously undermines both the adequate and meaningful discussion of public policy strategies and goals, as well as the sufficient building of public consensus and legitimacy both at the member state level and in the European Union at large.

That we are standing on the edge of an important historical moment and decision requires little debate. While the time to act is clearly now, attention should be paid to previous difficulties in reversing EU legislation once initiated (*e.g.* the CAP). Member states (in the Council of Ministers) and the European Parliament must agree on the energy and climate change package by March 2009 so that Europe is in a strong position at global climate change negotiations in Copenhagen in November 2009. The decisions made in the next year will set EU member states on a specific development path that will be difficult to alter in future years. The element of potential irreversibility in the climate change policy strategies to be adopted by December 2008 should be carefully weighed while considering the different options present in the EU's future climate change strategy.

The analysis of the EU's 2020 Climate Change Package is organized as follows. The first section addresses the basic background of climate change policy in the European Union. The second section discusses problems of transparency and methodology in the European Commission's assessments of the impact of EU policy. The third section provides a general discussion of some features of the policy package. The fourth section addresses the choice of the 2005 base year. The fifth section provides an extensive analysis of the problems arising from the rigid division between ETS and non-ETS sectors. This section discusses in particular the issue of energy efficiency and the failure of the EU policy guidelines to promote investment in one of the highest potential GHG reduction sectors. Further, a model is proposed for addressing this problem and integrating the EU ETS and non-ETS sectors. The sixth section discusses problems associated with the GO green certificate proposal, proposes an alternative model and provides a discussion of the EU's 13 per cent RES target for Hungary. The seventh section discusses the economic impact of the 2020 Climate Change Package and the eighth section provides a set of domestic level policy choices that could potentially lead to a more advantageous outcome. The final section concludes.

1) General Background: Global Warming and Climate Change Policy in the EU

Politics lie at the centre of the allocation process for CO2/GHG (carbon dioxide and greenhouse gas) reduction targets and quotas in the European Union (EU). Though most presumably agree that EU allocation of CO2/GHG reduction targets and quotas should both equalize (burden-sharing principle) and minimize the impact across individual states, the process by which state-by-state quotas are allocated is anything but transparent. Moreover, judging by the response of 8 of the 10 new member states to the CO2/GHG quotas allocated for the 2008–2012 period,[1] or by the response of most of the NMS to the current country-level GHG emission reduction targets proposed as part of the European Union's 2020 Climate Change Package introduced on January 23, 2008, the process appears tilted toward the interests of the old member states. The veracity of this claim aside, the relative lack of transparency in the decision-making process begs the question both of whose interests are most strongly represented in the final burden-sharing and quota allocation and why this is so.

In the political science and international relations literature, transboundary pollution is frequently seen as a force capable of overpowering the self-interested behaviour of states and encouraging them to cooperate by adopting more international and universal policy goals. Taking such events as the Kyoto Protocol and the Bali discussions as examples, the evidence that states can find common terms for cooperation and agreement is at best mixed. While global warming and climate change have contributed to the assembly of nation states in single locations to discuss and negotiate environmental treaties – as witnessed in particular by the signing of formal agreements on CO2 emission reductions (the Kyoto Protocol) – the degree of real success in reducing CO2/GHG output is slim.

In the EU, political cooperation at the supranational level was supposed to enable states to share their burdens and find "community" solutions to common problems. Though possessed of an institutional structure that – at least in principle – makes it possible to identify "Community" goals and formulate common "Community" solutions, there is a long literature suggesting most EU decision-making continues to be dominated by the interests of states and intergovernmental principles.[2]

The EU's approach to climate change policy encompasses both the signing of the Kyoto Protocol in 1997 and the current 2020 Climate Change Package introduced by the European Commission on January 23rd, 2008. Though the initial policy goals agreed in the Kyoto Protocol represent a significant reversal of world trends – in contrast to most other major countries of the world, the EU agreed to reduce CO2 emissions by 8 per cent by 2012 – overall EU performance in meeting these targets has to-date been lackluster. On paper, the EU will manage to meet its Kyoto requirements due to the Eastern Enlargement, not state performance.

Diverging from the general parameters of the Kyoto Protocol, EU member states chose to "more fairly" redistribute the burden of CO2 emissions reductions across countries. Performance however bears no resemblance to initial targets

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[1] Several of the NMS's have filed claims against the European Commission before the European Court of Justice.

[2] The current author has also contributed (in particular Ellison, 2006a). Much of the relevant competing literature is also cited in that article. See also Moravcsik (1999, 1997, 1991).

Table 1
Change in CO2 and GHG Output

	CO2			GHG		Kyoto
	1990/1980	2005/1990	2005/1980	2005/1990	2005/BY	Target (2012)
Bulgaria	-19.2	-31.2	-44.4	-40.0	-47.2	-8.0
Czech Republic		-62.7		-25.8		-8.0
Estonia		-26.1		-50.9		-8.0
Hungary	-20.0	-9.3	-27.5	-18.2	-30.7	-8.0
Latvia		-33.6		-58.9		-8.0
Lithuania		-38.6		-54.1		-6.0
Poland	-21.8	-13.9	-32.7	-17.8	-32.0	-6.0
Romania	2.5	-42.9	-41.5	-38.2	-45.6	-8.0
Slovakia		-12.6		-33.6		-8.0
Slovenia		33.7		10.0	0.4	-8.0
Austria	-4.7	43.0	36.3	18.0		-13.0
Belgium	-9.3	9.5	-0.7	-1.3		-7.5
Denmark	-15.8	-9.9	-24.2	-7.0		-21.0
Finland	-5.7	-1.5	-7.1	-2.5		0.0
France	-24.0	13.3	-13.9	-1.6		0.0
Germany	-6.9	-13.9	-19.8	-18.4		-21.0
Greece	47.3	28.2	88.8	26.6		25.0
Ireland	15.7	71.0	97.8	26.3		13.0
Italy	12.7	12.9	27.3	12.1		-6.5
Luxembourg	-8.9	17.1	6.6	0.4		-28.0
Netherlands	7.6	30.7	40.7	-0.4		-6.0
Portugal	85.6	48.6	175.8	42.8		27.0
Spain	15.0	64.5	89.1	53.3		15.0
Sweden	-38.2	9.3	-32.5	-7.3		4.0
UK	-1.6	-3.6	-5.1	-14.8		-12.5
Cyprus	70.9	76.6	201.7	63.7		0.0
Malta	74.3	27.4	122.1	54.5		0.0
EU 15	-3.4	18.0	14.1	-1.5		8
EU 27		6.5		-8.0	-10.7	

Sources: own calculation base on CO2 from Eurostat's online database and reported UNFCC GHG data. GHG data for Cyprus and Malta is from Eurostat's online database.

(see *Table 1* for data on individual country performance).[3] As illustrated by *Figures 1* and *2*, the lion's share of successful emission reductions occurred in the CEEC's. Western EU member states managed to reduce total GHG emissions by only 2 per cent (when individually selected base years are used for this calculation) and 1.5 per cent when the originally proposed 1990 base year is used. These figures disguise the more favourable performance of a few Western countries – in particular in Denmark and Sweden and to some extent Germany and the UK. In general however, the CEE NMS's – by joining the EU – make it possible for the EU as a whole to appear to meet its Kyoto requirements. Put differently, a set of countries representing 20.8 per cent of the EU population are responsible for

[3] A few countries were able to deviate from the 1990 base year by choosing base years in the mid- to late 1980's in which CO2 and other GHG emissions were highest. Thus for example, Bulgaria, Hungary, Poland, Romania and Slovenia benefited significantly from this choice of base year (see also Ellison, 2006b:21). The effect of deviation in the choice of base year is reflected in the numbers in the last column of Table I.

Figure 1
Total Mitigation Across the EU-15

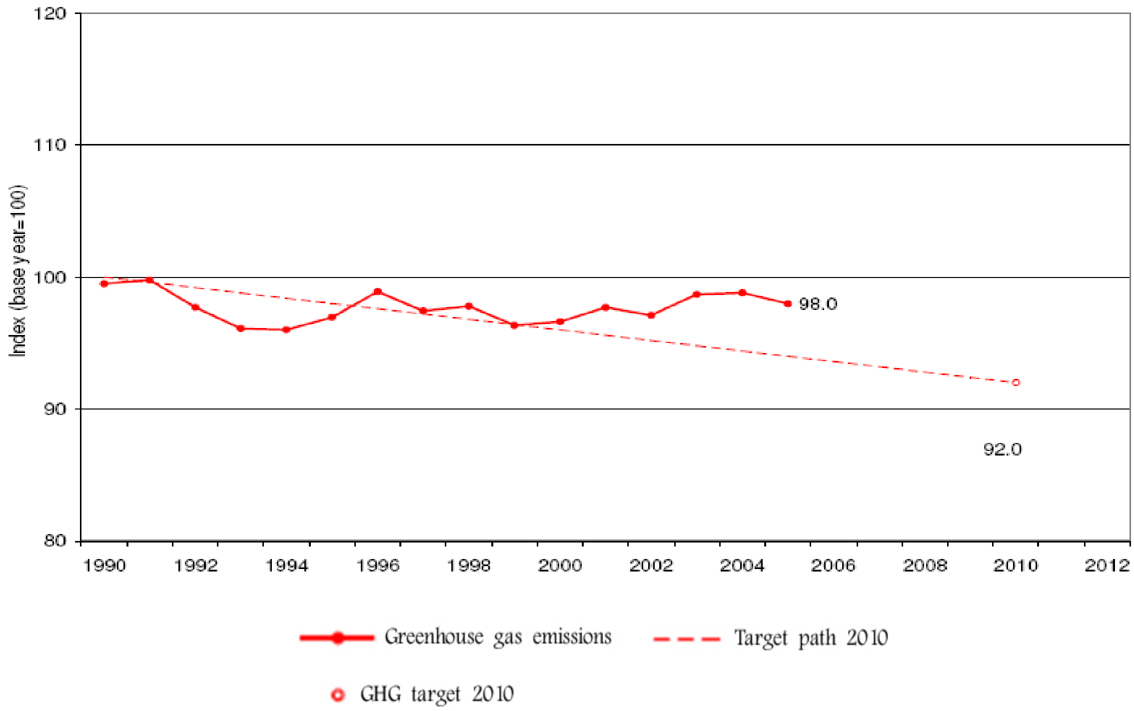
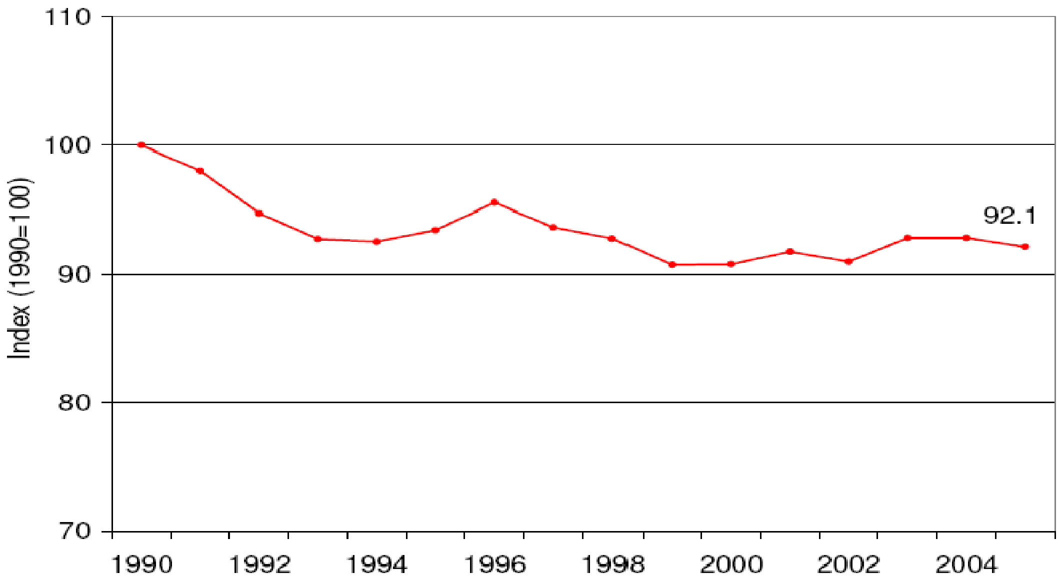


Figure 2
Total Mitigation Across the EU-27



Source: graphs taken from the European Environment Agency UNFCC reports (EEA, 2007:10–11).

approximately 75 per cent of EU CO2 emission reductions over the period 1990–2005 – about 3.6 times the relative contribution of the OMS's.

How things will look in the next round up to 2020 is anybody's guess. Negotiations on the EU's 2020 Climate Change Package are in their initial stages. The conclusion of the EU's March 2007 Summit called for the following features: (1) a 20 per cent reduction in GHG emissions by 2020 (30 per cent with the support of a renewed international Kyoto Protocol extending until 2020), (2) a 20 per cent increase in the share of renewable energy sources, (3) a 20 per cent reduction in energy use (potentially from increased energy efficiency) and (4) a 10 per cent increase in the share of biofuels in the general fuel mix.

Member states and representatives in the European Parliament must agree on the energy and climate change package by March 2009 to place Europe in a strong bargaining position at global climate change negotiations in Copenhagen in November 2009. The forthcoming decisions will set EU member states on a development path that will be difficult to alter in the years that follow. The element of potential irreversibility in these climate change policy strategies will weigh heavily on the individual countries and representatives in the European Parliament choosing from among the different options present in the EU's future climate change strategy and additional strategies.

The notion that there is one country position driving the 2020 climate change policy package forward is perhaps untenable. However, countries certainly strive to put their mark on the 2020 policy package. For one, Germany was the principal proponent of the general policy package, pushing for it during the German presidency in 2007 and achieving approval of the initial guidelines sent on to the European Commission in March 2007. The UK also appears to be playing a significant role behind the scenes. With the most fully developed country position on the policy package, in particular on the proposed guarantee of origin green certificate system (COM[2008] 19 final), the UK appears to have exercised considerable influence.[4] Moreover, individual countries repeatedly promote positions that reflect relative comparative advantages in energy production, energy security concerns or heavy investment in either energy intensive industries or services (*e.g.* the UK, France and other countries on the nuclear path, the CEEC's on heavy industry, the UK and Poland on carbon capture and storage (CCS), *etc.*).

A number of the details of individual 2020 policy package proposals and their related Impact Assessments however were arrived at in relative obscurity. Transparency is in fact a serious problem where the definition of emissions' targets and the assessment of their impact are concerned. As just one example, the mathematical models and data used for the Commission's Impact Assessment (SEC[2008]85-V2) are proprietary and not readily available either to the academic research community or to policy makers and their respective staff members in the member states. This fact alone raises serious questions about the overall transparency of the consultation and negotiation process. Further, it raises serious questions about the viability of social scientific assessment of EU climate change policy. If the academic and research apparatus behind individual member state governments are unable to replicate the models used for making EU-wide policy proposals and assessing impact, they cannot seriously test, critique or other-

[4] In this regard, previous Commission papers on renewable strategies (see "The Support of Electricity from Renewable Energy Sources", SEC[2008]57 and the precursor to this study COM[2005]627) strongly favoured the feed-in tariff systems employed to great success in countries like Germany and Spain.

wise assess the proposed policy models in a meaningful manner.

Why such methods and strategies have been chosen by the European Commission remains unexplained both to the scientific and to the political Community in the member states. Such a situation must presumably be considered unacceptable and member state governments are likely to demand resolution of this problem. Though there is little time left to make these important decisions, they should presumably be a product of "Community" policy in order for them to be supported, approved and to garner adequate legitimacy. In this regard the PRIMES and other models (GEM-E3, POLES and PACE, developed at the E^3M lab at the National Technical University of Athens and elsewhere)[5] and their use in the setting of burden sharing targets and impact assessments requires re-evaluation. Despite the increasing predominance of scientific values based on transparency and reproducibility, the calculations and formulae used are not publically available, nor is the database upon which they are calculated. Equally troubling, no competing research currently offers alternative models and predictions on viable and meaningful EU ETS and many other targets.

Hungary (and other new member states) filed a legal case against the European Commission (T-221/07) before the European Court of Justice on June 26th, 2007 regarding the firm-level CO2 emission quotas approved for 2008–2012. The Hungarian case argues the Commission failed to consider all available and relevant information – in particular the data and information Hungary filed with the Commission in its National Allocation Plan – and further that the Commission contravened the principles of transparency by failing to share the data and calculations used to arrive at the quotas established for the 2008–2012 period (see *e.g.* the Official Journal, 25th, 2007).

Though the problem of transparency makes it difficult to divine the structure of interests behind various elements of the Commission's climate change policy package, the remainder of this paper presents at least three ways in which powerful divisions across less and more advanced states pervade the structure of the current 2020 Climate Change Package. The following section addresses the general problem of economic growth and climate change in the EU. The second section discusses the problem of the choice of base year that arose with the current distribution of the burden for reducing GHG emissions by the year 2020. Finally, the third section discusses the strategy for reducing emissions across ETS sectors.

1.1. Economic Growth *vs.* Climate Change

Climate change and economic growth challenges were heightened by the March 2007 European Council Summit commitment to reduce GHG emissions by 20 per cent by the year 2020. While the new member states achieved quite dramatic reductions in their levels of CO2 output between the years 1990–2004 (due to the decline of heavy industry and many other factors),[6] most old member states exhibit remarkably little success. (See Table 1) Though Germany is perhaps the most successful OMS, a large share of CO2 reductions are the result of economic change in the former East Germany. Countries such as Sweden and Denmark, the UK and to some extent Germany, on the

[5] The POLES model, for example, was developed at the Institute for the Politics and Economics of Energy at the CNRS (Centre National de Recherche Scientifique) in France.

[6] The range of potential explanatory variables here is extensive. For a detailed discussion, see Ellison (2006b).

other hand, deserve high marks for their relative ability to reduce CO2 and GHG emissions in the face of competing concerns and a comparatively high level of economic development.[7]

The principal question for the less developed economies is whether the more advanced EU member states are able to lead by example rather than by command. By their own admission, ten EU OMS will achieve their individual Kyoto targets primarily by writing Joint Implementation (JI) and Clean Development Mechanism (CDM) investments off national-level emissions targets. Only one of the NMS (Slovenia) has chosen to take advantage of these measures in order to meet its target (EEA, 2006:30). While the European ETS facilitates environmentally beneficial investments in those countries and plants that represent the greatest potential return on investment (both in potential emission reductions and the related carbon credits) there are likewise two distinct disadvantages to this system. One is the postponing of real change in emission behaviour, in particular in the more advanced states. The second is the failure to demonstrate, by power of example, that future economic growth is compatible with reduced emissions.

Without significant GHG reductions in the more advanced states, the pursuit of both economic growth and CO2/GHG emission reductions may prove incompatible. Due in particular to the starting points of individual countries, Kyoto imposed "ceilings" are likely to impinge upon growth and convergence interests. As evident in Table I above, the less advanced Western states (Greece, Ireland, Italy, Portugal and Spain) continued their rapid growth in CO2/GHG emissions on into the 1990–2005 period and show no sign of slowing. *Table 2* represents a rough thumbnail estimate

Table 2
2012 and 2020 Growth Constraints?

Business as usual estimates (Million tons)		2012 Targets		2020 Targets	
	Estimated BAU GHG output (at 2005 avg EU GDP)	Kyoto target GHG output (2012)	Percent over Kyoto target	2020 Target (ETS+non-ETS, option 4)	Percent over 2020 target
Bulgaria	225.047	97.433	131 %	77.261	191 %
Romania	487.851	211.428	131 %	175.277	178 %
Poland	866.101	502.680	72 %	421.892	105 %
Latvia	24.241	16.320	49 %	12.587	93 %
Lithuania	47.223	32.912	43 %	25.329	86 %
Slovakia	90.731	60.120	51 %	50.353	80 %
Estonia	37.989	30.152	26 %	21.586	76 %
Hungary	138.610	103.081	34 %	82.825	67 %
Portugal	129.328	74.078	75 %	78.917	64 %
Greece	177.456	137.082	29 %	117.652	51 %
CzR	213.787	171.530	25 %	145.040	47 %
Slovenia	26.976	18.678	44 %	19.536	38 %
Italy	623.751	471.752	32 %	468.419	33 %
Spain	486.630	276.287	76 %	370.319	31 %

Source: Own calculations. EU average per capita GDP from Eurostat online database. Individual country Kyoto targets are available in EEA (2007). 2020 targets are based on "option 4" in the Impact Assessment (SEC[2008]85-V2:58-9). The formula for estimating BAU GHG output is: $(pcGDP_{EU\text{-}avg}/pcGDP_{2005})*GHG_{2005}$ = est. GHG output.

[7] The positive performance of some countries is marred by the role of nuclear power (France), or Germany's re-unification with East Germany (despite considerable progress in the introduction of renewables).

of GHG output levels given convergence on the 2005 EU average GDP (countries already above the average EU GDP have been excluded from the table).[8] Column I calculates the GHG output this would represent based on 2005 levels and columns III and V compare this number to the 2012 and 2020 targets. Significant growth constraints arise, suggesting the ability of the more advanced states to reduce CO2 emissions relative to GDP presumably defines future limits to economic growth – along with EU climate policy – for both more and less advanced states.

The European Commission's 2008–2012 strategy for setting emissions targets provides a meaningful example. The Commission required NMSs to scale back their national allocation plans for the period 2008–20012 by between 12 and 55 per cent (*Table 3*). For the OMSs, some 90 per cent of CO2 quotas were accepted. As indicated above, eight of the ten NMSs have initiated legal challenges. Seen against the backdrop of quite substantial NMS GHG and/or CO2 emissions reductions between 1990 and the present, these Commission imposed ceilings are diffi-

Table 3
Comparison of 2006 Verified Emissions with Proposed and Approved Emission Caps Imposed by the European Commission for 2008–2012

Country	Verified CO2 Emissions 2006 (Million Tons)	Proposed Cap 2008–2012	Approved Cap 2008–2012	Percent Difference Between 2006 Verified Emissions and 2008–2012 Approved Cap (%)	Percent Difference Between Proposed and Approved 2008–2012 Caps (%)
Cyprus	5.30	7.1	5.48	3.4	-23.0
Czech Republic	83.60	101.9	86.80	3.8	-14.8
Estonia	12.40	24.6	12.70	2.4	-48.4
Hungary	25.40	30.8	26.90	5.9	-12.7
Latvia	2.90	7.7	3.43	18.3	-55.5
Lithuania	6.70	16.6	8.80	31.3	-47.0
Malta	1.98	3.0	2.10	6.1	-29.1
Poland	215.00	284.6	208.50	-3.0	-26.7
Slovakia	27.20	41.3	30.90	13.6	-25.2
Slovenia	8.84	8.3	8.30	-6.1	0.0
Bulgaria		67.6	42.30		
Romania		95.7	75.90		
Austria	32.40	32.8	30.70	-5.2	-6.4
Belgium	60.00	63.3	58.50	-2.5	-7.6
Denmark	34.20	24.5	22.00	-35.7	-10.2
Finland	45.00	39.6	37.60	-16.4	-5.1
France	128.80	132.8	132.80	3.1	0.0
Germany	488.00	482.0	453.10	-7.2	-6.0
Greece	70.00	75.5	69.10	-1.3	-8.5
Ireland	21.70	22.6	22.30	2.8	-1.3
Italy	227.00	209.0	195.80	-13.7	-6.3
Luxembourg	2.70	4.0	2.70	0.0	-31.6
Netherlands	87.10	90.4	85.80	-1.5	-5.1
Portugal	33.10	37.9	34.30	3.6	-9.5
Spain	185.90	152.7	152.30	-18.1	-0.3
Sweden	21.90	25.2	22.80	4.1	-9.5
UK	284.96	246.2	246.20	-13.6	0.0

Source: own calculations based on annual verified emissions data and targets from the European Commission.

cult to understand. Moreover, given the lackluster performance of most of the OMSs reducing GHG and CO2 emissions, many of the Commission goals often appear unattainable. Despite the objections raised by the NMSs, compared to emissions levels in 2006, the Commission's cap approvals mostly require significant reductions from the OMSs and permit increases in CO2 emissions in the NMSs. Based on these numbers, the NMSs' position on CO2 caps is not immediately obvious.

Two basic problems however lurk behind the scenes. For one, CEE requests for higher CO2 quotas are in part the result of rapid economic growth and increasing economic investment. In Hungary, for example, 2006 verified emissions did not include the future emissions of some 5 plants scheduled to come online in 2007.[9] Thus over the period 2008-2012, firms in Hungary – in order to create room for new installations – must find ways to reduce emissions. Though little public discussion has emerged, quota allocation decisions have an effect on future locational investment decisions and act as potential barriers to entry. In this regard, overly restrictive quotas may limit future investment and hinder convergence-related economic growth.

The second basic problem concerns the following two key questions: 1) whether the more advanced states are genuinely able to achieve real CO2 emissions reductions, and 2) whether or not emissions' targets will act as constraints on future economic growth. While the European Commission proscribes CO2 reduction targets through the mechanism of the ETS and national allocation plans, little is really known about the limits of potential future CO2 reductions. As noted above, the more advanced states – apart a few notable exceptions – have not achieved significant emissions reductions.

[9] Interview with representative from the Hungarian Ministry of the Environment.

2) General Evaluation Problems

2.1. Transparency and Methodology

Transparency is a serious problem in the EU's 2020 Climate Change Package. The mathematical models and data used for the assessment are proprietary and not readily available either to the academic research community or to policy makers and their respective staff members in the member states. This fact alone raises serious questions about the overall transparency of the consultation and negotiation process. Moreover, it further raises serious questions about the viability of social scientific assessment of climate change policy in the Community. If the academic and research apparatus behind individual member state governments are unable to replicate the models used for making EU-wide policy proposals, they cannot seriously test, critique or otherwise assess the proposed policy models in a meaningful manner. Why such methods and strategies have been chosen by the European Commission remains unexplained both to the scientific and to the political community in the member states. Such a situation must be considered unacceptable and member state governments should demand that this situation be immediately resolved. There is simply too little time left in which to make such important decisions. They must be a product of "Community" policy in order for them to be both supported and approved.

The PRIMES and other models (GEM-E3, POLES and PACE, developed at the E^{3}M lab at the National Technical University of Athens and elsewhere)[10] and their use in Commission estimations for burden sharing quotas. Despite the increasing predominance of scientific values based on transparency and reproducibility, the calculations and precise formulae used by the Commission Assessment are not public information, nor is the database of independent indicators upon which they are calculated. By way of example, the US-based National Science Foundation (NSF) requires all recipients of its federal research grants to 'promptly submit significant research findings for publication', and to "share with other researchers, at no more than incremental cost and within a reasonable time, the data, samples, physical collections and other supporting materials created or gathered in the course of the work."[11] That an even higher standard has not been set for all research and data used for the development and formulation of EU public policy is a cause for great concern. Equally troubling, no competing research currently offers alternative models and predictions on viable EU ETS, GHG reduction and renewables targets.

Hungary has itself (as well as several other new member states) filed a legal case (#T-221/07) filed before the European Court of Justice on June 26th, 2007 against the European Commission regarding the firm-level CO2 emission quotas approved for 2008–2012. The Hungarian case argues the Commission failed to consider all available and relevant information – in particular the data and information filed with the Commission in Hungary's National Allocation Plan – and further that the Commission contravened the principles of transparency by failing to share the data and calculations used to arrive at the quotas established for the 2008–2012 period (see *e.g.* the Official Journal, Augustus 25th, 2007).

Much of the methodology behind the EU's 2020 Climate Change Package and in particular the related *Impact Assessments* is subject to strong criticism. Perhaps most importantly, almost none of the models presented in the assessments and their presented output provide evidence of what happens with variation in the estimation of individual parameters. For example, most models used in the assessments attempt to predict the overall impact on economic growth. Many of them depend for example on a specific price for the sale of carbon credits. Yet virtually no attention is paid in the assessments to what happens as a result of potential variation in the price of carbon credits (as is well known, these have varied dramatically over the short period of time they have been traded).

The second major methodological flaw is related to the failure to provide the relevant parameter estimates and related confidence intervals (beta coefficients, standard errors, possible measures of robustness or goodness of fit). All of these elements of scientific empirical or econometric analysis generally help provide evidence of the overall degree of reliability, transparency, and robustness of the calculations. But absolutely none of these elements are reported in the analysis. Such facts are surprising. If this were an academic exercise destined for the scientific or broader academic community, it would be rejected outright.

Such methodological flaws are particularly curious since many of the parameters and their likely future values are shrouded in considerable uncertainty: carbon pricing values, variation in types of planned energy capacity, the

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[10] The POLES model, for example, was developed at the Institute for the Politics and Economics of Energy at the CNRS (Centre National de Recherche Scientifique) in France.

[11] *NSF General Grant Conditions* (2007: p. 27).

role of future energy prices and the impact of modelling CO2 output based solely on energy sector emissions (not the broader measure of GHG output or the impact of additional economic sectors) or the impact of CCS (an as yet untested and undemonstrated technology).[12]

One possible comparison here is with the November 2007 IPCC Synthesis Report. Despite flaws of its own, as an academic exercise it is far more flexible in its overall analysis and gives a far more accurate assessment of the overall degree of uncertainty in the calculations and estimates provided. Moreover, the analysis is forthright about the presence of uncertainty and the difficulties in attempting to model climate change.

The European community's assessment of the potential impact of climate change policy would benefit dramatically from such openness and transparency in analyzing the impact of potential policy orientations. The provision of individual parameters and in particular beta coefficients and standard errors would both introduce a more credible element to the potential range of outcomes related to various strategy goals, as well as giving a more accurate sense of the impact of individual policy features. The explicit advantage of reporting parameters such as beta coefficients and their related standard errors is that policy makers can then more accurately estimate the impact of variation in expenditure on individual features of the policy toolkit as well as figure out which features of the policy toolkit are likely to have the greatest impact at the least cost.

[12] In the Impact Assessment (SEC(2008)85-V2), carbon pricing is discussed on p. 101, variation in types of planned energy capacity and the use of CCS on p. 32, and CO2 output from the energy sector on p. 33.

2.2. Awkward Assumptions and Omissions

A number of awkward assumptions and/or exclusions in the Impact Assessments are likely to play a significant role in estimates of the final impact on GDP. Some of these are positive, so their inclusion will likely have a positive impact on estimates of the GDP impact of the EU's climate change policy. However, not all of these elements will have a positive impact. Variation, for example, in the price of carbon credits can have either a positive or a negative impact on mitigation depending on the direction of price movements.

Some of the excluded features are surprising. In particular, the failure to model the potential contribution from re- or a-forestation (LULUCF, SEC[2008] 85-V2:36-7) appears a significant gap in the assessments. Some researchers have noted that in Europe between 1990 and 2005 the planting of forests in the EU27 absorbed an additional 11 per cent of continental CO2 emissions.[13] Though SEC(2008)85-V2, for example, notes that re- and a-forestation are increasingly being regulated in the context of climate mitigation (p. 37), the exclusion of this policy element from the Assessment may artificially raise the estimate of overall GDP costs. The important point here is that the failure to include the planting of forests in the green certificate model or in the EU ETS models is likely to have a significant impact on the cost and ease of climate mitigation attempts. Presumably, the planting of forest represents a relatively low-cost strategy for mitigating climate change and is one potential element in the overall mitigation strategy that should presumably be promoted. Further, as noted in the previous sec-

[13] Saikku, Rautiainen and Kauppi (2008).

tion, modelling accurately the impact of relevant policy features and providing parameter estimates and standard error terms for their estimated impact provides policy makers with valuable information which is unfortunately lacking from this report.

The failure to model (and thus consider) the role and mitigation efforts related to either CO_2 or GHG emissions from the broad economy is a second significant exclusion. SEC(2008)85-V2, for example, only tracks CO_2 emissions from the power sector (p. 33). Though it is true that CO_2 emissions typically track GHG emissions (there is a very strong correlation between the two), there is nonetheless occasional country-to-country variation. In the Netherlands, for example, in recent years CO_2 and GHG emissions have moved in opposite directions. In the Central and East European countries, the share of CO_2 and GHG emissions from other high emission sectors, agriculture, transport and the public sector are presumably higher than in other countries. The second crucial problem here is that countries with higher shares of energy intensive industries (or larger service sectors) will also tend to have higher (lower) power sector CO_2 emissions. Country-to-country variation on these dimensions is likely to have a potentially large impact on output related to the "macroeconomic and welfare implications" of allocation targets, carbon values, the role of JI/CDM mechanisms and auctioning revenues (the features covered by the GEM-E3 model (p. 33).

For the Central and East European countries, the share of CO_2 and GHG emissions from sources other than the power producing sector is likely to be large compared to other member state economies. And this is presumably even more strongly the case as the EU's Large Combustion Plant Directive has progressively contributed to lower SO_2 and CO_2 output in the power producing sector. Though it is possible to calculate these numbers, this alone would not be sufficient to calculate the impact on the model outcomes without knowing the required formulae and having access to the data. Why variation in CO_2 and GHG output related to the above-noted dimensions is not explored in the GEM-E3 model and thus elements of SEC(2008)85-V2 is at best curious. This is all the more true since relatively reliable data on country-wide CO_2 and GHG output is clearly available. No justification for this strategy is provided in the Assessment.

Working through the elements of the Impact Assessments and attempting to figure out what the overall impact is likely to be without access either to the mathematical formulae or the data used is complex. For one, what other features are potentially missing from the formulae used in the assessments is not shared with the reader, nor does the reader have sufficient information on the individual parameters and standard error terms. For another, estimates of the impact of this variable are likewise related to the choice of policy model.

In general, the failure to consider additional sources of CO_2 and GHG output is likely to have a negative impact on the side of mitigation costs. However, this analysis is complicated by the fact that mitigation costs differ dramatically both across the different sources of CO_2 and GHG emissions and across the different types of methods explored to accomplish their mitigation. For example, variation in how mitigation is pursued and how it is compensated in the EU ETS and non-ETS sectors and how carbon allowances are allocated across these two sectors will have a large and significant effect on cost outcomes. In Hungary, greatly improving energy efficiency, for example, in the public sector is likely to be a lost cost carbon mitigation strategy compared to similar efforts in EU ETS sectors. But whether this can be cost efficiently pursued depends also on how the potential allocation of allowances and the auctioning of credits is structured in and across the ETS and non-ETS sectors. The following section will address potential impacts of variation in policy models.

The final point raised in this section concerns the modelling of energy prices and their potential impact on mitigation costs. Two basic criticisms of the assumptions and data output relative to energy costs are addressed. First, SEC(2008)85-V2 appears internally contradictory about the impact of rising energy costs on overall mitigation costs. Page 41 points out that energy costs are expected to rise more rapidly in the less advanced EU member states (in particular in Central and Eastern Europe) and page 42 notes that the overall mitigation impact of rising energy costs will be higher in Hungary and other Central and East European states. On the other hand, section 5.3.9.5 argues that the impact of rapidly rising energy costs (*e.g.* rapidly rising oil costs, to which we should also add the possibility of rapidly rising natural gas costs due to its relevance to the case of Hungary) will 'reduce the costs of meeting the RES and GHG targets' (p. 81). Though we are lacking the parameter estimates on these variables, there appears to be a general contradiction between these two observations.

The second criticism regarding energy prices concerns the amount of the potential rise in energy costs, inadequate modelling of this potential rise across diverse energy sources and their ultimate impact on mitigation costs. Hungarian wholesale electricity costs have risen quite rapidly in recent years. Moreover, some critics[14] argue that argue that wholesale electricity costs in Hungary have risen as much as 60 per cent over the past year alone. In the recent past oil costs have likewise risen far beyond expectations (though insufficient detail is provided on this point in the Impact Assessment) and the level of Hungarian dependence on natural gas threatens to result in similar outcomes. To the extent it is accurate to say energy costs have risen and are rising more rapidly than predicted in the assessment, at least two important conclusions can be drawn. For one, energy costs in Hungary are likely to continue rising and continuously increasing energy dependence (in particular with respect to oil and natural gas) means that energy costs will presumably only continue to rise in the future. For another and perhaps more importantly, it is logical to conclude that the persistent rise in current and future energy costs in Hungary (and elsewhere) will only continue to make a shift to renewables and increasing energy efficiency more and more attractive. Such observations should encourage a rapid shift away from fossil fuels toward renewable energy sources.[15]

3) The Legislative Package

Of the various elements of the policy palette proposed as part of the EU's 2020 Climate Change Package, this analysis focuses primarily only on discussion of the distribution of burden-sharing across countries (and in par-

[14] See, for example, recent comments from the CEO of E.ON in Hungary and a representative from the Chamber of Commerce. These comments were made at a recent energy conference "Az energiapiaci liberalizáció hazai tapasztalatai" (Feb. 22nd, 2008). Cite info on participant comments…

[15] An important contrast here is the strategy currently pursued by some Middle Eastern oil-producing states. Based on the calculation that about 50 years of oil supply remains, these countries themselves are already rapidly investing in alternative energy sources. While the EU's current plan envisions a 50 per cent reduction in GHG output by 2050, the Middle Eastern plan envisions the more or less complete depletion of oil resources by approximately 2060. This would suggest that the EU plan is still far too conservative with respect to energy security.

ticular the effect of the choice of a 2005 base year), on possible modifications of the EU ETS system (in particular how allowances are allocated and credits auctioned across ETS and non-ETS sectors), and finally a discussion of the GO green certificate system (in particular its general effectiveness as a policy tool, its compatibility with national-level incentive systems, its potential impact on both the relative diversity of renewable resources and its related impact on the problems of base load power, grid load and energy security). The final sections of the paper address the question of the potential economic impact of the policy package on Hungary. The decision to focus on topical issues outlined above derives from the fact that there is relatively less controversy across countries concerning other features of the proposed policy package and comparatively less of an impact on Hungarian interests.

3.1. The Individual Pieces of the Legislative Package (Directive Proposals and Impact Assessments): (Initial Analysis of COM[2008]11, COM[2008]13, COM[2008]18, COM[2008]19)

The analysis of each of the individual legislative proposals and impact assessments is organized by topical theme rather than by each of the individual pieces of legislation and their respective impact assessments. The analysis thus focuses in particular on those points requiring the most urgent attention: the base year problem, the strict division between ETS and non-ETS sectors (as well as the related importance of both energy efficiency and transport), and discussion of EU and national-level incentives systems for promoting the use of renewables.

This notwithstanding, this section briefly addresses the other documents and topics that make up part of the overall 2020 Climate Change Package. Some of these documents (*e.g.* COM[2008]11 assessing those National Energy Efficiency Action Plans that have been submitted by the member states) are not of great significance in the overall analysis. While the issue of energy efficiency and the role it could play in both the EU and national level strategies for emission reductions is highly significant, this issue is best raised in the context of the discussion on the ETS and non-ETS sectors. COM(2008)11, in particular because it raises no significant or meaningful issues requiring further debate or discussion. This report generally supports the overall goal of energy efficiency raised in the document and discusses further details regarding energy efficiency potential and the division across ETS and non-ETS sectors below.

COM(2008)13 and COM(2008)18 essentially discuss the potential role of carbon capture and storage (CCS) and its research and development in the EU. Whether the EU should pursue this avenue and how much of the EU's or individual member state resources should be spent on it is problematic at best. Coal itself represents an abundant and comparatively cheap resource in the EU and elsewhere. However, as is well known, its exploitation is one of the principal causes of CO2 output. While the CCS theory is compelling, to-date there are no real life examples of this technological solution. Moreover, its development potentially lies so far off in the future that it would be virtually meaningless to pursue. The MIT (2007) study: The Future of Coal remains skeptical about CCS potential. While this reports support further R&D efforts in this area, it is questionable whether considerable EU resources should be dedicated to such a project at this time – especially when other clean technologies are currently available. Moreover, the CCS strategy is presumably most appealing to those states with significant coal resources (in particular, the UK, Poland and to some extent Germany).[16]

Further, some attention must be devoted to the discussion of biofuels. Though the European Commission has devoted considerable attention to biofuels and has promoted a 10 per cent use of biofuels in the fuel mix (this is treated in particular in COM(2008)19 final on the "Promotion of the Use of Energy from Renewable Sources", biofuels have increasingly been attacked from virtually all directions. Of particular interest was the recent report by the European Environment Agency (EEA) arguing that the EU should drop this goal from its strategy palette.[17]

The authors of the current report support this general view. Biofuels appear to represent an insurmountable obstacle for a number of reasons. The central problem is that demand for biofuel crops raises the price of other agricultural products, leading to excessive inflation of primary foodstuffs (wheat, flour, bread, meat, *etc.*). Moreover, this relationship appears to hold even if the raw material used for biofuels does not itself compete directly with food sector products (while corn can be used both by the biofuels industry and the food sector, other so-called "second-generation" and "cellulosic" biofuel crops are primarily destined for the biofuels sector). Even when the biofuel raw material is not directly required in food production, the raw materials still compete for arable land, thus again driving up the price of agricultural products. Moreover, further price increases are likely to be propelled by the US Energy Bill passed in December 2008 and which dedicated substantial resources to the biofuels industry. In addition to the EEA, several other international organizations have all called attention to the problem of rising agricultural prices and the threat this poses for the world's poor – not to mention the average consumer in Central and Eastern Europe.[18] Though other factors are also to blame for rising agricultural prices (international stock market speculation on commodities, global economic growth, changing food habits and rising fuel and fertilizer prices), rising demand for biofuel raw material appears to play a big role.

In Hungary (and other countries), one can also add the problem of rising temperatures and thus climate change into the overall equation for rising agricultural prices. Overall inflation in Hungary has been strongly driven by food price inflation which some have associated with higher summer temperatures and the resulting decline in agricultural output.[19] Since higher summer temperatures in Hungary (and elsewhere) are generally seen as an outcome of global warming, one can expect this situation to repeat itself on a somewhat regular basis in Hungary (and elsewhere). Although individual years may still see abundant crops (*e.g.* at this writing 2008 is predicted to be a good year for Hungarian agriculture), on average, countries should expect to see higher summer temperatures and declining agricultural yields. This fact,

[16] Oddly the Netherlands, with no meaningful coal resources to speak of, has decided to devote considerable research effort to CCS (see *e.g.* Ecofys, 2007: "Making CCS Work: Large-Scale Carbon Capture and Storage in the Netherlands").

[17] See http://www.eea.europa.eu/highlights/suspend-10-percent-biofuels-target-says-eeas-scientific-advisory-body

[18] See, for example, the World Food Programme. (http://www.wfp.org/english/?ModuleID=137&Key=2820), the UN's Food and Agriculture Organization (http://www.fao.org/newsroom/en/news/2008/1000826/index.html) and the International Food Policy Research Institute (http://www.ifpri.org/presentations/20080411jvbfoodprices.pdf).

[19] See "Summer Sun Seen Scorching Bio-ethanol Prospects, Fuelling Inflation in Hungary" (Portfolio.hu, July 27th, 2007).

combined with the problems posed by demand for biofuel raw material (and one should include demand biomass material in this discussion), is likely to pose significant problems both for future Hungarian, European and world agricultural prices and raises significant questions about "sustainability".

For these reasons we predict that the EU's current emphasis on biofuels is not sustainable and will soon be abandoned. Moreover, it does not appear to be in Hungary's general interest to pursue further biofuels production – in particular at this time. Heavy investment in biofuels will turn out to be very costly if and when this path is abandoned by the European Union.

One additional issue requires attention in this section. Though current discussion of the problems of "black carbon" or soot have not yet filtered down into the European Union's climate change discussion and policy agenda, this issue is likely to be of future significance.[20] Thus, although the Commission's policy package does not mention this problem, it should be considered in the general context of and climate change policies that are ultimately adopted.

Black carbon, or the particulate matter resulting from the combustion of fossil fuels (in particular coal, diesel, biomass and biofuels), has been linked to global warming and is likely to be increasingly emphasized both in academic research and in the policy arena. This point is above all important because much of the European policy agenda is focused on support for diesel (and biodiesel) and biomass (whether solid or other forms) as future potential and either "renewable" or CO2-friendly energy sources. In Hungary, for example, the principal share of renewable electricity production (about 70 per cent) is from (solid) biomass and approximately 90 per cent of Hungarian renewable energy derives from biomass.[21] Some of the black carbon output from these various sources can be minimized with the installation of filtering devices. This is the case, for example, with renewable biomass energy production. The installation of filters (where these are not already present) however will entail additional future costs. How this problem can be addressed for diesel and biodiesel fuels remains unclear.

The remaining Commission documents (COM[2008]16, 17, 19 and their respective Impact Assessments) are treated in the context of the thematic discussion appearing the following sections.

4) The Choice of Base Year (1990 or 2005)?

The 2020 Climate Change Package incorporates a shift from the original 1990 base year adopted in the Kyoto Protocol to a new base year, 2005. As illustrated by the country positions reported in Annex A,[22] virtually all CEEC's are opposed. None of the Commission documents reviewed either discuss or justify in meaningful detail the shift to a 2005 base year. Though the 2005 base year is mentioned in the European Commission's Impact Assessment (SEC[2008]85-V2) and other documents, the real impact is neither revealed nor analyzed, essentially papering over the potentially large and significant impact on the cost of mitigation in the CEEC's and in those few Western countries that have already made sig-

[20] See, in particular, Ramanathan and Carmichael (2008).

[21] See Hungary's *Renewable Energy Strategy, 2007–2020.*

[22] The Annex includes the positions of the 17 countries who had posted position papers with the European Council's Consilium website by the time of writing.

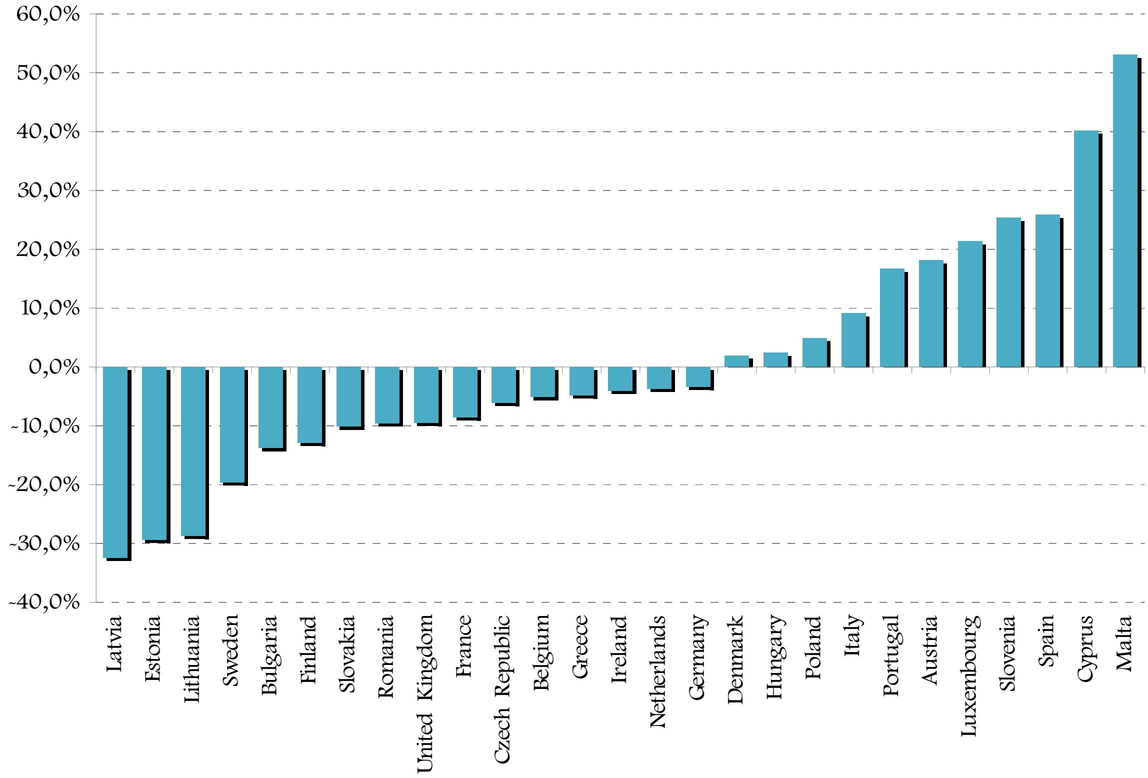
nificant progress in reducing GHG emissions.

For a document that intends to measure and weigh the total impact of the 2020 Climate Change Package and ultimately justify the distribution of burden-sharing across countries, this fact is shocking. Reference is clearly made in the Impact Assessment to the need to place less of a burden on the less advanced states in order to meet the 2020 target goals: "This will require developed countries to continue to take the lead in cutting their greenhouse gas emissions and efforts by developing countries to significantly reduce their emissions before 2020" (p. 16). The choice of the 2005 base year for determining required GHG emission reductions appears to obliterate these good intentions.

The choice of the 2005 base year for the second round of proposed GHG emission reductions up through 2020 sends a rude message to the majority of the new member states and to those Western states that have likewise managed to make progress in reducing emissions. As illustrated in *Figure 3*, all of the CEEC's (except for Slovenia) and a several Western countries (Greece, Finland, Sweden, the UK and France) are significantly hurt by the choice of the 2005 base year. The total gain or loss in tons of CO2 equivalent resulting from the change in base year is calculated for individual states. To provide a sense of the magnitude, this number is then divided by each country's 1990 GHG output.

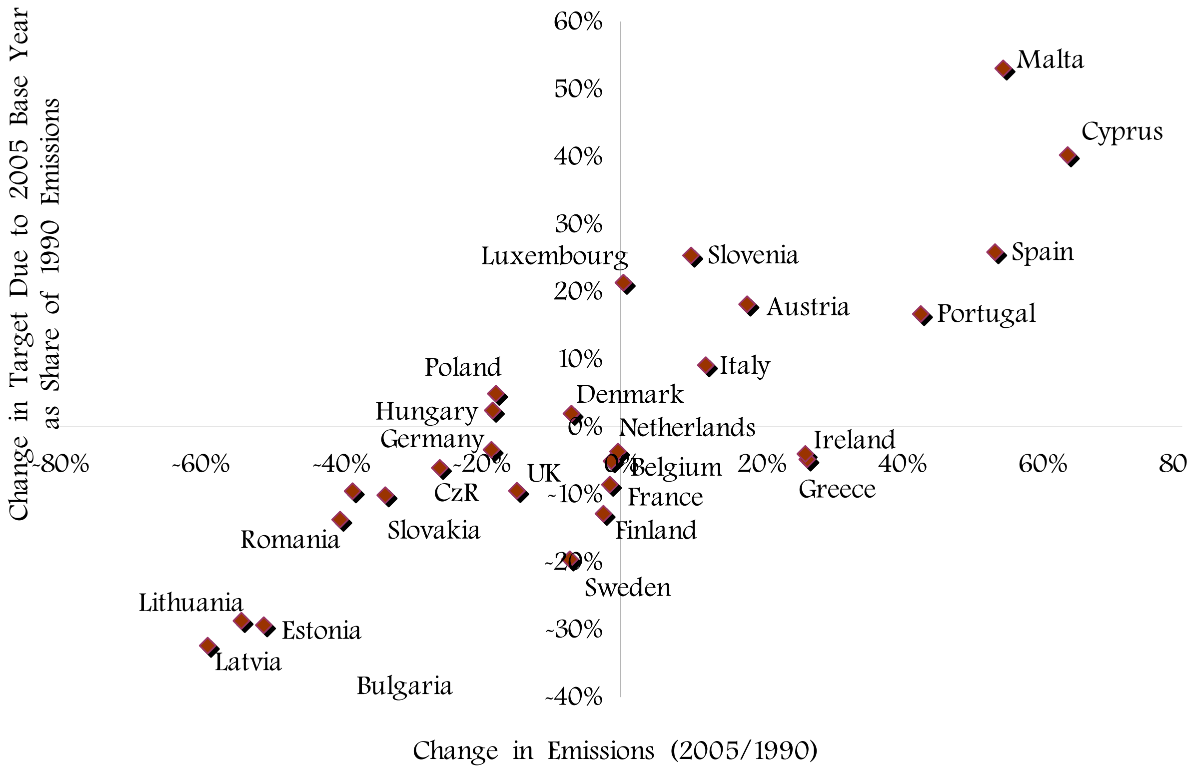
The findings seem out of keeping with the concept of burden sharing. Given that the enlargement essentially saved Western Europe from having to meet its Kyoto targets, there is considerable irony in this outcome. The East-

Figure 3
Change in Total 2020 Target Burden with 2005 Base Year
(Gain/Loss divided by 1990 GHG Output, Option 4)



Source: Own calculations based on UNFCC reported GHG emissions data (UNFCC registry), 2012 Kyoto Targets for EU member states (EEA, 2007) and the 2020 targets reported in the Impact Assessment. We thank Kornél Varsányi for providing foundational data.

Figure 4
Change in Target Due to Base Year Compared to Change in Emissions



Source: change in emissions data from Table 1 and change in target data from Figure 3.

ern Enlargement provided Western states with a cheap source for purchasing carbon credits, saving them from having to make far more considerable investments in renewables, energy efficiency and GHG reductions (in whatever form; JI/CDM or in the domestic market). Setting low emission reduction targets for the Eastern states and over-allocating emission credits to domestic firms in Western states provided plentiful and cheap solutions to potentially costly Kyoto goals. Moreover, those countries that made the most progress on their Kyoto targets will pay the price.

This point is best represented in *Figure 4*, which illustrates a very strong correlation between the change in the 2020 target based on the 2005 base year and overall change in GHG emissions between 1990 and 2005. More rigorous investigation provides further support for these findings even when important control variables (per capita GDP, energy intensity and a per capita target model are added to the regression analysis.[23] Countries that reduced emissions received higher targets (greater negative burdens) while countries that raised emissions received lower targets (or higher positive burdens). Though the CEECs were "rewarded" for their progress – they were able to sell surplus carbon credits – this revenue stream will presumably be diminished in the second stage of the climate mitigation strategy from 2013-2020. Though the price has varied dramatically, estimates suggest that Hungary could take in anywhere from 0.8 to 1.7 billion euros by 2012 from its sale of carbon credits. Most of these revenues are spent on energy saving investments in the residential sector.[24]

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[23] For more detail, see Ellison (2008).

[24] See, for example, "Az EBRD szén-dioxid krediteket venne Magyarországtól" (HVG, Mar. 26th, 2008) and "Nagy a tolongás Magyarország szén-dioxid-kvóttájáért" (Magyar Nemzet Online, Mar. 26th, 2008).

With respect to the general EU Climate Change Package, it is incumbent upon the framers of this policy proposal – at the very least – to provide adequate analysis and explanation for this dramatic shift in policy orientation. Moreover, this analysis raises important questions about the potential impact of the 2020 targets on the future economic growth and convergence aspirations of the less advanced states. Since this issue is neither raised nor really discussed in the Impact Assessment, it seems unlikely its overall impact on future economic growth is adequately modelled or even measured.

At least part of this shift to the 2005 base year is driven by external considerations. In the broader international negotiations over a new Kyoto package, in particular for a broad range of less developed countries, 2005 data is considered more reliable than 1990 data.[25] However, given that the EU has the necessary institutional setting with which to make more reasonable allocations of the GHG burden across states, it makes little sense to reward past poor performers. It is possible however to opt for the 2005 base year and to make reasonable adjustments to individual country targets that provide for a more equitable distribution of the burden across EU member states.

[25] Interview with the Hungarian Ministry of the Economy. Ministry representatives make the argument that, due to problems of measurement and data reliability in earlier years, a 1990 base year will be unacceptable in international negotiations.

5) The Allocation and Auctioning of Credits Across ETS sectors, non-ETS sectors and States (Analysis of COM[2008]16, SEC[2008]52 and SEC[2008]85-V2)

As expressed in individual member state positions on the 2020 Climate Change Package, several countries would like to see more flexibility across EU ETS and non-ETS sectors. For the countries of Central and Eastern Europe, such flexibility could represent a potential asset. This is above all the case since improvements in energy efficiency are likely to bring a far greater return in non-ETS sectors than in ETS sectors. This does not mean there are no firms that could produce significant returns on investments in energy efficiency and reducing CO2 emissions. But since the crucial issue in the Impact Assessment (SEC[2008]85-V2) is the cost efficiency of mitigation efforts and their overall impact on GDP, it is obviously more advantageous to make energy saving and emissions' reducing investments where they will have the biggest impact and largest marginal return.

While there is a definable logic to the current ETS system, it is questionable whether this is the best strategy for the Central and East European countries. For one, these countries have already made quite drastic cuts in their overall emissions, including CO2 and GHG emissions. For another, in per capita terms, Central and East European emissions levels on average are far below Western levels. While the energy intensity of GDP in Central and Eastern Europe remains well above Western levels, we know substantially less about how different levels of inefficiency are distributed across different sectors of the public and private economy. Expressed in simple terms, there is a substantially large and growing new segment of the economy that for the most part is likely to use energy comparatively efficiently. Western investors in particular have installed new plants and physical capital in Hungary and elsewhere in Central and Eastern Europe that, on average, is far more efficient than remaining segments of the economy. However, due to the introduction of market principles, the rapid rise of energy costs in Hungary has led many domestic firms to make energy saving investments.

In the public sector however, in part because of the lack of both foreign and domestic investment, there has been far less change. Studies of the potential opportunities for investments in energy efficiency in the building sector in Central and Eastern Europe suggest that energy use per square meter is considerably higher than in Western Europe (ECOFYS, 2006). As illustrated in *Table 4*, though the non-ETS sector contributes significantly to total GHG output, under the option 1 allocation of ETS sector targets (SEC[2008]85-V2:58), only the

Table 4
Share of Non-ETS Sectors in Total CO2 Emissions,
Non-ETS 2020 Targets and Services as a Share of GDP
(per cent)

	Size of Services Sector (Share of GDP in 2005)	Non-ETS Share of Total CO2 Output (2005)	Non-ETS 2020 Target
Denmark	74.0	58.6	-20
Ireland	60.0	67.9	-20
Luxembourg	82.7	79.6	-20
Sweden	70.5	71.1	-17
Austria	67.8	64.2	-16
Finland	66.7	52.2	-16
Netherlands	74.0	62.1	-16
United Kingdom	73.7	63.1	-16
Belgium	74.2	61.5	-15
France	76.3	76.3	-14
Germany	69.8	52.6	-14
Italy	70.2	61.1	-13
Spain	67.3	58.3	-10
Cyprus	na	49.0	-5
Greece	73.1	48.8	-4
Portugal	71.7	57.4	1
Slovenia	62.4	57.0	4
Malta	na	41.0	5
Czech Republic	59.3	43.4	9
Hungary	65.1	67.5	10
Estonia	66.9	39.7	11
Slovakia	66.7	47.3	13
Poland	64.0	49.3	14
Lithuania	61.5	70.7	15
Latvia	73.3	73.4	17
Romania	50.7	53.9	19
Bulgaria	58.0	42.0	20

Source: Service sector data from the World Development Indicators online database, remaining data based on data presented in the Impact Assessment. We thank Kornél Varsányi for providing foundational data.

Western states are required (or able) to make significant improvements in energy efficiency in the non-ETS sector. For the Central and East European countries, this strategy ultimately means that all of their GHG reduction efforts must be concentrated on the ETS sectors. In light of the above discussion, this makes little sense. For Hungary, the non-ETS sector represents almost 70 per cent of GHG output. Moreover, the requirement of putting all of Hungary's efforts into reducing GHG output in the ETS sectors means that all efforts are focused on an increasingly small share of the economy.

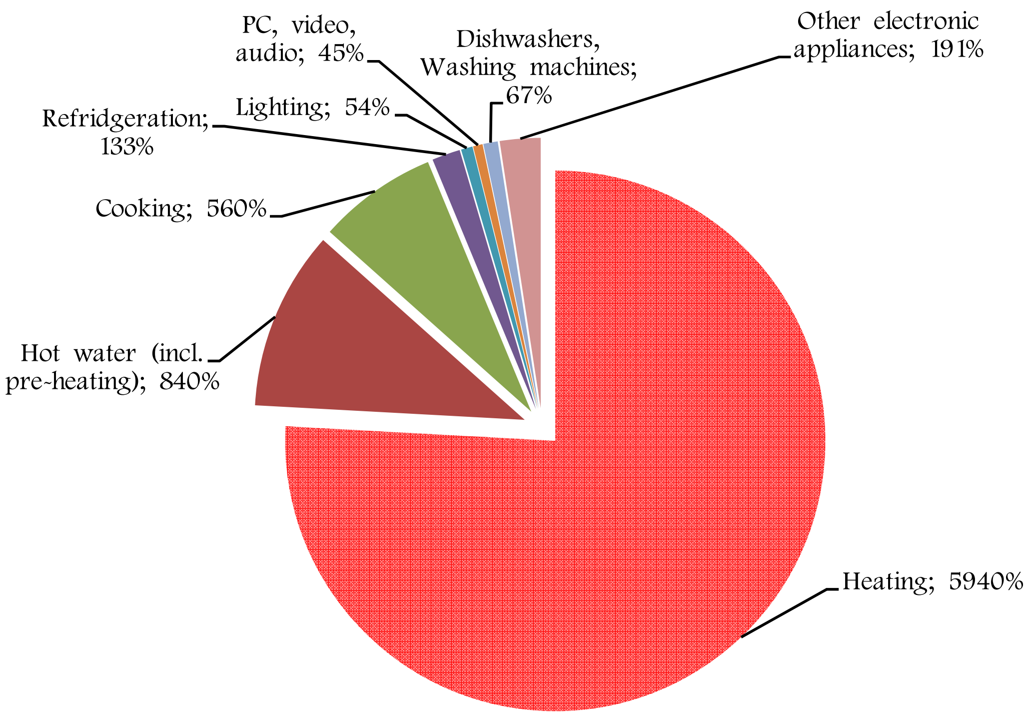
The strategy of imposing a strict division between ETS and non-ETS sectors seems ill-suited to the pursuit of cost-efficient strategies for reducing GHG emissions and achieving the general 2020 Climate Change Package targets. Moreover, given the very rudimentary data presented herein, it again seems highly unlikely that the various options presented in the Impact Assessment represent the best possible and most cost efficient strategies for individual countries to pursue – in particular the Central and East European countries. Even though one can expect the service sector to grow in size in Central and Eastern Europe in coming years (assuming these countries follow similar development trajectories to those in Western Europe), this does *not* mean that great improvements in energy efficiency cannot be achieved in the non-ETS sector. Moreover, placing all the emphasis on emission reductions in the ETS sectors will likely diminish attempts to improve energy efficiency since these are not directly rewarded by the structure of the proposed policy approach.

Most disconcerting is the fact that the Impact Assessments ultimately do not consider or assess a sufficient range of alternative models (SEC[2008]85-V2:56). As proposed by at least a couple of member states (see the respective country position table, Appendix A), a system of free allocation and/or auctioning across ETS and non-ETS sectors would give individual states more flexibility to promote emission reductions wherever they are the most cost effective. Moreover, the ability to sell (auction) carbon credits across states could potentially provide more incentive to undertake such investments. Precisely why such rigidity across ETS and non-ETS sectors should be introduced, or why states should not be immediately able to auction carbon credits is not immediately clear from the assessment. Moreover, such "rigidity" seems likely to cause significant problems where "new installations" and the emergence of potential "growth constraints" are possible outcomes. Though the interest in documenting "verifiable" emissions' reductions is an important issue, it is possible that this problem can be resolved in other ways.

5.1. On the Role and Importance of Energy Efficiency, Buildings, the Non-ETS Sector and Energy Security

Before entering into a discussion of energy efficiency, we propose a reorganization of the typical strategy for breaking down sectors by the share of their contribution to GHG emissions. Most work (see, for example, EK, 2008 submitted as a supplement to this report) typically organizes the breakdown of contributors to GHG emissions in terms of industry, transport, residential, trade and commerce, agriculture and other sources (*Diagram 2*). Given the different ways in which emissions are generated, however, it is potentially more meaningful to think about emissions in terms of production process-related emissions (hereafter process emissions) and emissions that are related to the maintenance and upkeep of

Diagram 1
Household Energy Use by Type



Source: from the EK supplement (2008: p. 15), our translation.

buildings (hereafter building-related emissions), in particular heating, lighting and hot water. In the first category – process emissions – the EU has divided up production processes into ETS and non-ETS processes, *i.e.* those that are CO2 or GHG intensive and those that are not.

In the second category – building-related emissions – there is a common tendency to focus most attention on residential buildings (apartments and single-family households). However, this report argues that the "building sector" should generally be conceived broadly to include all building types. Thus, in this second category (building-related emissions), buildings can be divided up into several types; industrial and commercial (the manufacturing, wholesale and retail sector), public use (hospitals, schools, municipalities) and residential (for the most part, single family households and apartment buildings).[26]

Though much of the literature on potential energy efficiency often clouds over or confuses these distinctions, one must realize that the discussion of buildings and energy efficiency comprises a much larger sphere than just the "residential" or "household" sector. All buildings – whether commercial, public use or residential – use energy and thus are responsible for CO2 and GHG emissions. Thus, the promotion of energy efficiency in buildings must confront the broad range of commercial, public use and residential buildings.

Two basic problems with the EU strategy immediately emerge from this categorization of the relevant emission categories. First, the typologies of process and building-related emissions cut across the EU ETS and non-ETS categories in ways that may have relevance

[26] Another common typology, that between end-users and those who produce the energy, is not entirely compatible with the typology generated above. But more importantly, it typically makes the mistake of separating the concept of use from that of direct on-site emissions. While this is true for a large share of emissions – electricity-generation and electricity-use are effectively separated in this way – this does not apply to natural gas use.

for policy-making and the development of meaningful strategies of climate mitigation. The way the ETS system is currently set up, only process-related energy efficiency is directly addressed. Building-related energy efficiency is only indirectly affected by the ETS system: rising energy costs associated with the impact of the ETS on electricity prices should motivate both individuals and producers to improve building-related energy efficiency. In the ETS sector itself, however, producers will presumably face stronger incentives to invest in process-related efficiency, since this will have the greatest direct and immediate impact on total emissions and thus the required share of allowances they will have to purchase on the open market.

Second, while EU policy essentially focuses on process-related emissions related to the ETS sector, it essentially fails to address the second category of building-related emissions. Though, as noted above, the category of build-related emissions cuts across the EU ETS and non-ETS categories, the vast majority of building related emissions lie outside the ETS sector. Yet, with some caveats raised below, the Commission's 2020 Climate Change Package essentially ignores the potential importance of the non-ETS sector.

Building-related emissions should be considered more seriously in the Commission's 2020 Climate Change Package for two basic reasons: for one, tremendous GHG reduction potential is available in the non-ETS sector and for another a comparatively small share of the total GHG reduction potential affects the demand for electricity. As is immediately clear from EnergiaKlub's *Diagram 1*, a very large share of energy use is related to heating and hot water (approximately 87 per cent), most of which depends on the use of natural gas (though a much smaller share still depends on wood-burning, coal and to some extent the electricity use associated with small space heaters and the like). According to Novikova and Ürge-Vorsatz, some 94 per cent of residential heating in Hungary is based on natural gas (2007:37).[27] At the same time, some caution is necessary in considering the diagram below. For one, as noted in the source information, the data represented is based on a wider reference area than Hungary. But more importantly, as noted above, the building sector is ultimately much larger than just the household or residential sector.[28] Ideally data providing us with a clear sense of energy reduction potential across the entire building sector as defined above would be preferable.

[27] Some caution is necessary with respect to this figure. The Hungarian Meteorological Office, for example, reports that; "In the structure of communal energy use natural gas represents 67.4 per cent. 70 per cent of households and institutions are supplied with natural gas" (OMSZ, 2008:36). Finally, though district heating is responsible for a significant share of heating in Hungary, most district heating is again based on natural gas (see *e.g.* the relevant documentation from the Hungarian Energia Hivatal). Note also that not all EU member states are the same in this regard. In Finland and Sweden, heating is generally based on electricity rather than natural gas (Eurostat, 2007:116).

[28] While the EnergiaKlub study attached as a supplement to this report does provide similar data for the tertiary or services sector, no such diagrams or corresponding building-related data are provided for the transport or manufacturing sectors. This does not appear to be an uncommon omission in studies of this type. Despite the fact that the Novikova and Ürge-Vorsatz paper, cited as one of the principal sources in the EnergiaKlub study, focuses primarily on energy efficiency and CO2/GHG emission reductions related to buildings, it oddly discusses only the residential sector.

The significance of the above observations is complex. For one, the biggest returns on reduction in energy use depend significantly on the type of energy use affected. Thus, for example, CO2 and GHG emissions' reductions are likely to be higher where these result from the production of coal or oil-based electricity generation. While reducing the use of natural gas likewise has an impact on CO2 and GHG emissions' reductions, targeting electricity generation (especially where the mix of coal and oil-based electricity generation is greater) will have a significantly greater impact on overall CO2 and GHG emissions. This is clearly expressed in *Table 5*. Assuming that the carbon content of coal and natural gas does not differ dramatically across the US and Europe, the carbon content coefficient of coal, for example, results in the fact that (averaging across the 4 different coal varieties: 26.635/16.99 =1.57) approximately one and a half times more CO2 output is produced per energy unit of coal than per energy unit of natural gas.

Table 5
Conversion Factors to Energy Units (Heat Equivalents)
Heat Contents and Carbon Content Coefficients of Various Fuel Types

Fuel Type	Heat Content	Carbon Content Coefficients (Tg Carbon/QBtu)	Fraction Oxidized
Solid Fuels	Million Btu/Short Ton		
Anthracite Coal	22.57	28.26	0.99
Bituminous Coal	23.89	25.49	0.99
Sub-bituminous Coal	17.14	26.48	0.99
Lignite	12.87	26.30	0.99
Coke	24.80	31.00	0.99
Unspecified	25.00	25.34	0.99
Gas Fuels	Btu/Cubic Foot		
Natural Gas	1,030	14.47	0.995
Liquid Fuels	Million Btu/Barrel		
Crude Oil	5.80	20.33	0.99
Natural Gas Liquids and LRGs	3.72	16.99	0.995
Motor Gasoline	5.22	19.33	1.00*
Aviation Gasoline	5.05	18.87	0.99
Kerosene	5.67	19.72	0.99
Jet Fuel	5.67	19.33	0.99
Distillate Fuel	5.83	19.95	0.99
Residual Fuel	6.29	21.49	0.99
Naphiha for Petrofeed	5.25	18.14	0.99
Petroleum Coke	6.02	27.85	0.99
Other Oil for Petrofeed	5.83	19.95	0.99
Special Naphihas	5.25	19.86	0.99
Lubricants	6.07	20.24	0.99
Waxes	5.54	19.81	0.99
Asphalt & Road Oil	6.64	20.62	0.99
Still Gas	6.00	17.51	0.99
Misc. Products	5.80	20.33	0.99

Note: For fuels with variable heat comments and carbon content coefficients, 2004 U.S. average values are presented. All factors are presented in gross calorific values (GCV) (*i.e.* higher heating values).

* Fraction oxidized for motor gasoline is 1.00 in the transportation sector, 0.99 in other sectors.

Source: U.S. EPA, "The US Inventory of Greenhouse Gas Emission Sinks: Fast Facts" (April 2006).

On the other hand, Hungary has a comparatively high input of nuclear power in the energy mix along with significant shares of natural gas, a fair amount of goal and some solid biomass and oil. In 2005, for example, some 73.7 per cent of Hungarian electricity was produced using nuclear power and natural gas (*Table 6*). Only a much smaller share (19.6 per cent) was produced using coal as the principal energy source. This ultimately means that electricity generation is less carbon intensive in Hungary than the use of natural gas alone.[29] Looking at the data presented in Table 6, this assumption turns out to be true. Compared to electricity, the use of natural gas is approximately (16.99/11.43=1.49) 1.49 times as carbon intensive as electricity use. Using the OMSZ numbers, one arrives at similar results (56.1/41.11 =1.36). Natural gas use in Hungary is 1.36 times as carbon intensive as electricity use. This point is particular important, since perhaps the most common perception when talking about increasing energy efficiency or reducing energy use is that this involves reduced electricity use. Few will think first of focusing on the reduction of natural gas use and certainly not as the principal strategy.

As pointed out in Table 6 below, EU member states vary dramatically with respect to the cumulative average degree of carbon intensity of electricity generation. Though the numbers noted in Table 6 neglect both the relative "thermal efficiency" of electricity generation and "life-cycle emissions", the general point is that an emphasis on building-related energy efficiency and the reduction of natural gas use in particular could have a potentially significant impact on reducing overall GHG emissions in some countries, in particular those at the lower end of the scale of the cumulative average carbon intensity of electricity generation. In addition, as illustrated in *Table 7*, Hungary uses a higher share of natural gas in the national energy mix than almost any other EU member state except the Netherlands (43.3 per cent and 43.6 per cent respectively). Though the share of natural gas use is on the rise across the EU, the EU 27 average share of natural gas in the energy mix is 24.5 per cent.

Though relative thermal efficiency certainly matters, two points must be emphasized here. For one, relative thermal efficiency matters much less than the potential to introduce big changes in relative thermal efficiency with update technology (whether these occur in electricity generation, ETS sector firms, or in building-related energy use). For Hungary, apart from the recent phenomenon of increasing use of co-generation, much of this potential to introduce big changes lies in building-related energy use. For another, the role of life-cycle emissions is potentially important. Fritsche for example notes that in Germany, Russian natural gas use, due presumably to long transport routes and aging technology, is approximately 7 times more carbon intensive than domestic natural gas resources.

The third point requiring clarification concerns the relative importance of energy security. While there are strong incentives, due to the related reduction in CO2 output,[30] to shift energy production from coal and oil to natural gas, the shift to natural gas likewise raises the level of energy dependence. In Hungary, both the relative share of

[29] This is likely to be true in other countries as well, in particular those that have significant shares of either nuclear power, hydro or renewable electricity generation. However, no calculations concerning other countries have been undertaken for this study.

[30] One meaningful way of understanding this point is that the shift from a coal-burning to a gas burning power plant results in an approximately 50 per cent reduction in total CO2 output.

Table 6
Cumulative Average Carbon Intensity of Electricity Generation, Selected Countries
(1990-2005)

Sweden Elec. Generation (source)	1990	1995	2000	2005	France Elec. Generation (source)	1990	1995	2000	2005	EPA Carbon Content Coefficient (tC02/QBTU)	OMSZ Carbon Content Coefficient (tC02/TJ)
Coal (% TWh)	1.2%	1.6%	1.1%	0.4%	Coal (% TWh)	7.5%	4.9%	5.1%	4.8%	26.6	104.7
Oil (% TWh)	0.8%	2.7%	1.2%	0.9%	Oil (% TWh)	2.1%	1.6%	1.3%	1.4%	20.3	73.34
Gas (% TWh)	0.3%	0.9%	1.0%	0.8%	Gas (% TWh)	1.7%	1.2%	2.8%	4.5%	17.0	56.1
Nuclear (% TWh)	46.4%	47.1%	39.4%	45.7%	Nuclear (% TWh)	74.6%	76.4%	76.7%	78.4%	0.0	0.0
Renewables (% TWh)	50.8%	47.6%	57.2%	51.8%	Renewables (% TWh)	13.2%	15.3%	13.2%	10.1%	0.0	0.0
Other (% Wh)	0.5%	0.0%	0.2%	0.4%	Other (% TWh)	1.0%	0.6%	0.9%	0.8%	0.0	0.0
Relative Carbon Intensity of Electricity Production (US EPA)	0.53	1.13	0.71	0.43	Relative Carbon Intensity of Electricity Production (US EPA)	2.69	1.83	2.10	2.32		
Relative Carbon Intensity of Electricity Production (OMSZ)	1.99	4.18	2.59	1.53	Relative Carbon Intensity of Electricity Production (OMSZ)	10.27	6.97	7.85	8.55		
Hungary Elec. Generation (source)	1990	1995	2000	2005	EU 27 Elec. Generation (source)	1990	1995	2000	2005		
Coal (%TWh)	30.0%	26.6%	27.3%	19.6%	Coal (% TWh)	35.9%	34.7%	30.6%	28.4%		
Oil (% TWh)	4.7%	15.5%	12.5%	1.3%	Oil (% TWh)	8.3%	8.2%	6.0%	4.2%		
Gas (% TWh)	16.3%	16.0%	19.1%	35.0%	Gas (% TWh)	8.4%	10.8%	17.0%	21.0%		
Nuclear (% TWh)	48.2%	41.1%	40.3%	38.7%	Nuclear (% TWh)	30.8%	32.3%	31.3%	30.2%		
Renewables (% TWh)	0.6%	0.5%	0.5%	5.4%	Renewables (% TWh)	12.0%	13.0%	14.0%	14.0%		
Other (% TWh)	0.1%	0.3%	0.3%	0.0%	Other (% TWh)	4.7%	1.0%	1.2%	2.3%		
Relative Carbon Intensity of Electricity Production (US EPA)	11.72	12.96	13.05	11.43	Relative Carbon Intensity of Electricity Production (US EPA)	48.38	48.38	45.95	44.57		
Relative Carbon Intensity of Electricity Production (OMSZ)	44.04	48.22	48.44	41.11	Relative Carbon Intensity of Electricity Production (OMSZ)						

Poland Elec. Generation (source)	1990	1995	2000	2005	Estonia Elec. Generation (source)	1990	1995	2000	2005
Coal (% TWh)	95.6%	94.7%	93.6%	91.4%	Coal (% TWh)	86.8%	96.4%	90.2%	91.2%
Oil (% TWh)	1.1%	1.1%	1.3%	1.5%	Oil (% TWh)	8.4%	1.2%	0.7%	0.3%
Gas (% TWh)	0.6%	1.1%	1.9%	3.2%	Gas (% TWh)	4.8%	2.3%	8.9%	7.4%
Nuclear (% TWh)					Nuclear (% TWh)				
Renewables (% TWh)	1.4%	1.6%	1.6%	2.7%	Renewables (% TWh)		0.1%	0.2%	1.0%
Other (% TWh)	1.2%	1.4%	1.6%	1.3%	Other (% TWh)				0.1%
Relative Carbon Intensity of Electricity Production (US EPA)	25.81	25.65	25.51	25.19	Relative Carbon Intensity of Electricity Production (US EPA)	25.65	26.31	25.67	25.61
Relative Carbon Intensity of Electricity Production (OMSZ)	101.30	100.64	100.01	98.58	Relative Carbon Intensity of Electricity Production (OMSZ)	99.75	103.11	99.92	99.84

Source: own calculations based on TWh data from the European Energy Commission, carbon content coefficients from the US. EPA data in Table 5 above and Hungarian OMSZ carbon content coefficients (2008:45, Table 3.4, a copy of this table is included in Appendix B).

Notes: Two caveats are necessary: First, the carbon content coefficient ignores both the relative thermal efficiency of the electricity generation process, as well as any carbon emitted in plant construction or in ancillary processes (so-called life-cycle emissions). Second, for the category "other", the relative carbon content coefficient is unknown. Since the relative share of electricity generation in this category is very small (varying between 0-0.6 per cent), the carbon content coefficient has been set to zero (even if one assumes a carbon content coefficient of 20 for the US EPA model. For Hungary, for example, this only changes the relative carbon intensity by a maximum value of +0.6 in 1998).

Relative Carbon Intensity is defined as the cumulative average carbon intensity weighted by the relative share in electricity generation across electricity generation fuel types.

Table 7

	Solid Fuels	Oil	Natural Gas	Nuclear	Renewables	Other
EU27 (2005, Mtoe)	319.98	669.80	445.45	257.36	120.75	2.80
Share in %	17.6%	36.9%	24.5%	14.2%	6.6%	0.2%
Belgium	9.2%	41.7%	23.9%	20.8%	3.3%	1.1%
Bulgaria	34.7%	24.4%	14.1%	24.2%	5.6%	-3.0%
Czech Republic	44.9%	21.8%	17.2%	14.2%	4.1%	-2.1%
Denmark	19.0%	41.6%	22.5%		16.2%	0.6%
Germany	24.0%	35.7%	23.4%	12.2%	4.8%	-0.1%
Estonia	57.4%	19.6%	14.4%		11.2%	-2.5%
Ireland	17.8%	55.5%	22.9%		2.6%	1.2%
Greece	28.7%	57.5%	7.5%		5.2%	1.1%
Spain	14.4%	48.4%	20.8%	10.3%	6.1%	-0.1%
France	5.2%	33.4%	14.9%	42.3%	6.1%	-1.9%
Italy	8.8%	44.5%	37.8%		6.5%	2.3%
Cyprus	1.5%	96.5%			2.0%	0.0%
Latvia	1.7%	29.0%	28.8%		36.4%	4.0%
Lithuania	2.3%	32.0%	28.8%	31.0%	8.8%	-3.0%
Luxembourg	1.7%	65.6%	25.1%		1.6%	6.0%
Hungary	11.1%	26.6%	43.3%	12.8%	4.2%	2.0%
Malta		100.0%				
Netherlands	10.1%	39.6%	43.6%	1.3%	3.5%	1.9%
Austria	11.9%	42.0%	24.0%		20.5%	1.6%
Poland	58.7%	24.0%	13.0%		4.8%	-0.5%
Portugal	12.5%	57.8%	14.1%		13.4%	2.2%
Romania	22.4%	26.0%	35.6%	3.7%	12.8%	-0.4%
Slovenia	21.1%	35.0%	12.7%	20.8%	10.6%	-0.2%
Slovakia	22.1%	20.8%	30.5%	23.6%	4.3%	-1.3%
Finland	14.3%	30.4%	10.4%	17.4%	23.2%	4.4%
Sweden	5.1%	28.4%	1.6%	36.2%	29.8%	-1.2%
UK	16.4%	35.5%	36.8%	9.0%	1.7%	0.5%

Source: data downloaded from the website of the European Commission: Directorate-General for Energy and Transport (DG TREN).

natural gas use in the domestic energy mix (as noted above) and the level of natural gas related energy dependence (as for many EU member states,[31] for Hungary about 80 per cent in 2004[32]) are quite high. According to the Hungarian Energy Agency (EH), the figures for 2007 were about the same. This third point is important for two reasons. For one, there is limited potential for moving more energy production to natural gas (though there is considerable potential for moving toward more renewable energy production), and for another there are strong incentives – quite apart concerns over global warming and climate change – to move in the direction of greater energy independence.[33]

Finally, the fourth point requiring clarification concerns the important dif-

[31] Despite the common perception that Hungary is one of the most natural gas dependent countries in the EU, 14 member states exhibited dependency levels over 90 per cent in 2004.

[32] Data from Eurostat's *Energy, Transport and Environment Indicators, 2006 Edition* (pp. 26–7).

[33] It is presumably not necessary here to enter into a discussion of all of the problems associated with the many hotly debated and potential future "*streams*" of natural gas supply in Hungary and Europe more generally.

ferences in the way that electrical energy and natural gas based energy are treated. Natural gas suppliers, despite the important role of natural gas in CO2 emissions, are not part of the ETS. It would not matter of course if they were, since the principal source of emissions occurs with end-users. What follows from recognizing this is the realization that only electricity use is ultimately affected by the imposition of a carbon price. Since natural gas providers and distributors do not emit meaningful amounts of CO2 or GHG emissions, they do not require carbon allowances and the output prices resulting from their activities do not and cannot reflect the imposition of a mechanically introduced carbon price.

Such a policy strategy however is likely to result in very significant and potentially perverse incentives. As the system is currently structured, higher prices in the electricity sector created by the imposition of a carbon price on electricity producers will ultimately favour electricity-saving energy efficiency investments over those affecting natural gas use. While rising energy prices – including rising natural gas prices – are also driven by market scarcity factors, in the long run some equivalence between incentives to use either of these energy sources is presumably advisable. In fact, incentives favouring electricity use over natural gas use (*i.e.* incentives raising the price of natural gas relative to electricity) should ultimately be more advantageous – at least in countries like Hungary with higher shares of nuclear power in the energy mix – in terms of reducing GHG emissions.

Since there are relatively few complementarities or substitution effects across electricity and gas use, it is not likely energy efficiency investments shifting usage from electricity to natural gas (due to lower prices) would result in higher overall emissions.[34] Potential inefficiencies in energy saving investment however do result from the likely stronger incentives to invest in electricity-saving energy efficiency. In general, without some kind of comparable mechanism affecting natural gas prices, the ETS sector mechanism – as currently proposed – will potentially drive inefficient investments in electricity-related energy efficiency.

Together, the above four points provide a strong logical foundation (1) for insisting that the far more attention than heretofore be dedicated to promoting energy efficiency in building use (including of course all three segments of the building sector: commercial, public use and residential) – in particular where this concerns natural gas use, and (2) for insisting that far more attention should be dedicated at the European policy level to energy efficiency and the reduction of energy use in the non-ETS sector. For Hungary (and presumably for many other countries, including in particular those in Central and Eastern Europe), these points pose a serious dilemma. In the EU policy framework, the ETS sector and that segment of the renewables industry that is focused on the production of electricity (not *e.g.* the replacement of natural gas using geothermal heat pumps) is the principal focus. However, in Hungary, and potentially for many other EU countries, it is not clear this represents the best strategy.

Ultimately, a strategy that focuses first on energy efficiency and, in particular reducing the use of natural gas in the building sector, could potentially bring far greater returns. At the very least, as proposed above, a strategy that attempts to unify or more strongly integrate the goals of the ETS and non-

[34] Some substitution effects do exist. For example, one can heat using both electricity and natural gas and many especially older hot water heaters are electricity based. However, electricity-based heat is rare in Hungary (except for space heaters) and on-demand natural gas-based hot water heaters are presumably still far more energy- and carbon dioxide-efficient than their “always on” electricity-based counterparts.

ETS sectors. This does not mean of course that one should not focus on reduction in electricity use. There are of course highly significant potential returns, for example, associated with the decommissioning or retro-fitting of Hungary's remaining coal-burning power plants. But the failure to recognize the advantages of reducing natural gas use – in particular in buildings where this can most easily be achieved using such technologies as passive solar, thermal insulation and geothermal heat pumps (and requiring such features in building codes) – represents a serious policy failure.

This last point is particularly true in the Central and East European context and further underlines the problems that arise for these countries with the EU's general climate change approach and, in particular, the 2020 Climate Change Package. As pointed out, for example, by Novikova and Ürge-Vorsatz, the relative effectiveness of energy efficiency investments depends on what has already be done in the past. If, as they point out, insulation has been added to the outside of a building, introducing an efficient furnace will have less of an impact than had there been no insulation at all (2007:10).

This analogy can of course be extended. In Hungary and many of the other Central and East European countries, the ETS system has been in place since 2005. Moreover, CO2 and GHG emissions have been radically reduced even before this as a result of reducing other emissions (*e.g.* SO2, CO, the reduction of fertilizer use, *etc.*).[35] In this sense, most of the EU effort is focused on a sector that has already witnessed significant emission reductions resulting in significant diminishing returns (and rising costs) regarding further efforts. This point is likewise argued in the Hungarian government's energy efficiency action plan (GKM, 2007:10). As pointed out in the section on the ETS and non-ETS sectors, the larger and far more untouched problem – in particular in Central and Eastern Europe – tends to be the relative energy use efficiency of buildings, in particular since this was not typically a concern with heavily subsidized communist era energy resources. For Western Europe of course, the story is not quite the same. Western consumers have faced far higher energy prices for a considerable number of years and end-user energy efficiency has been promoted for a long time. In both this regard and in other areas of the EU 2020 Climate Change Package, Western interests appear to be far more strongly reflected than Hungarian and potentially Central and East European interests.

By pointing this out however, we do not wish to claim that no significant reductions in CO2 or GHG output can be achieved in the electricity-generating or broader ETS sectors. By shifting more coal-based power production to either natural gas or, ideally, renewable sources, significant progress is possible. And such a strategy would – due to the differences in the carbon coefficients – have a significant impact on overall CO2 and GHG emissions. But for government policy regarding energy end-users or consumers, the focus should clearly be on other strategies – in particular the reduction of energy use in buildings (and also vehicles/transport). Thus this report supports the general ETS sector cap and trade approach to reducing GHG emissions. But a far more flexible policy structure that both motivates and incentivizes emission reductions across the much broader range of ETS and non-ETS sectors would be advisable.

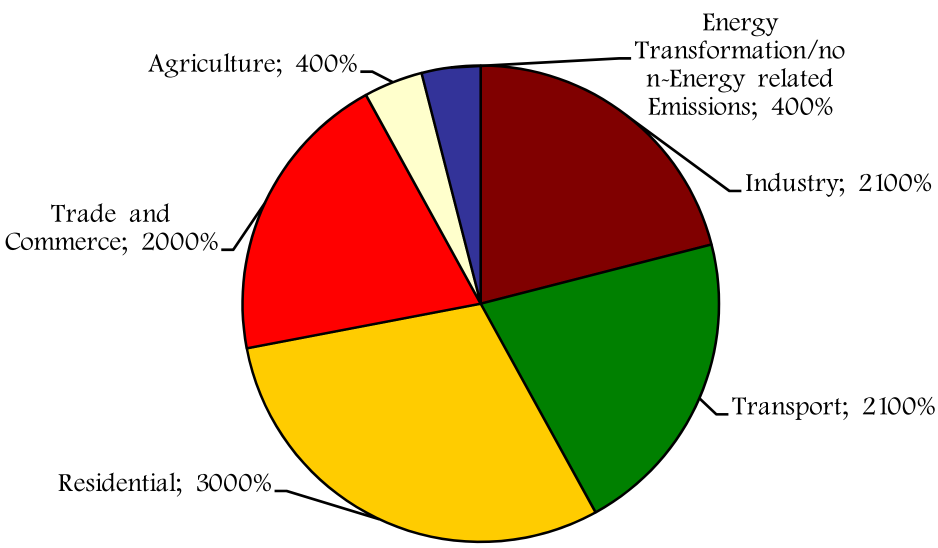
[35] While these emissions are not themselves the source of carbon dioxide or other GHG's, they are contained in energy sources (such as coal, oil, vehicle fuels, *etc.*) that are also typically high emitters of CO2 and GHG's. Thus reducing SO2 output in Western and Central and Eastern Europe, for example, had a significant impact on overall CO2 output.

5.2. Unifying the General ETS Framework across ETS and non-ETS sectors

As expressed in individual member state positions on the 2020 Climate Change Package, several countries would like to see more flexibility across EU ETS and non-ETS sectors As outlined above, it is crucial for the success of EU community policy that national (and/or municipal) governments be "incentivized" to undertake investments in energy efficiency and reduced energy use. Under the current ETS model proposed in COM(2008)16, investments in energy efficiency that translate into reduced energy use likewise translate directly into lower requirements for purchasing carbon credits (since all power sector carbon credits will be auctioned) and thus also an increased potential to sell unallocated carbon credits. On the surface, this sounds like an advantageous setting. However, the principal catch is that emission reductions in the non-ETS sector do not in and of themselves lead to an increased potential to sell carbon credits on the open marketplace. Only ETS sector emission reductions qualify.

The incentive of the European model is to promote energy efficiency investments that affect electricity demand (since power producers are directly part of the ETS). The consequence is that while ETS member firms face incentives to reduce emissions (this reduces the costs imposed by the ETS system), governments themselves cannot reap the benefits of their actions where these do not have a direct impact on ETS and in particular power sector emissions. More importantly, as noted above and despite the important role of natural gas in CO2 emissions, natural gas suppliers are not part of the ETS, though of course it would not matter if they were, since the principal source of emissions occurs with end-users. Successful attempts at reducing energy consumption only result in carbon credits that can then be sold on the open EU market if they also result explicitly in reduced electricity demand.

Diagram 2
End-User Emissions in Hungary by Sector, 2004



Source: from EK supplement (2008, p. 14).

Unused surplus carbon allowances in the non-ETS sectors cannot be sold on the market. In this sense, having "room to grow" (the positive non-ETS sector carbon allowances offered to the less developed economies) appears to be more of a burden than a benefit. Unused allowances can neither be sold on the open market nor can they be shifted from the non-ETS sector to the ETS sector. Moreover, the effect of an extra "cushion" in the non-ETS sector ultimately means extra pressure or higher imposed costs on the ETS sector, where most of the efforts at emission reductions will thus have to be focused. As noted above, the impact of the non-ETS sector on total emissions is far greater than that of the ETS sector. As in Diagram 2 above, industry in Hungary only makes up 21 per cent of total CO2 emissions. Moreover, ETS sector emissions represent a smaller share of this total.

Though it is argued throughout the European Commission's documentation that the structure of the current ETS sector and full auctioning in the power sector represents the most cost-efficient strategy for reducing GHG output and produces the most level playing field, this ignores a number of factors. First, the so-called "efficiency approach" for determining ETS and non-ETS sector targets outlined in SEC(2008)52 is defined by the, "equilibrium of marginal abatement costs of the trading and non-trading sectors" (p. 98). While it remains unclear from the text of these two Impact Assessments, presumably – there is unfortunately no way to determine this[36] – the numbers generated by this method determine the targets appearing in particular in "option 4" (SEC[2008]85-V2:58), the distribution of ETS sector targets that most closely appears to resemble the Commission's preferred strategy.

However, whether as argued in the text any of the different options outlined in SEC(2008)52 (p. 98) represent an equilibrium choice based on the abatement costs of trading and non-trading sectors, (and whether these bear any resemblance to the different options outlined SEC[2008]85-V2 p. 58), is impossible to determine. For one, the relevant calculations are not made available in these Impact Assessments. For another and more importantly, the above analysis suggests the opposite is more likely to be true. Investments in energy efficiency have potentially much higher returns (in terms of GHG reductions) in the non-ETS sector. Both the GKM in its Action Plan on energy efficiency (July 2007) and the EnergiaKlub (2008) in the supplementary report attached to this report come to similar conclusions. The overwhelming majority of the room for improvement appears to lie in other sectors (in particular the transport, residential, public and services sectors). Very little room for improvement is available in the manufacturing or ETS sectors (*e.g.* EK, 2008: Table 7, p. 23). Moreover as outlined above, most of the room for emissions' reductions lies in energy efficiency improvements across these sectors (including the ETS sector), those again this type of investment is less likely to have a direct impact on non power-related ETS sector GHG emissions.

As a result of this fact, perhaps the biggest challenge posed by the 2020 Climate Change Package and its predecessor is to find a method of unifying or integrating the ETS and non-ETS sectors in such a way that investments in energy efficiency are incentivized in the same way that ETS sector CO2 and GHG emission reductions are. Though this idea is not entirely new to the gen-

[36] There appears to be no way to reconcile the strategies outlined for determining ETS and non-ETS sector targets (in particular those appearing in SEC[2008]52: p. 98) on the one hand, and those appearing in (SEC[2008]85-V2:58) on the other. No guide for drawing a correspondence chart across these two documents is provided and it appears virtually impossible to re-create one from the information provided.

eral discussion of Kyoto and EU goals (see in particular Bertoldi, Rezessy and Ürge-Vorsatz, 2005), the 2020 Climate Change Package still suffers from the lack of a model of integrating these two sectors.

As suggested above, there are of course strong reasons for being concerned about the possible integration of the ETS and non-ETS sectors. As outlined clearly also in the Commission's proposal for a directive extending the ETS, "The emissions trading system should only be extended to emissions which are capable of being monitored, reported and verified with the same level of accuracy as applies under the monitoring, reporting and verification requirements currently applicable under the Directive" (COM(2008)16:8). The advantage of the ETS sector as currently defined (and especially with the proposed exclusion of small-scale facilities under 10,000 tCO_2/yr, from the ETS sector), is that it is comparatively easy to monitor and verify actual emission reductions. Identifying changes in actual energy consumption related to energy efficiency investments is far more complicated. Temperatures and thus energy use vary on a daily basis, as do household, commercial or public use building electricity needs. Thus the general criterion of monitoring, reporting and verification is particularly difficult to satisfy.

The "white certificate" model proposed in Bertoldi, Rezessy and Ürge-Vorsatz (2005) represents an important step in proposing strategies for integrating the ETS and non-ETS sectors. However, it raises a number of difficulties. For one, while the concept of issuing white certificates to individuals who invest in household renewables or energy saving technologies is compelling, the difficulty lies setting meaningful prices for such certificates (energy saving investments are likely to yield differing results in different settings) and in being able to verify whether emissions are actually reduced as a result. For another, serious questions arise over who should manage and administrate such a system. The authors, for example, argue that energy distributors (such as E.ON in Hungary) are perhaps best positioned to do this. However, as the authors themselves note, energy distributors could potentially exploit such strategies to favour their own interests. Energy distributors of course want to sell power and under the proposed ETS system for 2013–2020, energy producers gain little from reducing energy use (though they can gain from reducing the CO2/GHG content of their related emissions). Moreover, as argued below, much of the potential for increased energy efficiency/reduced energy use in Hungary concerns natural gas.

This of course raises important questions about which "energy distributors" should be responsible for such a program and whether this raises further insurmountable obstacles to such a strategy. The requirement of having another EU and/or national-level institution responsible for monitoring and issuing white certificates seems an unnecessary complication given current proposals for similar institutional requirements to manage GO green certificates and the ETS. Moreover, it is not clear that the European level of administration is necessary in order to introduce a broad range of national-level policies promoting energy efficiency (such as energy labelling on appliances, energy efficiency standards, rebates, tax incentives and other programs to encourage household adoption).[37]

On the other hand, the monitoring and verification of emissions at the national level have improved over time. As indicated for example by the Hungarian Meteorological Service's National Inventory Report for 1985–2006, the potential range of uncertainty in GHG-related

[37] Some of these examples have been drawn from Bertoldi, Rezessy and Ürge-Vorsatz (2005:966).

estimates was the following: CO2 +/-2-4 per cent, CH4 +/-15-25 per cent, and N2O +/-80-90 per cent. Due to the relatively low share of CH4, N2O and fluoride gases in total emissions, total uncertainty was estimated at +/-5 per cent and trend uncertainty at +/-2.4 per cent (OMSZ, 2008:27). Based on data from the individual member states, the most recent European Environment Agency's UNFCC report suggests that for the EU15, uncertainty regarding levels is +/-4-8 per cent, while trend uncertainty is smaller (+/-1-2 per cent) (EEA, 2007:61).

Given the above, a more appealing proposal is potentially one that incentivizes the role of the state rather than that of power producers and/or distributors. Moreover, even if one did hand over the task to power producers and/or distributors, some degree of state legislation would presumably be required. But the only incentives would be provided by the requirement of meeting the EU targets. Given the existence of the EU ETS system and the fact that it explicitly incentivizes states by giving them the right to allocate and sell carbon allowances, adding reductions in non-ETS sector emissions would presumably not pose any serious administrative obstacles. No new institutions would be required. And the explicit advantage would be the incentivizing of the state who could then sell surplus non-ETS sector carbon allowances to other states or firms (or perhaps even re-allocate them to new firms in the ETS sector).

The point is that in order for the state to be adequately incentivized to promote and encourage energy efficiency and reduced energy use it would be helpful for the state to be able to draw some explicit advantage or reward from the policies it introduces. Moreover, given that there are significant costs associated with many energy efficiency policies, the ability to garner some sort of return in the form of the ability to sell carbon credits means that states might be more likely to pursue important energy efficiency strategies. While uncertainty and the ability to monitor accurately remain a concern, the lack of strong incentives for states to engage in significant efforts to promote energy efficiency is presumably one obstacle toward meeting these goals.

In important ways, this model simply reinstates a piece of the Kyoto framework that – at least without a new Kyoto II agreement – will not be available to EU member states. The model builds upon the existing Kyoto I framework which allows countries to sell unused emission or carbon allowances to other countries (so-called AAU's or Assigned Amount Units).[38] Introducing such a model for the EU framework and further allowing transferability of unused carbon allowances across ETS and non-ETS sectors would introduce strong incentives to engage in energy saving investments. With the reduction of so-called "hot-air" or large cushions for further growth – in particular through the models strict application only to the EU area – such a model is far less likely to result in a dramatic reduction of carbon prices. Moreover, adapting a pre-existing model greatly facilitates the ease of transition. The only additional modification of the existing ETS system required is the definition of some kind of annual increment or reduction for the non-ETS sector (such as the annual reduction of 1.74 per cent currently proposed for the ETS sector), so that states can sell unused emissions on an annual or bi-annual basis. Without such a model and with small cushions available in the non-ETS sector, states face only very weak incentives to comply.

[38] See, for example, the discussion in Ürge-Vorsatz, Novikova and Stoyanova (2007).

5.3. On Energy Efficiency Potential

Just how much energy efficiency should ultimately be pursued and of what type(s) is no simple estimation. EU Directive 2006/32/EC provides an indicative target: an annual 1 per cent of energy savings over a period of 9 years. The Hungarian Ministry of the Economy and Transport (GKM) estimates that over the period 2007-2013, this amounts to approximately 5.97/year PJ in energy use reductions, or a total of 41.8 PJ across the entire period (2007:14). Assuming the same potential across the period 2013–2020, Hungary could potentially achieve energy reductions totalling 83.58 PJ.

Energy efficiency potential is of course a problematic term. EnergiaKlub, for example estimates there is a substantially larger potential for reductions in energy use in Hungary than those that have been proposed by the GKM (see the EK, 2008 supplement, 9–23, and Table 7:23). The authors of EK (2008) argue that at least 144 PJ could be saved by 2020 compared to the GKM study. But the definition of "potential" here is not very clear. For the most part, potential is defined as an average of previous energy efficiency improvements across the different sectors considered. After all, one could define "potential" in more dramatic terms, *e.g.* based on just how much energy reduction can be achieved in an individual residence or public building. In this regard, with passive energy design[39] or the right mix of passive solar, geothermal, solar cells, adequate thermal insulation and perhaps other low energy use features,[40] the zero emission residence or public use building is already imaginable.

In some senses, in attempting to define energy efficiency potential, the appropriate question is presumably not "how much can be achieved", but rather what is feasible within the context of the available resources (in particular financial resources – especially since the technological resources are clearly available). This however is perhaps an even more complicated number to calculate. The EnergiaKlub study, citing the Novikova and Ürge-Vorsatz (2007, 2008) study, for example, provides estimates of the total costs related to different kinds of energy efficiency measures (p. 16). The GKM (2007) paper on the action plan only provides estimates of total expenditures from 2000–2006 and otherwise holds to the prescriptions provided in the EU energy efficiency directive (Directive 2006/32/EC). But all of the above calculations avoid the more important question of what role cost plays in determining total annual energy efficiency potential. Thus, ultimately one has little sense of whether the proposed or potential targets fall within the means of available government support.

Estimates of the total cost of energy efficiency investments are sparse. In an earlier document, for example, EnergiaKlub estimates that 1 PJ of energy efficiency costs approximately 3 billion HUF (2007:6). Based on the numbers available for 2000–2006 from the Ministry of the Economy and Transport's Action Plan, 1 PJ of energy efficiency costs somewhere between 2.275 and 3.520 billion HUF depending on whether or not one considers the cost of "soft loans" (40.2/17.67=2.275 billion HUF, or 62.2/17.67=3.52 billion HUF if one

[39] See http://www.passivhaustagung.de/Passive_House_E/passivehouse.html.

[40] A number of other potentially valuable strategies include compact fluorescents, water saving devices and low energy use household appliances, programmable thermostats (*e.g.* Novikova and Ürge-Vorsatz, 2007:4).

adds in "soft loans", 2007:9). Novikova and Ürge-Vorsatz on the other hand provide estimates of total expenditure costs relative to various categories of energy efficiency investments. These numbers are reported in the EK supplement (2008: p. 16). Slightly more detailed numbers are reported by Novikova and Ürge-Vorsatz (2008:5).

The two questions that seem the most important, however, in the general discussion of energy efficiency strategies are not really answered by any of these reports and numbers. The first question is how much the Hungarian government can reasonably expect to spend on overall energy efficiency. Thus energy efficiency potential is definded here in terms of the total potential cost expenditure on either an annual or multi-year basis. The second question is what the overall impact of such expenditure is likely to be on economic performance. Thus, for example, should one think of these expenditures as a negative or a positive weight on overall economic growth?

These calculations are not yet far enough advanced to be able to provide adequate numbers. However, based on the assumption that the total cost per PJ of increased energy efficiency (or reduced energy use) is somewhere between the larger GKM estimate and the EnergiaKlub estimate (3.25 billion HUF per PJ), *Table 8* provides rough estimates of the total cost given different potential energy efficiency and GHG reduction target levels. Thus, the EU directive-based target of approximately 5 PJ per year would cost about 16.25 billion HUF per year, or about 0.12 per cent of the total government budget (based on 2007 values). Of course, based on the potential level of comfort or as change in the perception of the desirable target, annual expenditure could be much higher. A total of approximately 20 PJ in annual energy efficiency improvements would cost about 65 billion HUF, or about 0.5 per cent of the total government budget.

Of course, the biggest obstacle to overall expenditure levels and improved energy efficiency in Hungary has little to do with EU goals and far more to do with the current Hungary budgetary problems and the general state of the world economy. Finding additional room for energy efficiency expenditure is a considerable challenge in a situation where reduced budgetary expenditure is

Table 8

PJ Energy Savings	As Share of Total 2007 Budget	Cost (Billions of Forint)	Likely CO2 Reduction (Mtons)
1	0.025%	3.25	0.09
5	0.123%	16.25	0.45
10	0.247%	32.50	0.90
15	0.370%	48.75	1.35
20	0.493%	65.00	1.80
25	0.616%	81.25	2.25
30	0.740%	97.50	2.70
Total Government Exp. (2007, Billion Forint)	13,180		
Estimated Cost per PJ (Billion Forint)	3.25		

Source: Total government expenditure figures are from the Ministry of Finance (Jan. 2008). The estimated cost per PJ of energy efficiency is based on the average of the GKM (2007) and EK (2007) estimates.

Notes: Estimates of the total CO2 mitigation potential is based on the TPES metric of 90kt/PJ. However, this method does not take into account relative variation in the carbon intensity and thermal efficiency of the targeted installations.

The total reported budget exceeds government revenues. The figures do not take the resulting budget deficit 1,291.4 Billion Forint into account.

one of the principal considerations. This situation is not likely to change in the immediate future and is rendered more difficult due to the desire to join the European Monetary Union as soon as possible.

At the same time, while energy saving investments are primarily thought of in terms of their cost impact, they also represent potential gains in overall economic efficiency. Though this point is frequently lost on discussions of the "cost of meeting EU goals" or the "costs of mitigating climate change", one must recognize that there are ultimately very real economic and efficiency related returns to energy saving investments.[41] While for some policy expenditures there are very real questions about the potential return on investment, in this case real investments typically bring real gains in terms of increased economic activity, job promotion, improved productivity, lower prices and ultimately improved economic competitiveness. In the long run, greater efficiency in the allocation of resources and increased consumption expenditure are reasonable expectations of the outcome of government expenditure on energy efficiency. Moreover, if energy efficiency policy goals can be linked to a more effective EU-level strategy integrating the ETS and non-ETS sectors that incentivizes governments, the motivation to sell carbon credits could bring even greater rewards.

Energy efficiency investments in Hungary – as represented in the EK's supplementary document (2008: p. 26, Figure 7) – have declined significantly in recent years. Not only does this place Hungary in danger of failing to meet the EU guidelines established in the energy efficiency directive and extended with the 2020 Climate Change Package, it likewise means that valuable opportunities for improvement in overall economic efficiency are being missed.

To what extent this is specifically related to government policy and to what extent this is a function of current Hungarian habits and customs requires further research. At least some of the problem is presumably related to the current structure of government incentives to invest in energy efficiency. For example, 20 per cent rebates on total costs represent very weak incentives when the black market economy frequently offers better terms. Moreover the structure of rebates and tax incentives could presumably be improved. For example, while geothermal heat pumps represent a meaningful strategy for reducing natural gas use (significantly reducing CO2 output and reducing natural gas dependence), their cost appears somewhat elevated in Hungary (*e.g.* Novikova and Ürge-Vorsatz, 2008:49–50). Moreover, this is not an uncommon problem for many of the renewable and energy efficiency technologies. On the other hand, adequate government incentives to promote the use of these technologies should likewise have the knock-on effect of raising demand and ultimately lowering price (assuming a related increase in supply). Missing in all of this is a clearly defined strategy of public action campaigns and the public provision of clear price information to prevent price gouging and boost renewable investment.

In general, the current state of research on energy efficiency potential and strategies – in particular with respect to Hungary – could be significantly improved. Despite interesting and helpful recent studies, further research could help fill important gaps. For example, one of the most meaningful energy efficiency strategies "passive solar" – in particular because it is low cost and high impact – is rarely if ever dis-

[41] Generally these returns are calculated in terms of how many years it takes for energy saving investments to pay for themselves. For most of the available technologies, such returns are significant.

cussed.[42] This strategy is particularly meaningful since with a simple orientation of houses toward the sun – something that should be required where possible in all building codes (*e.g.* commercial, residential, public use) – yields impressive results through the medium of solar gain. More importantly, since passive solar only requires that new construction be oriented toward the position of highest exposure to the winter sun, it is virtually without cost.

Moreover, some of the recommended energy saving strategies – despite the fact that they reportedly take into account carbon intensity factors – often place electricity saving strategies before natural gas saving strategies. For example, the Novikova and Ürge-Vorsatz (2007, 2008) study appears to favour such strategies as the replacement of incandescent light bulbs with compact fluorescents, low energy use appliances and water saving devices over strategies that affect the use of natural gas. Since such strategies are comparatively low cost, they should of course be vigorously pursued. But the problem begins with measurements of the potential CO2 savings resulting from the different strategies analyzed. It is difficult to understand, for example, how the potential CO2 savings from geothermal heat pumps could be less than that from the installation of on-demand natural gas based hot water and heating furnaces. Heat pumps require no natural gas (though they do require moderate amounts of electricity), while on-demand furnaces of course use natural gas. Many other discrepancies also arise. Finally, it is also difficult to understand why such technologies as photovoltaic (PV) solar cells are not considered.[43]

As noted above, there is only very limited knowledge and data available in Hungary on the relative thermal efficiency of those installations (heat generating furnaces and the like) currently in use.[44] Such data, as should be obvious from the above discussion, is tremendously important. A new and improved strategy for the promotion of GHG emission reductions in building-related energy use should focus public policy in particular on those strategies that will produce the greatest gain in overall carbon efficiency.

Whether these should be pursued at the lowest potential cost is more problematic. Where significant improvements in overall energy efficiency will bring significant economic returns, it is important to weigh whether public expenditure in the form of tax incentives or rebates is genuinely necessary. In many cases, an intensive public awareness campaign may well be equally effective if the eventual outcome is a significant return on one's investment and such investments do not involve significant (*i.e.* potentially prohibitive) upfront costs. Thus for example it may be possible to persuade individuals to invest in compact fluorescent light bulbs if: (1) incandescent bulbs are outlawed, and (2) an excess of public information points out the long-term advantages of compact fluorescents.

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[42] While the Novikova and Ürge-Vorsatz (2007, 2008) paper notes the potential importance of passive energy design, it skips over or neglects passive solar.

[43] As discussed in some detail below, incentives for investing in PV solar are highly important for reducing GHG-intensive energy use and overall demand on the energy transmission network or grid. Though the cost of PV solar is frequently seen as an obstacle in Hungary, several arguments are provided below for why this should not result in the exclusion of PV solar as a renewable option.

[44] In Hungary, the relative lack of knowledge of the average thermal efficiency of building-related energy use is a matter of concern. The former Ministry of the Economy and Transport (GKM) noted in a preliminary report preparing the groundwork for Hungary's Energy Efficiency Action Plan that: "Hungary has officially *requested a temporary derogation of three years* for performing the other two tasks [outlined in the Community's Energy Efficiency Directive], that is, for introducing the certification process and for *starting the assessment of furnaces, boilers and air-conditioning installations*" (GKM, 2007:7, our emphasis).

The point is that, in general, public expenditure – based at least on a market failure approach to government intervention – should ultimately be reserved for those strategies that marketplace investors might not pursue without state aid but that could potentially have a significant impact on GHG emission reductions. Thus for example, public expenditure should target technologies such as household and larger scale geothermal use, insulation, the replacement of outdated windows and PV solar installations, that have significant upfront costs but that also are likely to have a significant impact on increased energy efficiency and/or GHG emission reductions. In terms of the required expenditure levels indicated in *Table 8* and their potential impact on GHG emissions reductions, this report has essentially argued that targeting certain types of investments will have a much larger impact on the relative carbon intensity of energy use. If successful, the result should ultimately be a larger impact on overall GHG emission reductions per unit of expenditure.

Finally, the potential range of buildings where a strategy focusing on energy efficiency more generally and reduced natural gas use in particular could be tremendously effective in reducing total GHG output is large. As noted above, this extends across all types of buildings (industrial and commercial, public use and residential).[45] The failure to consider this point in a more flexible ETS and non-ETS sector arrangement ultimately means that incentives will not promote investment in the most GHG reducing technologies. In the ETS sector, this will happen because firms are currently incentivized to promote the reduction of direct process-related GHG emissions over building-related GHG emissions. With regard the public use building and residential segments, without more direct incentives motivating states to promote energy efficiency investments across the broad range of non-ETS sector buildings, fewer of these types of investments will take place.

In general, the EU policy focus on the ETS sector – and in particular electricity use – does not seem well-suited to efficiency in the reduction of GHG emissions. In particular, too much of an emphasis is likely to be placed on the reduction of electricity use and somewhat perverse incentives to use more natural gas will likely result from the lack of a carbon price attached to this fossil fuel. This is further likely to have repercussions throughout the mitigation strategy network, since consumers and producers are likely to shift their energy saving strategies accordingly. While geothermal heat pumps, for example, represent an excellent CO2 mitigation strategy, in particular in the Hungarian context: they greatly reduce natural gas use and cause a small shift to electricity use.

In general however, the costs related to energy efficiency investments will presumably have a positive long-term impact on economic growth. Thus, government policies in this area, no matter how aggressive, are likely to have positive and significant long-term implications for future economic growth and convergence prospects. An aggressive and well-structured strategy for improving energy efficiency should ultimately improve Hungarian prospects for improved economic growth, economic convergence and overall competitiveness.

[45] In this regard, for example, Hungary's current Energy Efficiency Action Plan (GKM, 2007) focuses primarily on residential energy efficiency and generally misses a discussion of the broad range of building-related energy use and emissions.

6) The GO Green Certificate System *vs.* National-Level Incentive Programs (Analysis of COM[2008]19, SEC[2008]57 and SEC[2008]85-V2)

As the comparatively small degree of support for the current form of the proposed EU-wide GO green certificate system suggests (see the Table of country positions in Appendix A), there are significant concerns about the ability of the proposed system to promote advantageous trade in renewables across countries. Though there are several reasons why the GO green certificate system, in its current form, is ill-suited to solving this problem, the most important of these is that countries strongly fear the potential for negative competition between national level incentive systems and the EU-wide system. The primary reason there is likely to be strong competition between these two systems is that the GO system green certificates will be sold at one price for one unit of energy. In order to promote the broad diversity of potential renewable sources at the domestic level however, significant variation is required in the level of subsidy paid to different forms of renewable energy (solar, wind, tidal, geothermal, *etc.*).

Germany and Spain are the most outspoken countries on the need to protect national level incentive systems. Both of these countries currently employ feed-in tariff type systems to promote renewable energy and offer varied tariffs depending on the type of renewable energy. While predictions of what the likely price for GO green certificates would ultimately be (some argue they will be priced too high, others too low), the likely impact of this would be to drive producers who want to benefit from the ability to sell green certificates toward the lowest priced alternative. Generally it is believed that wind power would be the principal and perhaps only form of renewable energy pursued as a result of introducing the GO system. Even if GO green certificates were sold at one high price, wind would still be far more favourable to produce than other forms of renewables.

The problem of GO certificates *vs.* national level incentive systems should however been seen in terms of the related problems of energy security and overall electricity base and grid load. Though the assessment essentially leaves such issues outside the framework of the analysis, energy security in particular is becoming an increasing problem (for Hungary and for other countries). The increasing importance of energy security and the related problem of energy dependence require more complex approaches to the promotion of renewables than would be possible by introducing the GO certificate system and promoting primarily wind power. Feed-in tariffs (FIT) have one major advantage over green certificates. First, by promoting a broad range of renewable energy sources, FIT systems have a more significant impact on reducing overall grid load: households or commercial enterprises outfitted with solar installations not only feed energy back into the electrical grid, they likewise reduce overall demand on the electrical grid, thus reducing demand for the fossil fuel sources used to produce electrical power. In addition, more comprehensive national-level incentive systems focusing on a wider range of renewables can have an even broader impact on reducing energy dependence. In particular improvements in energy efficiency and the use of household geothermal can have a considerable impact on reduced natural gas dependence.

The problem of base load likewise suggests that countries should favour national-level incentives systems over the proposed EU-wide GO system. The basic problem in this regard is that excessive inputs from renewable sources that produce fluctuations in the total amount of power available on the energy grid (in particular wind and solar) create balancing problems for transmission networks. As the Spanish position on its renewable energy share makes clear, these are significant problems that require efforts to balance fluctuating energy sources with comparatively constant base load sources. This is apparently also already a problem for Hungary.[46] While this can be done with fossil fuel-based or nuclear power, it is wise to promote as much renewable energy use as possible. Hydropower, tidal energy, geothermal power production and biomass are all renewable sources of base load power. Hungary, in particular has great untapped capacity in the use of geothermal for the production of power as well as for household and commercial heating. Moreover, the example of Iceland clearly suggests that countries can rapidly exploit geothermal for the purposes of power production, having dramatically increased the share of geothermal power production in the 1980's and again since about 1999. As of 2006, 26.5 per cent of Iceland's electrical power needs were supplied by geothermal plants. Providing national-level incentives for the more extensive use of these power sources are important ways of diminishing the base load problem and increasing the degree of energy independence.

Great care should be taken in interpreting statements in the Assessment concerning the efficiency of GO green certificate systems relative to other incentive systems. As pointed out, for example, in the German position, the European Commission itself argues in at least two additional papers that feed-in tariffs are more efficient at introducing renewable technologies, introduce a wider range of renewable technologies (not just wind power) and are more cost-effective.[47] There are several reasons why green certificate systems are likely to be more expensive that could be detailed in a more lengthy report. The important point is that while GO green certificate systems are *in theory* more cost efficient, *in practice* the opposite has been true.[48]

Finally, while some countries may wish to rely on the GO green certificate system where they consider it impossible or difficult to sufficiently increase the share of renewable energy, there are a number of additional problems associated with such strategies. For one, little or nothing is known about how such a system would actually work. As noted in the assessment itself, the green certificate system being proposed is "experimental". The EU has no or only limited experience with such a system at a broader cross national EU level. There are only models of "how such a system could work" (p. 98). For another, there is little certainty concerning the future price of green certificates. *No precise estimates* of the future price of green certificates are provided in the assessment. The assessment only indicates that; "PRIMES modelling suggests

[46] While companies have applied to install up to 1750 MW's of wind power in Hungary, the MVM has set a limit of only 330 additional MW's based on estimates of how much wind power it can effectively balance.

[47] See eg "The Support of Electricity from Renewable Energy Sources", SEC(2008)57 and the precursor to this more recent study COM(2005)627. For other references making the same argument, see Lipp (2007) and Meyer (2007). For very brief introductions to the advantages of feed-in systems see Mendonca (2007) and NRP (2008).

[48] In addition to the previous footnote, see Van Der Linden et al (2005). Research on the role of certificate systems frequently ignores or neglects the issue of diversity in renewables, arguing that the incentive system should be "technology neutral" (see *e.g.* Söderholm, 2008).

… revenues from selling GOs in some member states could reach several billion Euros per year by 2020, and thus help considerably with encouraging and financing the development of renewables" (p. 101). The flipside of this observation of course is that the green certificates could ultimately represent very costly methods for achieving the renewable targets.

Uncertainty over the future price of green certificates should give countries pause. Several scenarios not outlined in the assessment appear possible. On the one hand – and especially if a significant number of countries opt to rely on the purchase of green certificates – it is possible that their price will be driven too high by relative undersupply. On the other hand, given the free choice over whether to make the GO system available at the national level or not, it is possible that this could potentially create a 2-tiered system with countries that promote national level incentive FIT systems and countries that adopt GO green certificates. Currently only a small number of EU countries use green certificates (7 do while 18 currently do not). If this possibility results in limited flexibility across the two systems, this again could radically drive up the price of green certificates. Additionally, inadequate cross-country infrastructure is also a related problem. Countries are likely to be preoccupied with the domestic electricity framework until EU interconnectedness becomes a fact of life.

6.1. An Alternative GO Green Certificate Proposal

As noted above, the biggest drawback concerning the GO Green Certificate model is the fact that – in its current form – it fails to respond adequately to two basic concerns: 1) the definition of one certificate as equal to one price for 1 MW of electricity ignores the diversity of renewable sources and variation in their relative price for the production of 1 MW of electricity;. 2) as represented in the individual country positions, a significant number of countries (in particular those that already employ a feed-in tariff model at the domestic level) are concerned about the potential for cross national trade in GO green certificates to undermine domestic level incentive programs. On the other hand, has noted above, most countries express interest in the potential for trading renewables certificates across borders.

Thus one principal objective of a revised model would be to find a form and structure that is (1) compatible with domestic incentive systems and (2) allows for more diversity in the use of renewable resources. One relatively simple way to do this is to define the price of one green certificate as equal to a range of amounts of energy and prices for individual renewable sources. For example, the price of one green certificate could be set equal to the following amounts (for the purposes of simplicity, this example is based on current German feed-in tariffs, see example below).

In this model, the price of 1 green certificate is set at 0.32 euros/Kwh. In order to be able to sell 1 green certificate, a company or private individual would have to produce either 1.88 Kwh of geothermal power, 2.56 Kwh of wind power or 0.737 Kwh of solar power. Such a model is of course perfectly scalable to the MW level. Moreover, such a model can easily be adjusted to correspond to European as opposed to German prices and could also be weighted according to purchasing power parities in individual countries (to adjust for cost differences due to variation in levels of economic development). In addition, like the German system, one could also weight tariffs in order to promote greater renewables investment in less developed regions.

1 green certificate = median renewable tariff (0.32 euros/Kwh)

Total amounts (in Kwh's) to be eligible to receive/sell 1 green certificate:

For hydro	= 3.299 Kwh (median tariff = 0.097/Kwh)	(.32/.097)
For geothermal	= 1.88 Kwh (tariff = 0.17/Kwh)	(.32/0.17)
For wind	= 2.56 Kwh (median tariff = 0.125/Kwh)	(.32/0.125)
For PV solar	= 0.737 Kwh (median tariff = 0.434/Kwh)	(.32/.434)

Such a model has a number of possible advantages over the current proposal. For one, this model provides greater assurances that multiple forms of renewable energy would be pursued. For another, such a system would not threaten to undermine national level incentive systems but should rather complement them. Finally, using this model, one could also dispense with the need for each country to reach a certain threshold level of renewable energy production before being permitted to sell green certificates on the open market.

Finally, in this way it would also be possible to establish one European registry for the sale of green certificates (similar to having one registry that sells carbon credits). Hypothetically one could even integrate these two institutions, though of course this would not be a requirement of the policy. One advantage of introducing a single European registry for the sale of green certificates is that individual producers could either sell renewable power to the local feed-in tariff market or to the single European green certificate registry. For countries that raise concerns about having to for foreign investments in domestic feed-in tariff programs, this model could likewise provide a meaningful solution. Moreover, this might further allow greater flexibility in cross-border investments in renewable energy – in particular in regions providing comparative advantage in specific kinds of renewable energy production.

One possible problem with this model is that the relative price of feed-in tariffs and green certificates should ultimately move in opposite directions over time. Since the goal is ultimately to encourage all states to introduce as much renewable energy use as possible, over time it should become more and more expensive to purchase green certificates on the open market. For feed-in tariffs, however, the reverse should ultimately be true. As in the German system, rewards should be higher for early investors and the value of feed-in tariffs that can be contracted in later years should decline along with changes in the marginal cost of renewable technologies. This feature could be achieved by introducing a graduated multiple in the value of green certificates. Over time, this would ultimately make it more attractive for individual investors to sell to the European green certificate market rather than to the domestic feed-in tariff program (assuming buyers remain).[49]

[49] This may introduce the additional problem that the green certificate cannot become so valuable that it becomes attractive for investors to postpone investments until later years. As in the German case, feed-in tariffs are set at relatively high levels for early years and include a commitment to reduce future feed-in tariffs over time. The intention is to promote renewable investments early on when they are most needed and to reward investors who are willing to take the related risks. As time passes and, in particular as costs decline, feed-in tariffs are also supposed to decline in value. Those who commit early, however, are guaranteed high feed-in tariff rates for extended, fixed periods of time (20 years).

6.2. On the Role of the MVM, Energy Sector Liberalization and the RES/Energy Efficiency Challenge

The goal of auctioning all carbon credits given to power producers might – under very different circumstances – seem like a meaningful and potentially effective strategy for reducing CO2 and GHG output. The threat of increased costs to energy producers (resulting from the carbon credit purchasing requirement) – especially where the ability of producers to pass increased costs on to consumers is limited (either by the role of competition across energy producers and potentially across countries or by the less favoured model of regulated energy prices) – is likely to have a significant impact on the efficiency of energy producers and ultimately on the overall energy mix purchased by transmission network operators. Moreover, additional incentives to reduce CO2 and GHG output could be furthered by imposing the requirement that transmission network operators first purchase energy from renewable producers, and then second from other power producers.

This of course is the ideal model. In a completely integrated and liberalized European energy marketplace where infrastructure transmission lines both within countries and across borders permit pure competition in power production and sale, the above mechanism introduced with the European ETS should effectively help reduce CO2 and GHG output. However, in Hungary, everything is different. For one, there is no real competition on the energy market and the free movement of power across borders is limited for various reasons. Moreover, and more importantly, there is no free market in the purchase of power. Hungary's energy producers have, for many years now, enjoyed long term power purchasing agreements (PPAs)[50] that fix the profit margin on energy production and require that the government purchase all available energy they produce. If other cheaper energy producers exist on the market (either through other available domestic capacity, imports, or the construction of new capacity), MVM is still bound by the obligation to purchase energy from those producers with whom it has long term PPAs.

The preferential agreements signed by Hungary ultimately bound the MVM to pay more to electricity producers than the sale price to consumers and remain valid for some 20-25 years from the date of signing (approximately 1997). MVM (*i.e.* the Hungarian government and Hungarian citizens) will have to compensate significant losses in the energy sector for some years (2017–2023) (Bakos, 2001). Complete liberalization of the Energy sector may lower energy supply prices, having a further impact on related costs to the Hungarian government (and presumably the Hungarian tax-payer). Bakos estimated potential losses at 300 billion HUF (2001:1129). Moreover, made prior to 2001, Bakos' estimate fails to account for the costs of energy sector liberalization in 2004 and 2007, suggesting the total loss will be much higher.

With regard to the EU's 2020 Climate Change Package, the Hungarian electricity sector configuration represents an explicit obstacle. Despite the fact that the electricity producing sector is directly exposed to the ETS regime and will be obliged to purchase all its carbon allowances on the open market, this is not likely to have a significant effect on incentives to improve efficiency or reduce CO2/GHG output. For one, due to the PPAs all costs can easily be passed onto consumers or onto the

[50] On PPAs (or what some refer to as long-term agreements, or LTAs), see Bakos (2001) and Domina (2007).

MVM (which will have to bear the increased costs as a loss and burden on the public deficit). For another, the lack of a real regional electricity market in Central and Eastern Europe means that price competition will have little or no effect either on electricity prices in Hungary or on the mix of CO2/GHG output. Moreover, increased competition ultimately only means that either consumers or the government have to assume the costs of any increases in the MVM deficit.

Finally, and what is perhaps most perplexing about the Hungarian case, little or no incentive is created by these interactions to purchase or produce more renewable energy. Though domestic fossil fuel energy production will increase in price as a result of the obligation to purchase carbon allowances, the obligation to purchase energy from its PPA clientele means the MVM faces powerful incentives to reduce or keep to a minimum any and all competing energy production – especially where this is attached to a purchasing commitment. Thus for example, although the Hungarian Electricity Act (86/200) contains a requirement to purchase energy produced from renewables, the MVM has limited the total wind power contribution to 330 MWs. Though this limitation on the potential contribution of wind power is explained away with reference to the total "balancing capacity" of the Hungarian transmission network, this ceiling is somewhat hotly contested.

Without entering too deeply into the thick of this argument,[51] without an adequate liberalization of the Hungarian energy market – in particular without dissolution of the PPAs, – the MVM faces very strong incentives to limit the share of energy provided by competing producers and, in particular, the renewables sector. The lack of adequate infrastructure to deal with both the high and low fluctuations produced by wind power and the relative cost of updating simply provide a further excuse not to raise the ceiling beyond 330 MWs. Further, though Austria's total electricity-generating capacity is only 1.84 times that of Hungary, its current wind energy generating capacity in 2007 (982 MWs) was approximately three times more than Hungary's current limit in wind power.[52] And Austria – in particular the Verbund power company still plans to extend its wind power generating capacity. In Germany, the Schleswig-Holstein managed to increase its wind power capacity by 30 per cent in 2007 and now produces 40 per cent of its electricity needs from wind. Further extensions of Schleswig-Holstein's wind capacity are planned.[53]

There appear to be at least two possible solutions to this general problem. One is the privatization of the MVM. While some note that privatization is not equivalent with removing or "unbundling" the monopoly control of the MVM,[54] it would have the benefit of potentially removing or limiting the "soft budget constraint" the MVM currently faces. This ultimately would mean that a privatized MVM would be more strongly required to encourage power production from cheaper producers and to put more pressure on PPA produc-

[51] See, for example, the EK study provided as a supplement to this report. See also Power Consult's (2007) report prepared for the Hungarian Ministry of the Environment and Water.

[52] Data on total electricity generating capacity comes from the European Energy and Transport Commission (DG TREN). In 2005, Hungary's total electricity-generating capacity was 35.76 TWs while Austria's was 65.7 TWs. Data on total installed wind-generating capacity is from the European Wind Energy Association (EWEA: http://www.renewableenergyworld.com/assets/documents/story/2008/windmap-08g.pdf).

[53] See the press release from the Schleswig-Holstein Ministry for Science, Economy and Transport: "Schleswig-Holstein deckt 40 Prozent des Strombedarfs durch Windenergie" (February 12th, 2008).

[54] Péter Kaderják made this comment at a recent energy conference in Budapest.

ers.[55] However, privatization alone may ultimately not be enough unless the government is also willing to dissolve the existing PPAs through buyout agreements with each of the individual power producers. Only in this way can Hungary hope to free itself from the constraint of paying for more highly priced energy, thereby allowing for greater competition in the domestic marketplace. But ultimately it will also be necessary to make good on the EU's project of real energy sector liberalization – which includes a consistent building up of international cross-border transmission networks. Though this commitment and obligation is already present in the energy liberalization directives and the commitments of the March 2002 Barcelona Summit, little progress has been made.[56]

The cost of these factors of course is not well modelled in the European Commission's Impact Assessment (IA) studies (in particular SEC[2008]85-V2). In particular, the Impact Assessment argues that increases in the prices of fossil fuels (*e.g.* oil or natural gas) are likely to drive further investment in renewables, since this then become cheaper in relative terms. However, given the above discussion, the Hungarian situation does not appear to fit well with the IA analysis. Increased fossil fuel and carbon allowance prices are simply likely to result in higher energy prices. Moreover, the MVM is likely to maintain its grip on ceilings to wind power and possibly also feed-in tariffs.

Finally, some attention should be paid to who chooses the relative power mix. At this writing, it is unclear how much leeway power grid or transmission network operators have in choosing the mix of power. Though they also do not benefit directly from lower emissions or higher levels of unused allowances, the proximity between such organizations as Paks and MVM, for example, is likely to produce potentially dangerous constellations. The incentive provided by the ETS is to rely as much as possible on GHG-free power production. In Hungary that could potentially be primarily nuclear. Further, if Hungary actually succeeds in cutting its connections with the LTAs, it can likewise sever itself from the commitment to buy power strictly from the related companies. This would then make it possible for them to "choose" to use more power from favoured suppliers. Moreover, the potential to boost government revenues through the sale of carbon credits will further promote these ties, especially in a context where the government is otherwise required to carry the balance of MVM losses.

Such a constellation is unhealthy and not likely to promote the use of renewables in a meaningful way. As suggested in an earlier communication with the Ministry of the Economy and Transport, the EU goal of complete energy sector liberalization provides an opportunity rather than a constraint for Hungary. In this regard, EU legislation provides incentives both for the privatization of the MVM and for the complete liberalization of the energy sector and energy sector trade with other countries. Moreover, the 2020 climate package likewise provides an additional incentive for the government to further pursue these goals.

[55] Privatization might also have the added benefit of distancing the MVM from Paks, further promoting real competition in the Hungarian energy sector.

[56] See for example CapGemini (2007): the report argues essentially that; "The interconnection levels, particularly in Western Europe, remain below the level of 10 per cent that was agreed upon at the Barcelona European Council of March 15 and 16, 2002. Since then only a little progress has been made, and most of the physical bottlenecks still exist. Consequently the list of priority projects has not changed much since 2002, even if the EU has tried to accelerate market integration by financing electricity transmission projects of European interest"(p. 63).

6.3. Meeting and Surpassing the RES Target – 13 per cent+

Despite the concern that the 13 per cent Hungarian RES target raises, the current authors believe that – with adequate planning – a 13 per cent RES target should be relatively easy to meet. However, a number of pre-conditions need to be fulfilled before this forecast could likely be fulfilled. First, as argued above, it is presumably necessary to conclude the privatization of MVM, the dissolution of existing PPAs and the unbundling of MVM, Paks and state control. As already noted, without a more flexible and competitive domestic and cross-border environment in electricity production, it is unlikely that enough responsiveness to renewable energy production can be generated in order to attract long-term investors in Hungary.

A second precondition concerns the recognition that the diversity of renewable energy production and renewable use is at least as important as (if not more important than) the relative cost of energy production. As outlined in detail above, a number of problems arise from concentrating RES efforts on single sources of renewable energy (in particular wind power). For one, as noted above, the problems of balancing the use of wind (and solar) energy argue against the logic of exploiting single renewable resources. In a wide expanse of the renewables literature, inadequate attention is paid to problems associated with fluctuating and base load power sources. For another, greater variation in the instruments used to promote renewable energy use means that one can have an impact both on the production of energy for the grid as well as demand for energy (both demand on the electricity grid and on other forms of energy use, in particular natural gas).

The general perception in Hungary appears to be that cost is the principal factor inhibiting the spread of renewables and rendering even the 13 per cent target difficult for some to imagine. However, a significant share of the problem of cost can be addressed with the appropriate incentives and related policy strategies. For example, when presented with geothermal power plants and residential heat pumps or household solar panels as possible solutions to improved use of renewables, the typical response is that high cost prohibits their use – in particular in less developed economies such as Hungary's. However, most of the development costs of geothermal, solar and other renewables result from the activities of private investors. For another, even where the cost of some installations appears prohibitive (*e.g.* household geothermal heat pump installations are currently several times more expensive in Hungary than elsewhere), the introduction of adequate incentives can encourage both demand and supply, reducing fixed investment costs.

Introducing an adequate incentive and policy structure will have a significant impact on the diversity of renewable resources. In this regard, Hungary's feed-in tariff structure is considerably under-developed. It offers one flat tariff for all types of renewable energy and fails to differentiate by price across energy types (though there is some variation according to the size of the installation). This is above all a problem because it favours a monoculture of wind energy production. The tariff is apparently set high enough to still be attractive for geothermal power and district heating installations (see section on geothermal in Hungary). However, at least one clear casualty of the current feed-in tariff structure is that private individuals and firms face few incentives to install solar power (as noted in the discussion of a hypothetical green certificate model, this is the more expensive form of renewable energy). At 26.46 HUF (approximately 0.106 euros) for solar and wind energy (29.56 HUF or 0.119 euros for other renewables), the January 1st, 2008 regulation provides the most "differentiated" feed-in tariff structure to-date (additional categories for energy generated from waste incinerators, hydropower installations and various installation sizes). But compared for example to the German tariff of 0.434 euros/Kwh, private individuals face few incentives to install this technology.

appear to be the only currently used mechanism for promoting broad-based and diverse renewable use.

Though as noted above the principal inhibiting factor – in particular where photovoltaic (PV) solar power is concerned – is the perception of cost, the German feed-in tariff system has oddly not been terribly expensive (*Table 9*). In general, based on the report from which the above data was taken, Germany produced about 10.4 per cent of its electricity needs from renewable sources in 2005 (compared to Hungary's 4.3 per cent). Of the costs related to the Renewable Energy Sources Act (which sets the feed-in tariffs), the additional cost of electricity consumption was about 1.84 euros/month, or 3.4 per cent of the total cost. More importantly perhaps from the perspective of less advanced countries worried about the total cost of investing in renewables, the price differential created by the German feed-in tariffs generated 7 billion euros worth of investments in 2005 alone. At the current rate, the report cited below predicts that by 2020, Germany will produce approximately 25 per cent of its total electricity needs from renewables. Given the current price of electricity in Hungary, the additional price of renewable energy should be even smaller than in the German case.

Table 9

	1998	1999	2000	2001	2002	2003	2004	2005*
Electricity bill (EUR/month)	49,15	48,2	40,66	41,76	46,99	50,14	52,38	54,36
Renewable Energy Sources Act	0,?3	0,28	0,58	0,7	1,02	1,23	1,58	1,84
Heat-Power Cogeneration Act	0	0	0,38	0,58	0,76	0,90	0,85	0,43
Electrivity tax (eco-tax)	0	2,25	3,73	4,45	5,22	5,97	5,97	5,97
Concession charge	5,22	5,22	5,22	5,22	5,22	5,22	5,22	5,22
Generation, transmission, marketing	37,6	33,8	25,15	25,05	28,29	29,9	31,52	32,90
Value-added tax	6,90	6,65	5,60	5,75	6,48	6,92	7,24	7,50
Cent per kWh	17,1	16,5	13,9	14,3	16,1	17,2	18,0	18,6
Electricity bill in prices from 2000	50,97	48,88	40,66	40,94	45,44	47,98	49,32	54,14

Source: copies from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety's report; "What Electricity from Renewable Energies Costs" (January 2007).

Some might argue that the ETS system and the carbon price it creates is enough to drive investors toward renewables and away from fossil fuels. As the carbon price rises, so does the relative attractiveness of renewables. This effect is similar to the role of the GO green certificate, since the GO green certificate lowers the price of renewables compared to fossil fuels and raises their attractiveness. However, as with the GO green certificate system, the basic problem with thinking of carbon price as sufficient incentive to promote renewable use is related to its inability to differentiate across the price of different renewable technologies. In this regard, differentiated feed-in tariffs

The above discussion of the cost of photovoltaic solar further ignores more recent innovations in the structure of PV investments: the rapid increase of commercial PV solar use and the recent emergence of companies using so-called "power purchasing agreements" as a strategy to encourage consumer adoption of the technology. PV solar in particular has suffered from the relatively high initial fixed investment costs. While high fixed costs have often prohibited private individuals from investing in PV solar, in particular for household use, the two above-noted innovations are likely to have a significant impact on the rate of range of PV solar adoption. With respect to the first big innovation, due to size differences, commercial enterprises are more easily able to make large initial investments. Due also to the declining costs of PV solar power – but also sometimes to incentives like feed-in tariffs – such installations are rapidly becoming attractive for commercial installations. In the US for example, there is a rapidly increasing and lengthy list of such investors, including such thrifty spenders as Wal-Mart's (along with many other corporate giants like Macy's, Home Depot, Google, Safeway, HP [note that both the HP and the Wal-Mart programs extend to suppliers] and now Best Buy, Toyota, Agilent, *etc.*).

The second big innovation concerns PPAs. Many of the investments now taking place both at the commercial and the residential level are financed by PPA agreements that leave ownership and the initial fixed investment costs for PV solar installations in the hands of investors, while private individuals or companies agree to buy the energy produced over some fixed contract period. While these agreements vary, they sometimes include the right to purchase the solar installation at a reduced price at the end of the contract period. General Electric Energy Financial Services, SunPower and Sun Run are examples of firms engaged in this type of venture in the US.[57]

While such examples remain unknown in Hungary for the time-being, in the US, commercial solar use is now one of the fastest growing segments of the PV solar market.[58] The innovation of PPAs will presumably accelerate this phenomenon, as well as accelerating household use. Given the comparatively high price of electricity in Hungary,[59] such innovations could presumably be promoted and ultimately accelerated with the introduction of adequate incentives. Moreover, such a strategy could presumably help resolve some of the problems Hungary currently faces due to rising energy and, in particular, rising electricity prices. Such factors not only threaten consumers, they likewise threaten future investment prospects.[60]

In this general context, an interesting cost comparison is provided by current discussion of extending the Paks nuclear power plant, something which even the current Minister of the Environment (Szabó Imre) has suggested Hungary must seriously consider. The cost of

[57] See www.Reuters.com: GE Unit Partners with SunPower on California Solar Projects" (January 7, 2008). SunPower, for example, installed an eight-megawatt solar power system for Macy's 26 California stores, resulting in an estimated 40-percent reduction in utility-provided energy use. This will reduce carbon dioxide emissions by more than 195 million pounds "over the lifetime of the (solar) systems". The article argues this is equivalent to removing 1,144 cars from California's highways each year. (PIA Press Release, in PIA Daily News Reader, 2007/07/31).

[58] See in particular the report from the SEIA and the Prometheus Institute, "US Solar Industry Year in Review, 2006" (p. 4).

[59] See the recent reports of the REKK (http://www.rekk.eu/pdf/epb2008-1.pdf, http://www.rekk.eu/pdf/epb2008-2.pdf).

[60] See "Power Prices Threaten Hungarian Project" (*Financial Times*, October 11, 2007). The article notes that 6 of Hungary's big electricity consumers lobbied the government to resolve the threat of potential power shortages and rising prices. As BorsodChem and others claim, rising energy prices and the lack of adequate supply threaten future investments in Hungary and thus ultimately threaten economic competitiveness.

extending Paks would certainly mount into the hundreds of billions of forints.[61] At the same time, at least 1750 MWs of wind power have been proposed in Hungary. Though this far exceeds the 330 MW ceiling set by the MVM, if appropriately balanced by other forms of base load renewable energy – in particular geothermal power plants and (bearing in mind the reservations expressed elsewhere in this document) perhaps also biomass – this additional renewable capacity could easily equal the existing capacity of Paks (1760 MW, or 40 per cent of Hungary's current electricity demand).[62] More importantly however, most of the investment in wind power, geothermal and biomass could easily be covered by foreign investment as long as the appropriate incentive structure remains in place. Paying for the extension of Paks, however, would primarily come out of the MVM and ultimately government budget (and thus ultimately the taxpayer's pocket). Finally, the degree of overlapping interests across the three major actors (Paks, MVM and the government) is this single factor most likely to influence which way the decision goes.

As proposed above, a potentially more meaningful strategy is the privatization of the MVM and the unwinding of the existing LTAs with domestic power producers. While unwinding the LTAs is a potentially costly venture, having done this provides the opportunity to privatize the MVM, which in turn would generate substantial revenues for the Hungarian state. Moreover, the potential reduction of the expenditure on MVM deficits represents an opportunity to improve the government's current account balance. Moreover, assuming adequate regulation is in place requiring that all new power producers be connected to the energy grid and that renewable energy production purchase agreements are put into place guaranteeing a 100 per cent power purchase requirement on the part of the MVM, it is possible electricity prices could be significantly reduced in Hungary in the longer term.

The one issue on which there is absolutely no consensus is just how much future energy capacity in Europe will result from renewables *vs.* how much future capacity will result from fossil fuels. Predictions from Capgemini (2007), the European Commission (2007) and the International Energy Agency (IEA, 2007: Ch.1) all tend to suggest the role of fossil fuels will be quite large making up some 80 per cent of new capacity through 2020 or 2030. These predictions are mirrored in particular by companies involved in the energy business that also frequently predict a strong role for fossil fuels.

On the other hand, reports from organizations representing the renewables industry frequently present a somewhat different picture of future potential energy capacity. According to the European Wind Energy Association (EWEA), in 2007 Europe installed 8,504 MWs of wind capacity, 8,226 MWs of natural gas-based electricity and decommissioned 750 MWs of coal-based and 1,203 MWs of nuclear-based electricity generating capacity.[63] If additional capacity from PV solar and other sources is added to these numbers, the contribution of renewables in Europe in 2007 begins to look more and more substantial. In 2006, Europe added some 966 MWs of grid-connected rooftop solar and presumably added more in 2007 (the data are not yet available). The use

[61] As a first measure, according to EK, simply the planned renovation of Paks was estimated at some 170 billion HUF (EK, 2007:5).

[62] In a pinch, one could also effectively balance wind energy with more natural gas-fuelled power plants. However, energy security concerns should presumably lead one to favour renewable options, the cost of which is set to decline while that of natural gas will continue to rise.

[63] See "Wind Energy Leads EU Power Installations in 2007, but National Growth is Inconsistent" (*EWEA New Release*, Feb. 4th, 2008).

of geothermal power plants is likewise beginning to increase rapidly in Europe and elsewhere.

The performance of individual countries in the addition of new renewable capacity is quite dramatic. While Germany is typically far and away the European leader in adding new renewable capacity, Spain surpassed Germany as the country with the largest and most rapidly growing share of wind power in 2007, adding 3,552 MWs in one year (more than twice Germany's 1,667 MWs). Spain is likewise one of the fastest growing solar energy markets, in particular with respect to concentrated solar power (CSP). Perhaps the most stunning potential example to-date arises from Norway's consideration of a plan to build 5,000 to 8,000 MWs of offshore wind power capacity and become one of Europe's principal renewable energy providers (representing the potential generating capacity equal to seven or eight nuclear power plants).[64]

This laundry list of successful attempts to promote renewable energy could be extended. The point however is the sharp contrast it provides with the predictions of Capgemini, the European Commission and the IEA. While these organizations predict that some 80 per cent of added capacity up through 2020 will stem from fossil fuel sources, the data on added capacity from 2007 are contradictory. Moreover, all expectations are that the rate of growth of renewables in Europe and elsewhere in 2008 will outpace growth in 2007. Ultimately, very little is known about the likely composition of the future energy mix in Europe and/or Hungary.

With regard to Hungary, most analysts appear to underestimate its real renewable potential. Why this happens is not entirely clear. On the one hand, many analysts appear to argue that the cost of renewable energy is an inhibiting factor. As argued above, however, with a little creative thinking, it is possible to imagine ways of financing additional renewable energy potential at relatively limited expense. More differentiated feed-in tariffs that encourage in particular the development of geothermal power plants and PV solar in households, public use buildings and across commercial establishments are at least one mechanism that could be more vigorously pursued. Moreover, feed-in tariffs may trigger other factors such as the pursuit of large scale commercial PV solar and the development of PPA schemes such as those outlined above.

A second objection is that Hungary has no real potential in renewable energy. However, as noted above, bids to provide up to 1750 MWs of wind power argue against this notion. Moreover, investors in the geothermal power sector (as discussed in the supplement provided on geothermal) are likewise going ahead with small scale investments. In fact, for geothermal, estimates suggest this segment will provide more added capacity by 2013 than EK (2008) forecasts for the year 2020. Moreover, geothermal industry representatives point out that the extent of their investments will increase as the prices of competing fuels (in particular natural gas) increases. Feed-in tariffs, if appropriately structured, can be used as a mechanism to promote such investments at an earlier point in time.

Complementary measures however are required to introduce further renewable use in the broad range of building uses noted above (commercial, public use and residential). While feed-in tariffs can be used to promote PV solar, this model is not applicable for promoting far broader scale use of geothermal heat pumps. Moreover, though far broader scale use of this particular renewable resource would be particularly advantageous in Hungary –

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[64] See the Energi21 report: "A Collective R&D Strategy for the Energy Sector". (http://www.energi21.no/index.php?page_id=17).

since it significantly reduces natural gas use and only marginally increases electricity consumption, thus making the most efficient use of Hungary's carbon intensity factors – it remains inadequately promoted by public policy measures. Measures that provide substantial rebates, low interest loans, are accompanied by significant public awareness campaigns and efforts at providing adequate public information on cost are basic requirements for the success of policy efforts. Finally, though the output of such resources as geothermal heat pumps are recognized by the European Commission's Proposal for a Directive on renewable resources in Article 5, Paragraph 1(b) (COM[2008]19:23), it is not clear this has been adequately recognized by government strategies.

In conclusion, the overall cost (and thus impact on GDP) of having to meet the RES target of 13 per cent+ need not be that high. In fact, with the correct choice of tools and strategies, significantly more than this is both possible and highly desirable in the Hungarian context. Moreover, such targets can presumably be achieved at minimal cost to the government budget and even the consumer. In fact, some of these strategies could ultimately reduce end-user costs to consumers. However, as outlined above in some detail, setting up the appropriate conditions under which this goal and be achieved in Hungary is no simple matter.

7) ASSESSING THE ECONOMIC IMPACT OF THE 2020 PACKAGE

7.1. Analysis of Macroeconomic and Industry Branch-Level Impact

Though all eyes are fixed on the potential economic impact of responding to the climate challenge, this is presumably the most difficult aspect to predict. Moreover, studies attempting to predict this impact arrive at wildly different conclusions. The recent OECD Environmental Outlook to 2030, for example, estimates that only 3 per cent of total economic growth up to 2030 would be lost if countries were to respond (or 0.03 per cent per year, OECD, 2008:24).[65] The Gazdaságkutató Zrt. (herein GKI), on the other hand, estimates that under a business as usual model (BAU), Hungarian GDP can be expected to grow by 60 per cent by the year 2020 and to increase energy use by some 127 PJ, or approximately 11.4 million tons CO2 equivalent.[66] Based on the very crude calculations presented above, without any further technological change or energy efficiency improvements, Hungary could potentially see an increase of GHG emissions by some 67 per cent, overshooting its

[65] The U.S. Department of Energy's Energy Information Administration recently predicted that, with the potential introduction of the Lieber-Warner cap and trade bill (S.2191), economic growth would be 0.2 per cent to 0.6 per cent less than anticipated levels by 2030 (DOE-EIA, 2008:xi). The Lieberman-Warner cap and trade bill failed to pass in the US Senate in July 2008.

[66] Based on private communication with the GKI and the GKI's preliminary report (2008: 28).

2020 target by approximately 55-56 million tons CO2 equivalent (Table 2). In this regard, the implied costs of fulfilling the EU's 2020 target criteria are potentially substantial. However, this estimate is presumably on the high side, while that of the GKI is potentially on the low side. With effective mitigation strategies however, this number should ultimately be much smaller, potentially even below the EU 2020 target.

Despite the wide array of available cost estimates (in addition to the above, the following should also be mentioned: the *Stern Review*, the IMF's *Climate Change and the Global Economy*, the Commission Joint Research Center's *2030 and Beyond*, and of course the Commission multiple *Impact Assessments* in the context of the *2020 Climate Change Package*),[67] there is relatively little consensus either on the best strategies to choose or even their potential cost in real economic terms.

In general, the predicted size of the potential economic impact associated with responding to climate change is very small. In Hungary and potentially elsewhere, other factors, such as changing oil prices, budgetary imbalances associated with election year spending, austerity policies linked to the drive for EMU, mismanagement of the electricity market, *etc.* may potentially have far greater impacts on overall GDP and competitiveness. Moreover, as should be clear from the above analysis, a very significant amount of the impact depends on the structure of the EU policy approach. As argued above, without significant changes in the European-level policy approach, in particular with regard to improving flexibility across the ETS and non-ETS sectors, with the current approach to the GO green certificate system and with the choice of base year, the EU's 2020 Climate Change Package could have comparatively negative consequences for Hungary. If some of the alternative approaches discussed above are chosen, the impact could ultimately be far more favourable. As a result of these factors in particular, it is exceedingly difficult to provide adequate predictions of the overall impact on Hungarian GDP.

At the same time, much also depends on the choices Hungary makes. Estimations of the cost of mitigation greatly depend on the assortment of climate mitigation strategies governments choose. Countries can, for example, opt for relatively low cost strategies (*e.g.* introducing passive solar considerations into building codes, planting more forests) – and allow for incentive-based strategies (*e.g.* feed-in tariffs and other methods that encourage both industry and private individuals to undertake much of the required investment), or they can opt for higher cost strategies (direct state and/or public sector investment in plant and mitigation technologies).

Finally, one additional reason there is variation in estimates of the economic impact of mitigation strategies can be explained by the failure to include the multiplier effects resulting from public expenditure. In this regard, the "costs" imposed by mitigation requirements also represent "salaries" and potential future consumption. One of the best examples of this is provided by Germany's estimates of the cost of its feed-in tariff policies. Alongside the numbers on electricity generation from renewable sources, the last column of data presents numbers on increases in employment in the renewables industry (Appendix C). In fact, many countries report very positive employment effects from the growth of and support for the renewables sector.

The basic economic impact of climate mitigation strategies will be passed onto consumers through three basic channels: first, through increased energy costs (due to the ETS imposition of carbon-related costs), second through increased

[67] There are likewise numerous studies of the potential costs for individual countries and economic sectors.

product costs (both through increased energy costs and the cost of mitigation or purchasing carbon credits in the ETS sector), and third through the cost of increased government expenditure, in particular that additional expenditure not compensated by reduced spending in other budgetary sectors. Most changes in government expenditure will result either from increased support to individuals, households and firms (*e.g.* for energy efficiency investments, through rebates, tax incentives and other programs), increased infrastructure costs, transmission network investments and increased investments in public sector buildings.

At the same time, the positive spinoff effects of such expenditure should generally be expected to be beneficial for the Hungarian economy. As argued above, assuming the right policies are pursued, renewables investments should be broadly manageable and energy efficiency investments should ultimately have the effect of promoting a better allocation of resources and overall economic competitiveness.

7.2. The Industry and ETS Sector Impact

For ETS sector power plants and branch industries, the initial and even long-term impact of the 2020 Climate Change Package is potentially more problematic and ultimately depends substantially on the final shape the package will take. As argued above, there are several significant deficiencies in the general package, several of which will have a significant impact on ETS sector firms. First, the lack of flexibility in current proposals across ETS and non-ETS sectors means that gains in the non-ETS sector cannot be made available to the ETS sector. Second, the current policy structure imposes most of the emission reducing burden on the ETS sector alone – in particular in the countries of Central and Eastern Europe (including Hungary). This imposes potentially significant costs on the ETS sector and ignores potentially more cost-efficient emission reductions in the non-ETS sector. Third, current proposals create powerful incentives to engage in energy saving investments related to electricity (and not to natural gas). Where reductions in natural gas use are potentially more cost-efficient, unless they have an impact on the reduction of direct (on-site) emissions, they will have no impact on the potential to sell ETS sector carbon credits. This incentive makes no sense since, in Hungary at least, natural gas use is more carbon intensive than electricity use. Moreover, for ETS sector firms, this incentive may artificially restrict the range of potential energy saving choices.

None of these issues are raised in the current proposals introduced by the European Commission on January 23rd, 2008. As a consequence, none of these options are ever considered or analyzed in the several different Impact Assessment documents (in particular SEC[2008]52 and SEC[2008]85-V2) provided by the Commission. This fact greatly complicates the analysis of the real impact of EU policies and possible alternative scenarios on industry branches. As argued throughout above, it would ultimately be preferable for the EU to adopt a number of alternative strategies or modifications of the existing plans. As argued above, these alternative scenarios represent potentially more efficient strategies than the ones currently proposed and they would typically have a far better impact on ETS industry branches and the power sector.

Much more work, however, could still be done to measure adequately the potential impact on the industry branches. Just how much GHG reducing potential there currently is in each of the ETS sector branches and firms is not very clear (and thus it is also not very clear what a 20 per cent purchasing requirement on carbon allowances with 1.74 per cent annual digressivity over the period 2013–2020 really means for each of the branches and firms). The industry surveys presented below provide some information on this point. However this analysis could go much further.

Moreover, as argued in this document, it would be advisable to have a clear picture of the different types of GHG emissions in the ETS sector (and how accurately they are measured). In particular, data on direct on-site GHG emissions would be helpful (with some indication of whether these are production process related or the result of building use – *i.e.* heating and cooling) and data on indirect GHG emissions (*e.g.* those related to electricity consumption or building use that is potentially not measured in ETS sector building use-related emissions). Without this data, it is difficult to provide a more detailed response about the ideal, most cost-efficient and GHG-reducing strategies ETS sector branches and firms might pursue. Moreover, it is difficult to adequately measure the impact of distortions of the current proposed EU policy framework.

The following section analyzes the impact of the Climate Change Package on the individual industry branches.[68]

[68] For the most part, the documentation used for the industrial branch analysis was produced by the GKI (Gazdaságkutató Zrt.). Thanks go in particular to Judit Barta for making this documentation available. Where this report does not draw from GKI documentation, it relies on formal interviews conducted with individual branches or on documentation supplied by individual branches. Thus the information supplied in this analysis, for the most part, reflects the views of the industrial branches. Only rarely were additional supplementary materials called upon to counter the views of the industrial branches.

7.3. The Brick and Ceramics Industry

The production of brick and ceramic products requires an extraordinary amount of energy. Thus these industries play an important role in carbon dioxide emissions. Brick production is primarily a local industry. Producers typically transport their products no more than 200 kilometres from the original place of production. Thus this industry typically does not compete with the products of distant countries. On the other hand, this also makes it impossible for those domestically produced goods to reach a market that would ensure increased growth potential (including the Chinese marketplace). Thus the increased costs resulting from the EU Climate package only represent a potential competitive disadvantage with respect to countries bordering the EU.

The globally competitive position of the ceramics industry, on the other hand, is very different. Both sanitary products and the tile-producing industry still measure up to global competition. China, however, has broken into this sector in a big way. China's share of the world market in 1998 was 16.6 per cent and increased to 40 per cent in 2006. Thus import-competition is strong in this segment. In the domestic (and the EU) sanitary and tile-producing sectors, the increasing costs incurred from carbon trading create real competitive disadvantages with respect to the global marketplace.

The characteristics of these two industries in Hungary are that small, medium and large enterprises all exist. For the most part, the SME's are primarily under Hungarian ownership, are capital poor and do not really develop their own products or production processes. In general, larger firms are typically foreign-owned and affiliated with capital-rich firms or production plants. Far more R&D-type activities occur in these firms and they likewise exhibit a greater capacity to bear financial burdens.

Concerning energy efficiency, these branches have progressed significantly with respect to their ability to precisely control temperature changes in the production process. For the most part, this was the result of a change in the source of fuel. After the 1980's, various firms shifted from using coal to using natural gas. One reason for this was that the coal mines closed their doors after the system change. However, another reason was that the rising quality of the products required more precise temperature control. In the production of tiles, a temperature of 1000 degrees Celsius is necessary. Deviations from this temperature cannot range beyond plus or minus 1 degree. With coal, it was impossible to fulfill this requirement. This problem was resolved with the introduction of natural gas. This switch also led to a significant reduction in the sector's emission of damaging substances. Due to the technological requirements, a shift to either electricity or natural gas use is not likely.

Understandably, this sector emits a considerable amount of wasted heat. The large, capital-rich firms for the most part re-use this heat energy. However the SME's in general are not able to re-use this energy source, in part because of the related financial obstacles. By re-using wasted heat (*e.g.* for the pre-heating of basic materials), these firms could reduce their use of primary energy resources by some 30 per cent.

Another method for reducing the energy bill would be for these firms to produce a share of their own energy and to pursue this in the form of "co-generation". For the time-being, this possibility remains only a distant vision. Though for some of the more capital-rich firms this is a real option, it also poses serious constraints. In general however, there are not very many large firms in this sector and most firms locate relatively near sources of primary materials. Thus generally, the sector is not very concentrated. The construction of plant-specific energy production facilities in general would not produce significant returns. Even where relatively large producers are concerned, production is in general so dispersed in multiple plants that it is generally not worth building a stand-alone energy generating facility. Moreover, co-generation facilities imposed significant financial obstacles not only for SME's but also for larger firms.

The presence of consumer associations however introduces new possibilities. In this case, several large consumers (for example factories, schools and other public institutions) can form associations and build their own power plants. In this case, in could be profitable to build one's own power plant.

Transferring costs on to consumers however is difficult to do. For example for bricks, substitute products exist such as construction materials for light-frame houses. An additional problem is that the current fall in domestic growth weighs in particular upon the construction industry and those construction material suppliers who are linked to them. The decline in real incomes reduces the number of residential renovations which has a dampening effect on the demand for tiles and sanitary products. Brick production, on the other hand, is closely linked to the construction of new houses. This sector would have found it easier to bear the burden of the environmental challenges if GDP had been increasing at the same time. Rising costs in the ceramic tile sector also have a constraining effect on improvements in the concrete and steel-based tile sector.

As a result of being included in the ETS sector, some SME's will finally be forced to close down. For these firms, the possibility of re-locating production beyond Hungary's borders is generally not an option. Many of these firms are frequently small-scale family or community-based operations. For larger firms, it is likely that the least efficient plants will be forced to shut down.

Joint implementation (JI) and clean development mechanism (CDM) investments remain a possibility for the larger firms. Some of these types of investments have already been undertaken in the Ukraine, Poland and Russia. The fact that more and more former CIS states are interested in efficient brick and ceramic industry technologies presents additional opportunities.

During the first ETS period (2005–2007), most of the brick industry was able to sell carbon quotas and few firms in the ceramic industry were required to purchase additional carbon allowances.

Concerning brick production, it is important to emphasize that energy use is not the only source of carbon dioxide: so-called "technical emissions" are also a source. One of the basic materials added to bricks – intended to improve insulation capacity – results in the release of carbon dioxide during firing. This type of emission can even amount to 30-40 per cent of total emissions. In order to reduce these emissions, it would be necessary either to reduce production or to reduce the use of these insulating materials. However, this would also have the effect of reducing the insulating capacity of the bricks. Thus there does not appear to be any convenient or easy way of reducing these emissions. One possible solution however would be to switch over to a straw or some other agricultural waste product. Because materials of this type are incinerated during firing, they can reduce the use of natural gas. Switching to biomass as a fuel source is also possible, but runs into problems due to the availability of supply.

Potential future energy efficiency investments could include such measures as bio-solar drying, but would also require more labour resources. Future investments will not likely to be carried out due to the uncertainties in the future business climate.

7.4. Cement and Lime Production

Restrictions on carbon dioxide emissions are a cause of great concern to the cement producing industry. Nonetheless, this branch was able to stay within its quotas. But from 2008, this branch will become a net-purchaser of quotas.

Though the share of technical emissions varies substantially based on the type of production, they are a specific problem for this branch (in 2005 they amounted to 58.4 per cent of total emissions). Oddly, this share has declined in recent years and is likely to continue to decline in the near future. Though not all cement producing firms have done this, the principal reason is that the cement industry is gradually shifting over to new fuel sources. Due to persistently increasing natural gas prices, many firms have switched from natural gas to coal and coke. These energy sources however are significantly more carbon intensive.

There are several possible ways of reducing technical emissions in this sector:

(1) One can modify the composition of the raw materials that end up in the furnace with different additives. Though related attempts have been successful, their impact has not been significant. Additional problems arise from the fact that the price of these additives (slag compounds) has risen due to rising demand and the increasing uncertainty regarding a predictable, long-term and cheap

future supply. Thus far, many production plants have been using biomass. But the future of this energy source and the technology requirements create significant obstacles.

(2) One can improve overall energy efficiency. Significant developments emerged in this sector after the system change and energy use has consistently been reduced. Producers are now using best available technology and the Hungarian cement industry is the 10th most efficient in Europe. Even waste heat is now used in this sector.

(3) The share of additives in the slag compounds could be increased. However, this ultimately does not depend on the producer but rather on the consumer and in any event is limited by the role of market demand. However, when used for the construction of bridges, builders require cement with high slag-content. Thus this method does not offer a significant option for reducing emissions.

The cement industry is suitable for burning waste as the atoms in the materials are broken down by the high temperatures and the particularly damaging elements are not absorbed into the atmosphere.

Although rising energy prices have already posed a significant challenge to actors in this sector, carbon quota regulations raise their costs even higher. The requirement of buying even small amounts of carbon allowances already unequivocally results in the destruction of their competitive advantage, in particular with regard to Slovakian, Ukrainian and Croatian producers. Domestic demand for cement is covered approximately 80-85 per cent by domestic Hungarian firms and the remainder is imported. Due to high transport costs, the sector is not exposed to global competition. Currently Ukrainian and Croatian producers are not burdened by the ETS regulation. Slovakian producers, on the other hand, received a much higher quota than necessary and thus production can continue to increase there.

Even accepting the fact that the firms in the sector received their initial quota free-of-charge and are only required to purchase carbon allowances for emissions that surpass the original quota, the ETS regulation causes such a significantly high rise in costs for this sector that already at the price of 20 euros per ton of CO2, firms produce at a loss.

The increasing rigorousness of GHG regulations also affects firms attempting to procure slag. Quota costs also weigh on slag producers and these costs trickle down through supply costs to cement producers, further exacerbating producer costs.

Due to the very high share of technical emissions in the cement industry, emission reductions of 21 per cent are not realistic. Thus all surplus emissions will require the purchase of additional carbon allowances. Emissions could be drastically reduced if producers shifted back to natural gas use, but this option is made difficult by the rising price of natural gas.

Similar problems confront the production of lime. Technical emissions are significant, there are few potential ways to reduce them and the plants have already employed BAT-technologies. Despite the stagnation of product prices, supply costs have risen some 60-70 per cent.

7.5. Steel and Iron Production

In the first ETS trading period, most steel producers were able to remain within their allotted quotas and many were able to sell unused carbon allowances. In fact, due to the initial free distribution of carbon allowances, many firms were able to take advantage of remaining production capacity without being required to purchase additional carbon allowances. Though many of the interviewed firms expect their production to rise in the future, none of them were willing to admit they will able to meet the 2020 CO2 emission targets without having to purchase additional carbon credits.

In general, the firms in this sector use developed technologies. Thus, the potential for achieving additional emission reductions is relatively small. Among these possibilities, shifting to and modernizing existing natural gas burners will not yield significant emission reductions. In recent years, including the present, firms have carried out significant investments in energy efficiency thanks to which the reduction of particularly dangerous emissions has been possible. Though many firms already make use of waste heat, some energy efficiency improvements are still possible in this area. Shifting to electricity or natural gas use is not a reasonable option and renewable resources are also not an option due to the high temperature requirements in the sector. Other firms have not initiated the use of renewable energy sources due to difficulties in obtaining permits.

Varying measures of success are likely to confront steel sector firms attempting to adjust to the additional costs resulting from the ETS system and the elimination of free carbon credits and to competition in the international marketplace. Some steel product categories have experienced sharply rising demand in recent years (*e.g.* hot-rolled products) and thus will likely survive these rising costs. For those subcategories that exhibit high CO2 emissions or that produce raw materials for other segments of the steel industry, it is quite possible these firms will move beyond the EU's borders.

The interviewed firms are not planning any JI or CDM projects.

The firms in this sector are seriously contemplating the 20 per cent emission reduction target and are considering different ways to improve energy efficiency. Depending on the firm, where there is some potential to reduce emissions this strategy is frequently limited by the vertical nature of production in the steel and iron sector. Thus most firms will be required to purchase carbon credits.

7.6. Aluminum Production

Things similar to those said about actors in the iron and steel producing sector can also be said about aluminum producers. In general, the firms were able to stay within the quotas and thus there was no significant need to purchase additional carbon allowances.

The energy efficiency of the sector is continuously improving. However, since the share of energy represents the largest share of the budget for these firms, improving energy efficiency has been one of the principal investment concerns. In recent years, energy efficiency improving investments have been continuously pursued and, thanks to these, energy use has been significantly reduced. Both natural gas and electricity are used as energy sources in production. Since these are the most suitable energy sources, no switching to other energy sources is likely. Due to the high temperature requirements, renewable energy sources can only be used in moderation, typically only for heating and hot water. Cogeneration is not unknown in this sector. Companies buy power from plants that produce cogenerated electricity. In recent years, the construction of biomass-based power plants has also been considered. But the current price of biomass and the unreliable nature of the future outlook for this energy source pose obstacles for such plans.

Reducing emissions from dangerous substances is also not a real possibility due the technical problems. One solution is the substitution of aluminum waste for the basic raw materials. This would dramatically reduce energy consumption. However, this option is limited by the availability of aluminum waste.

A second possible solution involves shifting away from those products that are most strongly affected by the introduction of carbon quotas and toward the production of higher value-added products. Transferring increased costs on to customers is also a potential solution.

7.7. The Chemical Industry

The EU's 2020 Climate Change Package also affects the European chemical industry in several ways. Listed below are a few of the more important examples:[69]

* The European chemical industry is an important user of energy: representing 12 per cent of EU energy demand.
* The EU chemical industry is responsible for 16 per cent of total CO2 emissions in the manufacturing sector.
* In the past 10 years, the EU chemical industry has reduced its GHG emissions by 6 per cent.
* The majority of EU chemical sector firms are small and medium-sized enterprises (totalling 20,000) whose GHG emissions are comparatively small.
* The chemical industry is developing into an important factor preventing climate change.
* Trade in chemical industry products is global and international competition must be considered.

The impact of the principal plans on the chemical sector:

* An increasing share of the carbon allowances in this sector will be auctioned in the future and auctioning will soon be the principal mechanism for distributing carbon allowances. However, the EU's role in auctioning carbon allowances imposes a unilateral, EU-specific price burden on firms whether they work at maximum CO2 efficiency or not. Moreover, due to the impossibility of calculating future carbon prices, auctioning results in considerable uncertainty.
* The power of the EU ETS system is increasing:
    - o The definition of incinerating devices is being broadened such that, as a result, more chemical sector activities will come under its purview. (In Hungary, this already happened previously).
    - o The inclusion of new activities:
        - ▪ Emissions from aluminum producing firms.
        - ▪ In the chemical sector eight activities: producers of carbon from the charring of organic materials; nitric acid producers; adipin acid producers; producers of glyoxal or glyoxil acid; producers of ammonia; producers of organic elementary substances by cracking, reforming; producers of hydrogen and synthetic gases by reforming or partial oxygenation; producers of sodium carbonate and sodium hydrogen carbonate.

[69] The following is based on documentation representing the explicit view of the chemical industry association.

- o New GHG-producing substances are also being included in addition to CO2. N2O in particular presents a problem for the chemical industry.

* Sectors that are placed at risk as a consequence of their emissions (for those producers who are not able to pass on rising prices and are thus obliged to move beyond the EU's borders, thus raising global emissions) will be able to receive free CO2 allowances based on benchmarking. By June 30th, 2010, the Commission will determine which branches are affected and will review this decision every three years.

The most important messages from the chemical sector:

* The relocation of firms and technologies and rising CO2 emissions at the global level.
* The current situation is decidedly complicated. A working system is necessary that would both easily monitor and also maintain competitiveness and production within the EU's borders.
* Flexibility is necessary, in addition to the ability to exploit the possibilities of JI/CDM projects.
* Predictability must be established over the long term (thus reviews that occur every 3 years are not a viable option).
* The free distribution of carbon allowances based on the BAT-benchmark better serves the internal market than the auctioning of carbon allowances.
* The energy intensive branches are particularly exposed (this represents a big risk for the chemical sector due to its relative complexity, the integrated structure of its branches and the difficulty of protecting it against exposure).
* Chemical industry representatives suggest that the procedure for the eight special branches should be based on the free distribution of carbon allowances based on the BAT benchmark.
* Small firms with relatively low emissions should be excluded.
* Methods for clarifying indirect emissions should be clarified.

7.7.1. The Opinion of the Chemical Sector on the EU ETS

The Hungarian Chemical Industry Association supports international cooperation against climate change and in this regard the general ambition to reduce greenhouse gases. In this regard, it proposes the elaboration of a new international cooperation framework that would also incorporate the largest emitting countries. This would make it possible to pursue a long-term strategy for reducing greenhouse gas emissions without distorting economic competitiveness.

Unilateral measures cannot guarantee the reduction of greenhouse gases at the global level and severely threaten the competitiveness of European industry – in particular that of the energy intensive sectors. Since chemical sector firms are substantial energy users and use technical processes that emit large amounts of GHGs, the chemical sector is the most seriously threatened sector. Since the chemical sector is exposed to strong international competition, if it wants to remain competitive, it will not able to meet the costs of purchasing additional carbon allowances for CO2 and GHG emissions through the ETS system. According to the chemical industry, it is unacceptable and technically unjustifiable that the constraint of having to purchase carbon allowances should penalize firms that already employ carbon and energy efficient technologies.

Appropriate amendments are currently missing from the long-term 2020 strategy and thus complete uncertainty presents significant obstacles to investor planning. The chemical industry typically plans technology change out over several decades. This legal uncertainty inevitably leads investors to move development plans beyond EU borders. As a result, Europe loses jobs and incomes while global level emissions are not reduced. Rather, they increase ("carbon leakage").

The interviewed firms did not use up their quotas in the first ETS period. However, in the second period, some firms were required to purchase additional carbon allowances. Several firms have already made efforts to reduce their CO2 emissions. Some of them have switched from heating oil to natural gas, leading to significant emission reductions. Due to intense competition, energy efficiency has also been an important strategy and many firms already employ BAT technology. The use of waste heat is common and most actors in the chemical industry make use of this energy source. Where firms produce their own power, cogeneration is frequently used. Many energy efficiency improving investments are also now underway at the interviewed firms. Since the chemical industry is a significant electricity-user, the elimination of free quotas in the electricity-generating sector is likely to raise prices for the chemical sector. The chemical sector however is not in a position to pass on these costs. Thus their competitiveness is likely to deteriorate.

Firms (including the larger ones) in the chemical sector have no plans for the realization of JI/CDM projects. This typically is not part of their general profile. Emission reductions are thus usually pursued within the firm and the 2020 targets will most likely be resolved by purchasing carbon allowances and being obliged to accept the damage to their competitive position.

7.8. The Paper Industry

Paper production itself does not give rise to CO2 emissions. However the production process does require a significant amount of energy. For the most part, paper producers were able to abide by their quotas. Few had to purchase additional allowances while most firms could sell surplus allowances.

Domestic paper consumption grows at an annual rate of approximately 4-5 per cent and can be expected to continue growing over the next 5-7 years. Domestic producers fulfill 60-70 per cent of domestic demand, the remainder is imported. The most significant competitors are in Europe and the Far East. Due to the continuous rise in energy prices and increasingly intense competition, Mondi Szolnok Zrt was obliged to shut down operations on March 20th, 2008 due to increasing losses. This provides a good example of the competitive situation in the sector. Actors outside the EU (in the US and the Far East) are not constrained by the requirement of purchasing carbon allowances. Thus the profitability and competitive position of European producers is deteriorating. Rising energy prices have a noticeable impact on expenditure and product prices are not able to keep up with the changes.

In the last 10 years, firms in this sector have significantly improved their energy efficiency. The energy required to produce one ton of paper (whether electricity or steam energy) has been reduced by 20-40 per cent. Though there is still room for improved efficiency, current Hungarian paper producers exhibit a high degree of efficiency.

Many firms acquire the necessary energy directly and in significant amounts from the market. Where this is not the case and firms produce their own energy, several different energy sources are used. Though some firms are 100 per cent users of natural gas, others use oil and some newly built factories also use up to 85 per cent coal-based energy.

Within the sector, it is meaningful to distinguish between cellulose and paper producers. In one Hungarian cellulose plant, 70 per cent of the energy comes from biomass and more biomass use is planned. In another carton producing plant, however, 100 per cent waste paper is currently being used.

Competition is strong in both sectors and the branch as a whole competes with the global market.

The respective firms have no plans for JI or CDM ventures.

The paper industry is unanimous in its opinion that, as a result of the modernization process, the past years' investments have significantly increased their energy efficiency. Future potential for improvement in this regard is thus relatively limited. Thus energy efficiency improvements of 20-40 per cent will not likely re-occur in the future. The elimination of free quotas in an already tight market further damages the profitability of these firms and creates advantages for producers outside the EU.

7.9. The Glass Industry

Glass production results in CO2 emissions from two sources. One source arises from the natural gas used to heat the smelting furnaces from which approximately 70-90 per cent of the CO2 emissions arise. The other source is the technical emissions that arise from the chemical effects of heating the raw materials (soda, limestone, dolomite and coal). These make up a total of 10-30 per cent of emissions.

In order to improve energy efficiency, firms can employ oxygen-burning technologies. However, this is a very expensive process and only results in a significant reduction of emissions in a small number of cases. The higher degree heating potential of natural gas does raise overall energy efficiency. The use of glass cullet (recycled container glass) is also a potential solution, but it does not result in a significant reduction of CO2 emissions. Though domestic glass collection for recycling purposes fails to provide an adequate supply, several firms are able to buy glass cullet from the larger Central European regional marketplace.

In general, the energy efficiency of the existing smelting furnaces rises above the West European average. Thus one cannot count on significant potential for improvement.

Most glass industry companies were able to stay within their quotas during the first ETS period and during the second period (2008–2012) few purchases of additional carbon allowances are likely. The majority of firms count on the stagnation of, or a minimal reduction in, CO2 emissions. This will result from the gradual aging and replacement of smelting furnaces and the related rise in efficiency, as well as from the use of CO2-reducing technologies.

In the past period, there was no change with regard to the choice of energy sources, thus it is unlikely one can count on this in the future periods. 100 per cent natural gas use has already been realized in this sector. The use of waste heat has been experimented with in a few plants, but has not resulted in significant improvements in energy efficiency.

Firms tend to respond very differently to the elimination of free quotas. According to some, this would not worsen their competitive position. Some think they would even be able to gain revenues from this. According to others, however, products coming from the Far East are likely to compete more and more strongly with European products. Thus this would result in a loss of profitability. Many regard the consistent rise of domestic natural gas and electricity prices as a real threat.

According to experts from the Hungarian Glass Industry Association, the glass sector will not be able to stay within the 2020 quotas. Some firms think it is conceivable that this will favour using waste- or recycled glass.

Firms in the glass sector are not planning any JI or CDM-type projects.

7.10. District Heating

District heating firms have so far been able to stay within their quotas. There are many reasons for this:

* They generally received surplus quotas.
* Production has declined (favourable weather conditions, consistent progress with insulating residential buildings)

These firms are not likely to be able to remain within their 2020 quotas. On the producer side, there are several opportunities for improving overall efficiency, such as the use of flue gas or geothermal energy (see the geothermal supplement). Several firms are thinking about the possibility of using renewable energy or how they might be able to add more co-generation capacity. But there is ultimately more potential for CO2 emission reductions on the side of consumers and reducing the demand for heat. These firms are persistently investigating the potential for improving efficiency.

In the past 15 years, there has been considerable change in the use of energy sources. Solid fuels and heating oil have given way to natural gas use. The newest district heating plants typically use 100 per cent natural gas.

Concerning the elimination of free quotas, this above all is likely to reduce the competitiveness of the larger firms – smaller firms are not subject to the ETS requirements. Despite the fact that this is not a supply-dominated market, the increasing costs resulting from the quotas are difficult to pass on to consumers. The renunciation of district heating represents the sectors principal barrier to raising prices. In particular, subsidized natural gas prices make alternative heating systems more favourable. The persistent rise in natural gas prices and the comparatively fixed nature of market prices significantly narrows district heating profit margins.

These firms do not currently plan any JI/CDM-type investments. However, should carbon prices go sky high, they will consider this option more carefully.

7.11. Conclusions based on the situation of the industry branches

After the system change, for the most part the various sectors of Hungarian industry underwent significant privatization or simply closed down. The least efficient firms completely shut down. Those firms that continued operations undertook significant developments. During the 90s and even up through the years following 2000 the types of technologies that were imported into the country were among the best and the most efficient in individual sectors.

With the rise of energy prices, these developments received continued support. Investments pursuing greater energy efficiency and reducing the emission of damaging substances were at the top of the agenda. Thanks to these investments, the large energy intensive sectors are able to compete efficiently with European firms. However, in some sectors, the strength of global competition resulting from the price-competitive impact of Far Eastern firms represents a significant factor.

The efficiency of raw material use has increased significantly in recent years. An evolution of comparable magnitude is not likely by 2020. Industry is already an efficient user of raw materials. Thus it is unlikely that the affected sectors will be able to attain their targets and thus remain within their allotted quotas. Thus these firms will be required to fulfill these goals by purchasing carbon allowances. Most firms do not plan JI or CDM projects. However this fact could easily change if the price of purchasing additional carbon allowances goes sky high. On the other hand, significant limitations are imposed by the fact that JI and CDM type investments are complicated and often do not really fit well into the investment plans of individual firms or sectors.

8) Some Ideal Carbon Mitigation Strategies Emerging from this Analysis

Since a key element in keeping costs and the overall impact on GDP down is the pursuit of effective national-level strategies, ample attention should be paid to the type of strategy most likely to reduce overall costs. Some general strategies that might be pursued in order to keep costs down are the following:

(1) Introduce building codes that require attention to/consideration of passive solar and other emission reducing features in all buildings (not just residential buildings). Other emission reducing features include: geothermal heat pumps, sun collectors for hot water, high insulation factor requirements and other features focused in particular on reducing natural gas dependence.

(2) Aggressively promote energy efficiency investments in private household, large-scale residential, public use, municipal and other public sector, commercial and industrial buildings (factories, warehouses, office buildings, *etc.*).

(3) Aggressively promote low energy use appliances (compact fluorescents, low energy use TV's, refridgerators, computers and other high efficiency electronic appliances).

(4) Use the EU energy sector liberalization program as a strategy to open up access to and break MVM's control of the Hungarian energy grid (transmission network) – in particular with respect to the development of renewables (wind, solar, geothermal and biomass).

(5) Use differentiated feed-in tariffs to promote diversity in renewables (esp. base load power sources: geothermal power plants, but also household use of renewables, in particular PV solar).

(6) Combine a rural development strategy (drawing upon EU rural development funding) with a strategy for promoting regional and local energy independence – in particular by promoting local and small scale renewable energy production (wind turbines and/or small hydro).

(7) Extensive re-a-forestation.

9) Conclusions

How the EU's 2020 Climate Change Package will fair in the EU legislative process remains unclear. Though decisions must be made quickly, both to adequately prepare the groundwork for the next round of negotiations over Kyoto II and to stem the tide of climate change, there is a good chance current EU negotiations will encounter substantial resistance. Though the EU potentially provides a framework for fairly distributing the burden of reducing GHG emissions, the EU has so far been unsuccessful in doing this. To-date, most of the "burden" has been transferred to the Central and East European new member states. While this fact produced little resistance for the first Kyoto round, current negotiations are likely to produce far greater resistance.

Fairness in burden-sharing presumably means the more advanced EU member states – in particular those with higher per capita GHG emissions – should bear a significantly higher share of the burden. Moreover, the burden should presumably be based on a measure approximating both fair and sustainable usage of the world's environment in the international sense: *i.e.* an GHG emission level that is directly correlated with a state's share of the world population. At the same time however, new targets should presumably taken into account progress already made (or the failure to make progress).

To-date, the EU experience leaves little assurance that such a fair distribution of the burden can be achieved. For one, the lack of transparency behind the choice of GHG emission targets and the choice of base year make genuine consultation and negotiation difficult. As an exercise in policy formulation and evaluation, this is an excellent example of how not to do things. More importantly, many of the policy proposals themselves – as currently formulated – seem ill-suited to achieving the important goals of climate mitigation. Thus, several of the policy proposals, in particular the choice of a 2005 base year, the lack of flexibility across ETS and non-ETS sectors and the choice of an undifferentiated GO green certificate system seem either strongly tilted toward Western interests or simply ill-suited to the important task of pursuing the introduction of diverse renewable energy sources, greater GHG reductions and high levels of energy efficiency. This report notes with some concern that these obstacles could potentially jeopardize the future of the proposed 2020 Climate Change Package.

Given the overall importance of responding to the challenge of climate change, these points require immediate resolution. A first step in this regard would be to require the release of the relevant data and mathematical models to public and scientific scrutiny. A second step would be to extend the range of possible Impact assessment scenarios in the manner suggested above. In particular, considering greater flexibility across the EU ETS and non-ETS sectors would seem a crucial component to adequate analysis of the possible policy scenarios – in particular for Hungary. A third step is to consider revision of the EU-level GO green certificate model. A fourth step is to consider alternatives to the currently proposed targets – in particular one based on per capita emissions but set at a level that fairly and accurately recognizes past achievements (as of 1990 or the respective base year). Such a strategy is likely to facilitate greater intra-EU cooperation and may help to eliminate many of the current roadblocks to a successful resolution of the EU's 2020 Climate Change Package.

The consequences of failure to make these basic changes in the 2020 Climate Change Package are quite serious. For one, strict divisions across the ETS and non-ETS sector could ultimately have the disturbing impact of promoting energy efficiency and emissions reductions investments where they are likely to have the weakest, not the strongest, impact. Moreover, the failure to adequately incentivize the state is likely to mean that Hungary (and presumably also other countries) will have a far more difficult time obtaining the goals set out in the 2020 Climate Change Package. For another, the current GO green certificate proposal is entirely inadequate for responding to the goals of diversity in renewable energies, the promotion of renewable base load power and ultimately the reduction of energy dependence.

On the other hand, the goals set out in the 2020 Climate Change Package are important for the survival of mankind. In that vein, the intent of the 2020 Climate Change Package is positive even if it remains inadequate in many of its current details. Thus this report strongly recommends that Hungary bargain vigorously with other states in the hopes of achieving a more efficient and effective climate change package.

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Appendix A

Country Positions on 2020 Climate Package

Problems with Base Year (2005 vs. 1990)

Probably the single most important observation is that from all of the countries that have so far submitted national positions on the proposed 2020 Climate package and related Directives, the Central and East European countries consistently mention the shift in base year from 1990 to 2005 as a significant problem. All of the CEEC's clearly prefer 1990 to the proposed 2005 base year. Arguments against the 2005 base year range from the potential loss of credit for good performance to lost transparency in the international Kyoto negotiation framework. This clearly appears to be one of the key issues for negotiation and is likely to create a significant political split across the more and less advanced, or the old and new EU member states. Countries such as Spain, Portugal and Greece do not mention the issue of the 1990 base year. This is presumably because they, like most of the advanced states, are explicitly advantaged by the choice of 2005 as a new base year (*i.e.* they are forgiven for significantly overstepping their early Kyoto targets). Denmark and Sweden however are likely to be big losers from the 2005 base year (since they have made the most progress in genuine emissions' reductions) and may be willing to support the 1990 base year.

GO Green Certificates and National Level Support Mechanisms

The second major issue addresses whether or not the GO green certificate system proposed by the European Commission has sufficient flexibility to be compatible with national-level support mechanisms. Most countries appear to favour some form of cross-country trade in renewable energy. In general however, respondents argue there is likely to be insufficient compatibility across the two systems (at least as currently defined) and most countries express the concern that the GO system represents a significant threat to national-level support mechanisms. Countries generally favour their national level support mechanisms due to the relative flexibility they offer in promoting different kinds of renewable technology. The general fear is that one EU-wide green certificate system set at one price will undermine national-level support mechanisms. The ability to offer different "feed-in" prices for energy produced from different technologies (solar, wind, tidal, *etc.*) is generally seen as an explicit advantage of the national support mechanisms.

There is some disagreement about whether a GO system would lead to one *high* GO certificate price based on scarcity of supply (Italy's position), or on a price set at the level of the most expensive energy source (Germany's position). Both Italy and Germany thus argue that the GO system as currently defined would be highly inefficient. The other argument repeated by some of the other countries who fear their national level systems would be undermined suggests that one *low* GO certificate price would emerge, making it possible to support only the cheapest renewable sources and reducing the relative diversity of renewable sources. Portugal, for example, mentions an interest in developing tidal energy sources, but is concerned that the EU-wide GO system would make this impractical.

With respect to the debate over the EU-wide GO system versus national-level mechanisms, both Spain and Portugal, despite being less developed than many other EU member states, are strong supporters of national level support mechanisms and argue against the GO system in its current form.

Given the very small number of supporters of the GO system, it is likely that this element will be either strongly modified or eliminated in future negotiations. Only the UK seems to be a very strong supporter of this model.

ETS and non-ETS Sectors

Additional issues of interest are the support from three states (the UK, Estonia and Poland) for increased flexibility or the free allocation of carbon quotas across national-level ETS and non-ETS sectors and mention of concern over approaches to energy intensive industries (in particular Italy and Romania). On the other hand, there were surprisingly few responses in this general category given its overall importance.

Energy Efficiency

Though not included as one of the categories for comment on the climate change package, a few countries noted the failure to treat this element of the package here. Germany in particular argued that energy efficiency should have a higher profile (receive more attention) in the overall discussions. Italy argued that energy efficiency should receive more attention, in particular because of its importance for the non-EU ETS sectors, and noted that countries should not be left to deal with energy efficiency issues entirely on their own. This report generally argues that more flexibility across EU ETS and non-EU ETS sectors would be an explicit advantage for Hungary (as argued in the Hungarian position). It would be far more advantageous to pursue extensive energy efficiency measures, in particular in the public sector, if these are easily rewarded under the ETS system. One problem in this regard however is likely to be the degree of verifiability of the resulting GHG reductions.

Sustainability (Biofuels and Biomass)

In general, countries support the initiative to create sustainability criteria. Very few countries argue against establishing these criteria and a few even argue in favor of extending the sustainability criteria to include economic and social criteria in addition to the current environmental criteria. Countries wishing to extend the criteria tend to be concerned about the potential negative impact on food production (rising costs) and land use (loss of bio-diversity).

The greatest amount of conflict in this category is likely to come from divisions over how strongly the EU should support free trade in biofuels (and/or biomass). A few important countries (in particular France and Poland) are resistant to the introduction of free trade. Most countries however support the concept of free trade and are likewise usually supportive of extending sustainability criteria to the trade regime. It may ultimately be possible to get countries that oppose free trade to agree with the guarantee of imposing strong sustainability criteria on both internal EU trade and trade with third countries.

CCS

There is typically little or no discussion of CCS in the country position papers. There does not appear to be strong opposition to this goal. But neither is their strong support (if one can interpret the lack of response in this way). In general, where CCS is mentioned, there is likewise support for further research on the technology (in particular from the coal-rich states Poland and the UK and from the Netherlands which has set on a CCS future and has at least 2 demonstration projects). It is interesting that there was little mention of CCS in the Finish position paper, since at least one private sector project to develop CCS in Finland is known to the authors of this report. At the same time however, caution against excessive (especially financial) support of CCS is warranted. As this report mentions, this technology is still under development and there have been no successful "demonstration projects" to-date. The timeline on these projects comes much too late to be helpful for meeting the EU's 2020 target. On the other hand, if successful, such a technology could go a long way to contributing to GHG reductions in 3rd countries (for example China).

Table 1
General Comments

	General	Additional comment
Belgium	Support but want more flexibility and fairer burden-sharing (no detail provided)	Need cooperation/participation from other developed countries
Britain	Support	Higher levels of free allocation, prevent leakage
Cyprus	Emphasize special national circumstances	Concern about RES target
Estonia	1990 as base year for GHG's	Clear rules on electricity import (prevent leakage)
Finland	Support	
France	Support	
Germany	Emphasize manufacturing competitiveness, proper account of past performance, fair burden-sharing	Step up efforts on energy efficiency
Greece	Support	
Hungary	Principal emphasis on 1990 base year	
Italy	Energy efficiency should be given more weight and not left up to states	RES and GHG targets should be revised in light of national potential in non EU ETS sectors with due weight to energy efficiency, no or inadequate cost-benefit analysis
Lithuania	Should consider progress since 1990 base year	States must also ensure energy security, economic viability, competitiveness and social welfare, emphasize national circumstances: closure of nuclear power plant, 70 per cent rise in GHG emissions related to power, 250 per cent rise in energy prices (with more expected)
Netherlands	Support	Supports 2005 base year, data from 1990 not as reliable
Poland	Heavy emphasis on competitiveness	Concerned about potential leakage
Portugal	Support	
Romania	Strong objection to 2005 base (instead of 1990 or original base year), not compensated for 1989-2005 reductions	Must include 3rd countries (leakage)
Slovakia	1990 base year	High relative costs for NMS, concern about potential leakage due to domestic GDP importance of energy intensive sectors
Spain	Support	Subsidiarity should be observed, especially concerning national level RES support mechanisms
Sweden	Support	

Table 2
EU ETS

	Division between ETS sectors and not	EU or state-level cap	Additional comment
Belgium			
Britain	Economy-wide targets (not based only on ETS sectors)	EU-wide	
Cyprus			
Estonia	No strict division, emission reductions easier in non-ETS sectors		Exclusion of SME's under 10 ktons (if adopt measures to reduce emissions)
Finland			
France			
Germany			
Greece			
Hungary	Favours more flexibility at the national level to allocate carbon quotas across ETS and non-ETS sectors		
Italy		Must determine now (not in 2011) what special arrangements will be granted to energy intensive industries to prevent leakage	Address energy efficiency here, see risk of leakage even with international agreement
Lithuania			
Netherlands	Approves recognition of CCS in ETS		
Poland	Favours no strict division, more flexibility (potential in non ETS sectors)		
Portugal			
Romania			Adopt EU-wide sectoral standards for energy intensive industries
Slovakia			
Spain			
Sweden			

Table 3
CCS

	12 demonstration projects	Comment
Belgium		
Britain	Support	
Cyprus		
Estonia	Projects should include sequestration in addition to storage, funding from 7th FP	
Finland		
France		
Germany		
Greece		
Hungary		
Italy		
Lithuania		
Netherlands	Strong support, Govt has opted for a CCS future	2 demonstration projects, thinks of as exportable technology (China/India)
Poland	Supports, would host 1-2 projects	Geological identification and specification of land & marine storage locations
Portugal		
Romania		
Slovakia		
Spain		
Sweden		

Table 4
Sustainability Criteria

	Biofuels	Biomass	Comment
Belgium	Want sustainability criteria made explicit in Renewable Directive and compatible with "quality of fuels" directive		Want effective system for evaluating sustainability criteria
Britain	Wider, more challenging criteria than currently defined		
Cyprus			
Estonia			Free, unrestricted trade with non-EU states
Finland	Further sustainability assessment, neutral raw material criteria	Forest-based biomass sustainability criteria should be consistent with existing (nat) criteria	Wants certified peat included when reduces GHG by +35 per cent
France	Favours transparent criteria		Appears to favor a "French" biofuel plan and attention to competitiveness of European biofuel industry
Germany	Early adoption of minimum requirements, should also apply to imports	Same	Address cultivation, protecting natural habitats, reduction of GHG's, risks to small farmers and food production
Greece	Taken into account national level difficulties in meeting target		Include ALL renewable energy sources in transport in 10 per cent
Hungary			
Italy	Binding targets acceptable where production is sustainable, 2nd generation fuels become available & fuel quality directive amended appropriately	Same environmental sustainability criteria should apply	Criteria must be environmental, economic and social, with clear certification mechanisms for imports, no trade-offs between, imports and 2nd generation biofuels, no import tariffs
Lithuania	Express concern that 5 per cent biofuel mix may not be compatible with some vehicles		
Netherlands	Supports sustainability criteria, should include trade		
Poland	Warns against too rigorous criteria	Wants sustainability criteria for biomass (& biofuels), no imports	Opposes import of biofuels (and biomass), particularly where sustainability criteria not met

	Biofuels	Biomass	Comment
Portugal	Already set 10 per cent objective for 2010 at national level, but should account for low prices in international vegetable oil markets		EU criteria may be too strict for national producers, support minimum 35 per cent GHG saving for "final product" but not its "components"
Romania	Favour easy free trade (in biofuels and biomass)		Clear, easily quantifiable sustainability criteria for biofuels & biomass
Slovakia	Support sustainability criteria, concerned about competition with food stock production		
Spain	Support extensive sustainability criteria (strong concern for downside effects of biofuels)		Sustainability criteria should reflect social and economic considerations, impact on food supply (in addition to environmental criteria)
Sweden			Harmonized, non-trade distorting criteria

Table 5
Renewables

	Comment 1	Comment 2	Interim targets
Belgium	Directive does not adequately guarantee targets will be met		Early interim targets may be too high for some states
Britain	Clarity on costs, effectiveness		Relax interim targets, increase portability of system
Cyprus	Targets must take into account special national circumstances	Claim 13 per cent is too high and unworkable, say 9 per cent is possible	
Estonia	Right to apply stabilizing measures with renewable price fluctuations	Limit proof origin red tape	
Finland	Problems with dependence on wood imports from Russia (sets external limit to renewable adoption?		Supports interim targets
France	Flexibility		
Germany	Emphasize importance of support system and need to insist on country obligations		
Greece	Support feed-in tariffs, simplify licensing	Concern about national potential to meet 18 per cent target, support synergy with environmental state aid	
Hungary			
Italy	Targets do no take national potential, or previous efforts into account, thus no equity in proposed targets	Should be maximum flexibility in trade in renewables, regret that national support systems not harmonized	More flexibility required, especially regarding non-EU ETS sector
Lithuania	Insufficient safeguards?	If energy consumption grows too rapidly (high economic growth), may not be able to reach RES target	
Netherlands	Supports, has also suggested nuclear fusion		
Poland	Wants to "verify" Commission methodology for arriving at RES target	More developed states should bear more of burden	
Portugal	Will surpass 2020 target, anticipate 45 per cent by 2010 (EU target requires 31 per cent by 2020)	Want longer reference period for hydropower criterion (dam project could otherwise jeopardize viability of target)	
Romania			Want to revisit interim targets, requiring heavier investment in later years

	Comment 1	Comment 2	Interim targets
Slovakia	Support RES target	Want better definition of RES in final consumption (otherwise possible data inconsistencies)	
Spain	Support RES target but emphasize importance of subsidiarity (national support mechanisms)	Emphasizes importance of cross-border & EU-wide "synergies" - require cross-border grid connections amounting to 10 per cent of installed capacity to manage RES share	
Sweden	Limit administrative burden		

Table 6
GO Green Certificates

	Comment 1	Comment 2	Comment 3
Belgium	Expresses strong concerns about compatibility of GO system and national level mechanisms	But still favor a stable, liquid and open market in certificates (if compatible with nation level mechanisms)	
Britain	Immediate, free portability of certificates	Can system be used to further reduce costs?	Relax qualifying criteria for systems coming online after 2020
Cyprus	Concerned about economic consequences of RES target and green certificate system	Emphasize importance of security and reliability of electricity networks	
Estonia	Support national level control	Only one type of guarantee too restrictive for electricity and heat markets (favor heat)?	
Finland	Ensure compatibility of GO scheme with national level incentives (concerned about this)	Wants to protect national-level incentive systems to encourage R&D	
France	Ensure compatibility of GO scheme with national level incentives (fear undermining national level diversity)	System hinders export of national level renewable production	
Germany	Favours some form of cross border transfers, but ultimately argues surpluses should be transferred at national level	Current GO proposal is incompatible with the differentiated feed-in tariff system at national level (uniform prices for green certificates will undermine national-level diversity)	GO certificate price would be determined by price of most expensive energy source, thereby creating windfall profits for cheaper forms of energy (counter-productive and expensive)
Greece	Favour feed-in tariffs	No single market for electricity, hampers GO scheme	
Hungary			
Italy	Possibility for trading with 3rd countries even where facilities already exist (encourage technology transfer, improve efficiency)	Interim requirement makes system impractical, likely shortages in the availability of certificates will raise their price beyond what is efficient	Incentive schemes should be harmonized (fear competition among different national incentive systems), GO system only possible with harmonization
Lithuania	Adequate flexibility and cost-effective	Harmonization of national level support systems would have negative consequences for current RES investors	
Netherlands	Supports trade in certificates	But notes necessity of preserving domestic level incentives systems	
Poland	Concerned about GO threat to national support systems, especially if implemented at enterprise level	Possible negative impact on RES investment at national level	
Portugal	GO system unable to promote development of diverse RES technologies	National support systems necessary to promote diverse technologies (eg tidal energy)	Must examine consequences of GO and national feed-in tariffs
Romania	Notes cost to consumers that will decline with improve technologies	Clarify role of state in having sole discretion to sell GO transfers	
Slovakia	Establish clear rules, minimize barriers to trade in GO's	Shared experience on certification processes across states could help minimize administrative barriers	
Spain	Concern that GO system could undermine good results of national support system	Feed-in tariffs most effective system (compared to GO systems or market), costs lower	Propose alternative trade in "targets"
Sweden	Criticizes lack of flexibility, state control, lack of long-term stable conditions	Will conduct more analysis of Commission proposal	

APPENDIX B

OMSZ Carbon Content Emission Factors

Fuel type	Emission factor (CO2 t/TJ)	Oxidation factor
Coking coal	94.6	0,98
Other Bituminous Coal	97.4	0.98
Lignite	112.0	0.98
BKB	94.6	0.98
Coke Oven/Gas Coke	108.17	0.98
Crude Oil	73.34	0.99
NGL	63.07	0.99
Gasoline	69.3	0.99
Jet Kerosene	71.5	0.99
Gas/Diesel Oil	74.07	0.99
Residual Fuel Oil	77.37	0.99
LPG	63.07	0.99
Bitumen	80.67	0.99
Petroleum Coke	98.08	0.99
Other Oil	73.33	0.99
Natural Gas	56.1	0.995
Biomass (Solid and Gaseous)	109.63	0.99

Source: OMSZ (2008:45, Table 3.4).

APPENDIX C

Development of electricity generation from renewable energies and mine gas in 2006 which is remunerated under the Renewable Energy Sources Act (provisional data, in some cases estimated) [1, 2, 3, 4]

	Number of installed plants	Installed capacity (new construction 2006)	Electiricity generated under the EEG (change against 2004)	CO2 reduction[7]	Remuneration paid under the EEG (change against 2004)	Volume of investment	Jobs, including areas falling outside the scope of the EEG
		MW	in billion kWh	million t	€ million/a	€ billions	
Hydropower (Article 6 EEG)	7.524[1]	4.700 (-20)	4.924[2] (+6.7%)	22.522	366.6 (+8.6%)	0.07	9.400[8]
Landfill gas, sewage treatment plant gas, mine gas (Article 7 EEG)	770	598	2.789 (+7.7%)	3.303	195.8 (+7.4%)		
of which sewage treatment plant gas	290[4]	123[4]	0,270 (+1.1%)	0.966			
of which landfill gas	330[4]	250[4]	1.050 (+/-0)	1.143			
of which mine gas	150	225(-2)[5]	1.469 (+33.5%)	(1.194)			
Biomass (Article 8 EEG)	5,262	2,331(+598.4)	10.03)	12.706	1,337.4(+163%)	1.35	64,000
of which solid biomass	162	1,091 (+76)	5.42[3] (+66.8%)	8.300			52,600
of which biogas	3.300	1.000(+335)	4.17(+208.7%)	3.412			10,600
of which liquid biomass	1,800	237 (+177.4)	1.314(+1.606%)	1.075			800
Geothermal energy (Article 9 EEG)	1	0.2 (0)	0.0004	0	0.05		Approx. 50
Wind energy (Article 10 EEG)	18,658	20,622 (+2,224)	30.71 (+20.4%)	26.47	2,733.8 (+18.3%)	2.9	82,100
of which repowering		280.8[6] (+140)					
of which offshore	0	0	0	0			

Photovoltaics (Article 11 EEG) of which tree-standing	approx. 200,000 1/1	2.831 (+950) 187.6(+74.6)	2.220 (-208.6%)	1.516	1,176.8 (+316%)	4.28	26,900

1) Plus approx. 155 plants producing electricity which is not remunerated under the EEG;

2) Plus around 15,749 billion kWh of electricity generated from hydropower which is not remunerated under the EEG;

3) Plus around 3.6 billion kWh of electricity from the biogenic share of waste and 1.1 billion kWh of electricity from other plants which Is not remunerated under the EEG;

4) 2005 figures: more recent data not available;

5) In 2006, total installed capacity decreased for the first time;

6) As recorded for the period 2003–2006;

7) Including electricity generated from renewable which is not remunerated under the EEG;

8) Including jobs in those parts of the hydropower sector not receiving remuneration under the EEG.

Source: copied from BUM (2007:7).