European Wind Energy Association

Response to the European Commission's Green Paper:
Towards a European strategy for the security of energy supply

November 2001

The European Wind Energy Association (EWEA) represents the interests of the wind energy community at an international level. Established in 1982, EWEA is a non-profit, non governmental association with a membership consisting mainly of national affiliated societies, companies/organisations involved in wind related activities. Membership of EWEA is open to all companies and organisations with an interest in the development of wind energy in Europe and the world. EWEA members include manufacturers, utilities, project developers, R&D institutes, financiers, etc. Membership includes national associations and research centres in the EU, CEE and elsewhere. EWEA represents over 15,000 members through direct membership and the membership of member organisations.

Executive summary

The European Wind Energy Association (EWEA) welcomes the debate on security of energy supply initiated by the Commission's Green Paper. Investments in energy technology are capital intensive. Therefore, it is important to analyse scenarios and create debate about the future development. The projections in the Green Paper clearly demonstrate the problems that could arise with respect to security of supply if current trends in energy consumption and supply are not changed significantly.

However, whilst the paper proposes demand side measures, it does not begin to consider the significant changes needed in the supply of energy in the European Union.

The European energy sector faces a myriad of challenges over the coming years. Within the framework of the treaties it has to respond to security of energy supply, economic growth, sustainable development, climate change, employment and technological development. Only renewable energy technologies have a positive effect on all of these goals. The Green Paper recognises this but, unfortunately, it does not follow up with concrete recommendations about renewable energy technologies.

Supply side action should be part of the debate about future energy dependence in the European Union to the same extent as energy efficiency and limiting demand. Otherwise, cheap, effective and viable possibilities in securing Europe's future energy supply will be overlooked.

Taxes and state aid should be the means to overcome the distorting effects of not having the full costs to society reflected in the production prices of energy products.

It does not make sense to discuss competitiveness between the various electricity generating technologies. It only makes sense to discuss technologies that can or cannot compete under the current market distorting conditions. Harmonised taxes, reflecting the actual environmental impact of each technology, would make the full production costs of electricity generation transparent and thus make the Internal Electricity Market more fair.

The EWEA strongly disagrees with the suggestion that support for renewables should come from contributions of funds from »profitable« sources of energy. On a superficial level, a transfer from profitable, polluting generation to new, clean generation projects

may appear a good suggestion. In reality this apparently simple sentence is fraught with problems. That does not mean, however, that no effort should be made to develop renewable energy sources.

The existence of environmentally damaging support schemes to mature industries such as coal and nuclear will inevitably lead to higher environmental policy costs. One of many steps to influence the internal supply of electricity should be to remove state aid to fossil fuels, nuclear and other mature and environmentally damaging industries. This would contribute towards a more level playing field in the electricity markets, create less biased market conditions, save large amounts of money currently spend on unproductive state aid schemes, and finally make it considerably cheaper to develop an indigenous European energy base on renewable technologies.

The cost of renewables may seem high in a narrow electricity market context, but in a wider socio-economic context there is little doubt that greater use of renewable energy would be both an environmental and economic benefit to the European Union, and would unquestionably contribute to a larger indigenous primary energy base, create employment, develop technology and increase exports.

The role of nuclear power should be discussed, but there are viable and more obvious supply side options, which are less risky, which are no threat to national security, and which enjoy more public and political support than nuclear power. Some of them, such as wind power, are even considerably cheaper.

Greenhouse gas reductions should be undertaken at the lowest costs possible. If the European Union takes a short-term approach to combating climate change, and only focuses on once-in-a-lifetime solutions, it risks creating a gap in the technological development of those new and renewable energy sources that are a precondition for combating climate change at the lowest possible cost in the long run.

The Green Paper fails to provide a vision for a sustainable energy supply, presenting arguments based entirely on the past. A sustainable energy supply requires investment now. A backwards looking approach, dependent on the existing model of centralised generation, and lack of vision into the future seriously threaten chances of attaining an otherwise feasible sustainable path.

There are no technological, economic, or resource limits constraining the European Community from enjoying the dual benefits of high levels of energy services and a clean environment.

A wider, more objective perspective, looking beyond the fossil fuel and nuclear past to a sustainable future is needed amongst those making key decisions about our future energy supply, to ensure that all energy related investment decisions, especially the allocation of RD&D funds, are not determined by past developments but by the options available for the future.

Contribution to the debate on the Green Paper
Towards a European strategy for the security of energy supply

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Please add your answers after the question(s), which deal most closely with the subject(s) on which you wish to comment so that the Commission can deal with the remarks efficiently and swiftly.

1 Can the European Union accept an increase in its dependence on external energy sources without compromising its security of supply and European competitiveness? For which sources of energy would it be appropriate, if this were the case, to foresee a framework policy for imports? In this context, is it appropriate to favour an economic approach; energy cost; or geopolitical approach; risk of disruption?

The European Union should not accept an increase in its dependence on external energy sources. It will inevitably compromise security of supply further, create economic risks, increase exposure to price fluctuations and potentially erode European competitiveness.

Fortunately, the European Union does not have to accept an increase in its dependency on external sources of energy. If sufficient efforts are put into stimulating the supply side as well as increasing energy efficiency, and reversing the trend in energy consumption, dependency on external energy sources could be dramatically lowered.

Plenty of opportunities on the supply side

The projections in the Green Paper clearly demonstrate the problems that could arise with respect to security of supply if current trends in energy consumption and supply are not changed significantly. However, whilst the paper proposes demand side measures, it does not begin to consider the significant changes needed in the supply of energy in the European Union. Far more far reaching changes need to be considered to secure the many objectives listed in the Green Paper.

The Green Paper correctly states that new and renewable forms of energy are the first option for action in relation to security of supply, the environment and rural population. Unfortunately, the statement is not followed up by recommendations about what action should be taken.

In its conclusions to part two, the Green Paper does correctly point out that: »Effectively, the only way of influencing supply is to make serious efforts with renewable sources.« The conclusion is followed by a preface to the Green Paper's Outline of Energy

Strategy in part 3 stating: »in order to engender public debate, the priorities outlined in this Green Paper are basically focused on action that is both specific and coherent to limit demand«. The EWEA believes that the priorities should include supply side measures and action to create and expand the Community's indigenous resource base, by taking advantage of the vast possibilities of developing renewable energy technologies.

The recommendations in the Green Paper are greatly biased toward demand side action. Supply side action should be part of the debate about future energy dependence in the European Union to the same extent as energy efficiency and limiting demand. Otherwise, cheap, effective and viable possibilities in securing Europe's future energy supply will be overlooked. There is plenty of room for intervention on the supply side, as the Green Paper mentions, and that should be reflected in the debate and in the priorities of the Green Paper.

Integrated approach

It is clear that improvements in security of energy supply must be considered alongside other policy objectives of the European Union. An integrated approach is now the norm in the context of sustainable development. Energy supply decisions have widespread consequences. Clearly the full impacts of energy supply decisions should be assessed. This requires an integrated approach - it is not a choice between economic or geopolitical approaches. The economic, environmental, and social implications should be considered as well, taking into account the full range of energy options.

Even with the de-coupling of energy use from economic growth, energy imports are projected to rise dramatically (81% from 1995 to 2030). The cost of those imports is projected to grow faster than GDP. According to the Green Paper, import prices will rise by 86% for oil, 81% for gas and 5% for coal. The opposite is true for most of the new renewable energy sources. Prices have already come down dramatically and will continue to do so in the years to come. To benefit from the full potential in cost reductions it is of paramount importance that action is taken now.

With sufficient efforts both to increase the use of renewable energy and to increase energy efficiency, the European Union would not need to accept an increase in its dependency on external energy sources.

2 Does not Europe's increasingly integrated internal market, where decisions taken in one country have an impact on the others, call for a consistent and co-ordinated policy at Community level?

Pollution knows no borders. Therefore, efforts to avoid degradation of the environment and climate change should at least be co-ordinated between the member states.

The European Union wants to include renewable energy sources in the Internal Electricity Market as laid down in the Directive on the Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market. While it is generally accepted that renewable energy technologies should be compensated for the fact that electricity prices do not include the total social costs of energy production, there is still a need to better understand the impact of different support schemes on renewable energy generation. Therefore, the European Union has emphasised the importance of subsidiarity for national support schemes until it has a better understanding and more evidence on the impact of different schemes. EWEA supports that procedure.

Until we have a better understanding of how best to increase the share of renewable energy from 6 % to 12 % by 2010 and include it in the Internal Electricity Market, it is important that the current process of liberalising electricity markets does not undermine the national support schemes. This requires coordination of information.

An effort to map the level of subsidies to electricity generators is another example of an area where coordination between member states can help prevent the continuation of opaque European electricity markets.

3 Are tax and state aid policies in the energy sector an obstacle to competitiveness in the European Union or not? Given the failure of attempts to harmonise indirect taxation, should not the whole issue of energy taxation be re-examined taking account of energy and environmental objectives?

It is the foundation of any economic activity that the consumption of scarce resources should result in costs. Otherwise the resources would be too rapidly consumed and would disappear. So far, it has been virtually free of charge to pollute the environment. Taxes and state aid should be the means to overcome the distorting effects of not having the full costs to society reflected in the production prices of various products.

A more harmonised Community framework of taxation on energy products would in fact prevent distortion of competition and increase European competitiveness in the long run.

State Aid

Unfortunately, state aid is too often paid to mature industries to protect them from competition and prevent redundancies. The effect is often that potential efficiency gains are lost and little technological progress is made.

This applies to a large extent to the Internal Electricity Market. For the greater part of a century, European utilities have taken the form of national monopolies generously supplied with heavy direct and indirect state subsidies. Also the coal industry has been blessed with public funds in large amounts. The outcome has been distorted competition between the various electricity generation technologies and, consequently, the reduced competitiveness of the European Union.

European electricity markets are not free and fair. Therefore, it does not make sense to discuss competitiveness between the various electricity generating technologies. It only makes sense to discuss technologies that can or cannot compete under the current market distorting conditions.

Renewable energies cannot compete under the current European conditions and it will become increasingly difficult for them as the Internal Electricity Market progresses towards full liberalisation, unless corrective action is taken to level the playing field. With its Community Guidelines on State Aid, the European Union has already taken steps to do so by allowing member countries to introduce schemes that secure development and installation of renewable energy capacity.

World coal subsidies: $63 BILLION

EWEA strongly supports the Commission's efforts to level the playing field. However, focus should also be directed at removing state aid to mature technologies based on fossil

fuel and nuclear, as suggested by an OECD study on improving the environment through reducing subsidies[1].

It argues that »support is seldom justified and generally deters international trade, and is often given to ailing industries«. It further argues:

»This policy is often both costly and ineffective in the long run. Technological change and the development of new product markets will generally lead to an even further loss in the competitiveness of the supported industry. As a result, larger amounts of support will be required in order to maintain the industry. (…) In many cases, support is used to prop up declining industries, merely postponing their certain demise at the expense of tax payers and consumers.«

The OECD also argues »that support may be justified if it lowers the long-term marginal costs to society as a whole. This may be the case with support to 'infant industries', such as producers of renewable energy«.

Aid to EU coal production alone stands at more than Euro 3.8 billion (2001), according to the EU Commission[2]. According to the Worldwatch Institute[3], total world coal subsidies are estimated to be $63 billion, including $30 billion in industrialised nations, $27 billion in the former Eastern block, and $6 billion in China and India. In Germany the total is $21 billion, according to the Worldwatch Institute – including direct production supports of more than $70,000 per miner.

Unfortunately, once introduced, subsidies are difficult to remove. The existence of environmentally damaging support schemes to mature industries such as coal and nuclear will inevitably lead to higher environmental policy costs.

The first step to influence the internal supply of electricity should be to remove state aid to fossil fuels, nuclear and other mature and environmentally damaging industries. This would contribute towards a more level playing field in the electricity markets, create less biased market conditions, save large amounts of money currently spent on unproductive state aid schemes, and finally make it considerably cheaper to secure the European Union's internal supply of electricity through what the Green Paper refers to as »the only way of influencing supply« (p. 64): Renewable sources of energy.

EWEA supports the Commission's effort to make a systematic inventory of state aid to see whether it ties in with the political priorities of the European Union, including energy policy, security of supply and the promotion of renewable energies.

Taxes

A lower price for electricity is of little benefit if it means higher costs to society as a whole, and it certainly does not contribute positively to the competitiveness of the European Union - not in the short run and even less so in the long run.

[1] Improving the Environment through Reducing Subsidies, OECD 1998.
[2] Document 501PC0423: Proposal for a Council Regulation on State aid to the coal industry, European Commission September 24 2001
[3] King Coal's Weakening Grip on Power, Seth Dunn, Worldwatch Institute, 1999, p.18.

It is often stated that taxes on electricity should be avoided because they distort competition and the Internal Electricity Market. The Green Paper rightfully indicates that the argument is all backwards.

»A more harmonised Community framework of taxation on energy products is needed to prevent distortion of competition.« (P. 51).

Taxes on coal and natural gas are generally low. The EWEA agrees that taxation can be an effective tool in energy policy if it aims to internalise the costs to society of environmental degradation, and contributes to the polluter pays principle.

Harmonised taxes, reflecting the actual environmental impact of each technology, would make the full production costs of electricity generation transparent and thus make the Internal Electricity Market more fair.

Costs do not just disappear

The Green Paper does show that most renewables, including wind energy, can compete with combined cycle gas if externalities are included. Both wind energy, biomass, small hydro, photovoltaics and geothermal are significantly cheaper for society than coal if externalities are included. Coal is almost twice as expensive as wind and biomass (1998 figures) according to the Green Paper.

Unfortunately, these interesting findings of the recent EU funded ExternE research project, have been hidden on page 19 in the little distributed technical document that accompanies the Green Paper, and thus effectively buried with little chance of becoming part of the public debate.

The Green Paper fails to mention that the ExternE project estimates that the cost of producing electricity from coal or oil would double and the cost of electricity production from gas would increase by 30 %, if external costs, in the form of damage to the environment and health, were taken into account. Currently, average electricity production costs in the EU are Euro 0.04 per kWh. The study further estimates that these costs amount to 1-2 % of EU GDP or between Euro 85 billion and Euro 170 billion, not including the cost of global warming and climate change.

The EWEA believes that external costs should be an important part of the discussion. Electricity generators are not financially penalised for the pollution they cause. External costs do not disappear from the face of the earth just because they do not appear on the electricity bill or because they are not part of the utilities' cost of producing energy. They are being paid for by society as a whole through taxes on households and companies, and they hurt European competitiveness.

The Commission has proposed to harmonise taxes in the European Union in order to meet objectives in transport and environmental policies, with little success to date. The EWEA supports these efforts if they contribute to internalising the costs to society of degradation of the environment in electricity prices, and contribute to the polluter pays principle.

Furthermore, it is of vital importance to structure measures to address or compensate for current market failures that foster barriers to renewables development.

Both wind energy and biomass are significantly cheaper to society than coal, and slightly cheaper than combined cycle gas, and the costs are continuing their sharp downward trend.

The Green Paper is hesitant in its recommendations about renewables. That is unfortunate when the debate should be focused on how much, and for how long, the member countries can afford to pay vast amounts of money to keep polluting the environment with production forms that are expensive for society as a whole, damaging to public health, which increase Europe's dependency on imported energy, and hurt European technological progress and competitiveness. It could prove very expensive, and environmentally damaging, to fail to have this discussion.

4 In the framework of an ongoing dialogue with producer countries, what should supply and investment promotion agreements contain? Given the importance of a partnership with Russia in particular, how can stable quantities, prices and investments be guaranteed?

N/A

5 Should more reserves be stockpiled - as already done for oil - and should other energy sources be included, such as gas or coal? Should the Community take on a greater role in stock management and, if so, what should the objectives and modalities be? Does the risk of physical disruption to energy supplies justify more onerous measures for access to resources?

N/A

6 How can we develop and ensure better operation of energy transport networks in the European Union and neighbouring countries so as to enable the internal market to function properly and guarantee security of supply?

N/A

7 The development of some renewable energy sources calls for major efforts in terms of research and technological development, investment aid and operational aid. Should co-financing of this aid include a contribution from sectors which received substantial initial development aid and which are now highly profitable (gas, oil, nuclear)?

The first question is whether the sources of energy referred to are »profitable«, when considering the full costs to society: the various direct and indirect subsidies to established generation using coal, oil, gas and nuclear have a significant cost to society not reflected in current market measures of profitability. It is the duty of public authorities such as the Commission to consider the full social costs, not exclusively the benefits to investors.

The EWEA strongly disagrees with the suggestion that support for renewables should come from contributions of funds from »profitable« sources of energy. On a superficial level, a transfer from profitable, polluting generation to new, clean generation projects may appear a good suggestion. In reality this apparently simple sentence is fraught with problems.

It is a bad idea to make the gas, oil and nuclear industries co-finance the development of renewable energy sources. That does not mean, however, that no effort should be made to develop renewable energy sources. In that sense, the above question is far too narrow in its range.

No distinction between renewable technologies

It is painfully clear that the European Union has to further develop an indigenous primary energy base. Unfortunately, the Green Paper focuses little on the most obvious part of the solution to future energy supply security – renewable energy.

The EWEA agrees with the Green Paper's finding that major efforts are needed to develop new and renewable energy sources. However, the Green Paper fails to distinguish between the different renewable technologies and their stages of development, when referring to costs for renewables as a major obstacle.

It is true that some renewable energy technologies are still far from being competitive, but technologies are available today, such as wind and biomass, that could compete with traditional energy sources based on fossil fuel and nuclear, if fair market conditions were in place. Moreover, one factor is true for most of the renewable technologies: their costs keep falling faster than the costs of fossil fuel and nuclear technologies.

The cost of renewables may seem high in a narrow electricity market context, but in a wider socio-economic context there is little doubt that greater use of renewable energy would be both an environmental and economic benefit to the European Union, and would unquestionably contribute to a larger indigenous primary energy base, create employment, develop technology and increase exports. True, action is required to fully utilise the renewable potential on the supply side. However, the effort needed is not as overwhelming as the Green Paper foresees, if steps are taken to level the playing field in the Internal Electricity Market.

The hidden truth

The Green Paper does have many good points relating to renewable energy and their role in securing energy supply. Unfortunately it fails miserably in deriving positive contributions from its analysis, and no serious recommendations relating to renewables are made.

One example is the well concealed fact (p. 45 in the technical document), that wind energy could potentially contribute up to 30% of electricity demand equal to 15% of overall primary energy use in the European Union. It also finds »wind energy a potentially powerful instrument in energy supply policy, subject to stability of production and electricity storage or back-up possibilities«. Regrettably, none of these correct discoveries have been applied in the concluding recommendations in part three of the Green Paper.

Missing assumptions

Furthermore, it is impossible to know how the production costs of power generation technologies in annex 2 have been calculated. It is difficult to argue about the assumptions since it is agonizingly unclear what the assumptions are. The study is partly based on the Primes model but most of the underlying assumptions are simply missing, while

the few that are mentioned, such as the use of operating hours, indicate a completely erroneous approach to cost comparisons.

To give just one example of many of the shortcomings of the approach: According to the calculations, the lowest wind power production costs in Europe are to be found in Denmark and Germany while Ireland is among the countries with the highest wind power production costs. Few in the wind energy industry would doubt that Ireland is home to possibly the lowest production costs in Europe, due to a spectacular wind resource while Germany and Denmark have more moderate wind resources and, hence, higher production costs per kWh. Furthermore the generally low primary energy price assumptions largely disfavours wind power (and nuclear).

Numerous studies have shown that wind power on fairly windy sites (as assumed in annex 2) can already fully compete on generation cost with electricity from **new** coal fired power plants, even without taking the environmental benefits into account.

The objective of the study in annex 2 of the Green Paper is to investigate the possible impact of fiscal intervention on consumer choices. No valid evidence can be drawn from the study.

Persistent underestimation of renewables

Perhaps the biggest flaw in the Green Paper is that the top-down model used to generate the scenario presented in the »EU Energy Outlook to 2020«, used in the Green Paper, persistently underestimates both the current and the future role of renewable energy sources. The 30 year scenario from 1990 to 2020 has figures for the present day which are significantly below existing achievements, implying that the figures for the situation in 20 years time will be gross underestimates of the use of renewable energy.

Appendix 1 provides full details of the discrepancies between the Primes model outputs used in the Green Paper and the reality in the year 2000.

8 Seeing that nuclear energy is one of the elements in the debate on tackling climate change and energy autonomy, how can the Community find a solution to the problem of nuclear waste, reinforcing nuclear safety and developing research into reactors of the future, in particular fusion technology ?

The Green Paper does not pay much attention to supply measures in its *Outline of Energy Strategy*. When it does, it almost solely focuses on nuclear.

The Green Paper states in the conclusions to part two that »Effectively, the only way of influencing supply is to make efforts with renewable sources«. Oddly enough, the statement is not followed by any mentioning of renewable technologies' role in tackling climate change and energy autonomy in the 13 *principal questions*.

An additional *principal question* in this debate should have read: »Seeing that renewable energy sources are elements in the debate on tackling climate change and energy autonomy, how can the Community…«

The role of nuclear power should be discussed, but there are viable and more obvious supply side options, which are less risky, which are no threat to national security, and which enjoy more public and political support than nuclear power. Some of them, such

as wind power, are even considerably cheaper. Those renewable energy options deserve to be part of the debate.

The future of nuclear: as clear as coal

When nuclear power was introduced, supporters claimed that fission technology would turn out to be *too cheap to meter*.

Here, 40 years later, the same argument is heard. The only difference is that today's argument refers to thermonuclear fusion – a technology that few believe will be available for the next 50 to 100 years, if ever.

It is not clear that nuclear is an economically viable approach to tackling climate change, nor that it is a credible option in the debate on measures to tackle climate change.

There are numerous challenges associated with nuclear power, and the problems with irradiated fuel management and waste storage have not yet been solved, despite enormous efforts. The Euratom Treaty was established back in 1957 to provide Europe with an indigenous energy supply source. By pooling resources it was believed that the technology would progress faster and at lower costs. It may have, but new nuclear power stations are certainly not *too cheap to meter*. If the same efforts had been put into developing renewable energy technologies, Europe would today be facing much less of a security of supply challenge.

Existing nuclear power stations, whose capital costs have largely been written off under previous national ownership, whose owners are protected by government liability guarantees from assuming responsibility for the risks associated with nuclear power plant operation, are able to generate power at competitive prices in Europe's electricity markets. That does not mean, however, that the technology is cheap. Extending the life of existing nuclear capacity may be relatively cheap, but when it comes to installing new capacity some renewables, such as wind, can easily compete on cost per kWh with new nuclear power capacity.

Biased recommendations

It is difficult to understand the highly biased recommendations in the Green Paper's *Part Three*. Further support into thermonuclear fusion, and a further stepping up of research into storage and waste management are among its recommendations.

Given the high budgets dedicated to research in nuclear technologies and associated issues over the past 40 years, and that the solutions to these issues have not yet been found, it would appear sensible to divert a large part of the money from nuclear research to other low or no emission energy generation technologies.

Too much effort is being put into a technology for which the future is referred to in the Green Paper as »uncertain, particular in Europe«. The EWEA believes that the European Union should divert attention from nuclear into developing suitable conditions and further improve renewable technologies. The potential for technological advances in renewable technologies are larger, the political will is greater, and risk of accidents and risk to national security are lower. Furthermore, Europe holds a far larger competitive advantage in renewable energy technologies than in nuclear power, e.g. European companies held a 90% world market share in wind turbines in 2000.

9 Which policies should permit the European Union to fulfil its obligations under the Kyoto Protocol? What measures could be taken in order to exploit fully potential energy savings which would help to reduce both our external dependence and CO2 emissions?

The EWEA acknowledges and fully supports the EU's tireless efforts to reach a global agreement on climate change. In order to meet the EU's international environmental obligation under the Kyoto Protocol far-reaching efforts are necessary.

The EWEA agrees with the Green Paper's conclusions on compliance with the Kyoto Protocol (p. 50). Drastic measures in both transport and energy policy are absolutely necessary and, as the Green Paper recommends, concrete fiscal and regulatory measures geared to energy-savings and promotion of renewable energy sources must be undertaken.

Focus on short-term action expensive in the long run

According to the European Environment Agency, the 15 EU member states will increase their emissions of greenhouse gasses by at least 5.2 % between 1990 and 2010 rather than lowering them by 8 % as per EU commitments at Kyoto. Further political action is therefore necessary to be in accord with the Kyoto Protocol.

As the Green Paper mentions, emissions would have to be cut by 50 to 70 % immediately just to stabilise the CO2 concentration at current levels. Efforts to combat climate change, do not end with the Kyoto targets in 2010. That is why the European Union must take a long-term approach in dealing with the problem. Short-term solutions may seem attractive but they can rarely be applied more than once.

Europe has succeeded in keeping its CO2 emissions in 2000 at the 1990 level, but that achievement can be almost fully contributed to German unification and the shift to natural gas in Great Britain. It is fair to assume that such events only happen once.

Today there are considerable differences in the marginal costs of reducing emissions between EU and the neighbouring countries in Central and Eastern Europe. In the short-term it is cheaper to reduce CO2 by insulating houses compared to installing solar panels. But again, such can only be done once.

Greenhouse gas reductions should be undertaken at the lowest costs possible. If the European Union takes a short-term approach to combating climate change, and only focuses on once-in-a-lifetime solutions, it risks creating a gap in the technological development of those new and renewable energy sources that are a precondition for combating climate change at the lowest possible cost in the long run.

To give an example: The cost of producing a kWh of wind power today is one fifth of the 1980 cost. Over the past five years alone the cost of wind power has been reduced by 20 % and the EWEA expects a similar reduction in the near future. If only short-term measures are considered, that positive development could be jeopardized leading to higher costs, once the short-term possibilities have been exploited. This is true, to an even greater extent, for renewable energy technologies that are less mature than wind power.

It should be painfully clear that there is no single miracle cure to relieve the world from climate change. The European Union and its international partners have to employ all options - present and future – that are available. Renewable energy cannot do the job alone, neither can energy savings, higher efficiency or taxation.

The consequences of climate change could potentially result in economic costs and natural disasters without precedent. The problem should not only be addressed through the Community's climate change programme but should be incorporated into all initiatives that have an effect on climate change. The debate about securing energy supply is most certainly such an initiative.

Renewable energy technologies should be at the heart of the debate. Not only are they the only long-term answer to creating sustainable development as stated in Articles 2 and 6 of the Treaty establishing the European Union, they are also the Community's only chance of establishing a truly indigenous energy base. We need to look beyond Kyoto and take action now to limit the economic and environmental impact on future generations.

10 Can an ambitious programme to promote biofuels and other substitute fuels, including hydrogen, geared to 20% of total fuel consumption by 2020, continue to be implemented via national initiatives, or are co-ordinated decisions required on taxation, distribution and prospects for agricultural production ?

Answer: N/A

11 Should energy saving in buildings (40% of energy consumption), whether public or private, new or under renovation, be promoted through incentives such as tax breaks, or are regulatory measures required along the lines of those adopted for major industrial installations?

Answer: N/A

12 Energy saving in the transport sector (32% of energy consumption) depends on redressing the growing imbalance between road and rail. Is this imbalance inevitable, or could corrective action be taken, however unpopular, notably to encourage lower use of cars in urban areas? How can the aims of opening up the sector to competition, investment in infrastructure to remove bottlenecks and intermodality be reconciled?

Answer: N/A

13 How can we develop more collaborative visions and integrate the long-term dimension into deliberations and actions undertaken by public authorities and other involved parties in order to evolve a sustainable system of energy supply. How are we to prepare the energy options for the future?

There is a desperate need for long-term vision in the energy debate. Too much emphasis is put on vested interest rather than the public good.

Vision for a Sustainable Energy Future

Given the importance of security of supply and the pressing need to address global climate change, the EU should be aiming for a future in which almost all energy needs are met by renewable energy. Such long-term goals are necessary in the energy supply sector, where investment decisions fix the technology used over a long time period. The feasibility and benefits of 95% renewable energy supply alongside energy efficiency measures have been demonstrated in a Commission-funded study[4].

Unfortunately the Green Paper fails to provide a vision for a sustainable energy supply, presenting arguments based entirely on the past. A sustainable energy supply requires investment now. A backwards looking approach, dependent on the existing model of centralised generation, and lack of vision into the future seriously threaten chances of attaining an otherwise feasible sustainable path.

Evidence

Analysts have been pointing to a renewables-based energy supply sector for more than 10 years.

In 1995, Shell published a global sustainable growth scenario, showing more renewable energy and new 'surprise' technologies accounting for more than 50% of the World energy supply by 2060. Since then, other scenarios have explored the potential for renewables and the subsequent economic, social and environmental impacts in more depth.

The World Energy Assessment[5] published by the United Nations Development Programme and Department for Economic and Social Affairs and the World Energy Council in 2000, 2 months before the publication of the Green Paper on Security of Supply, presents scenarios showing that it is possible to meet sustainable development objectives through much greater use of energy efficiency, renewables and advanced energy technologies. The report is clear: to achieve a more sustainable development path, significant policy and behavioural changes are needed over the next few decades; the seeds for developments after 2020 need to be sown before then. This requires strong support for sustainable energy options from the EU within the timescale discussed in the Green Paper.

A sustainable energy scenario for Europe up to the year 2050, relying on energy demand reductions and renewable energy supply to meet 95% of the remaining demand was developed by a project funded under DGXII's APAS programme. The report from 'Long-term integration of renewable energy sources into the European energy system' project shows the annual cost of a renewable energy supply in 2050 to be about half the costs of the energy supply system in 1990.

According to the report the 95% renewable scenario would cost app. 270 billion euros in 2050. The fossil fuel-based option would cost an estimated 200 billion Euros in 2050.

The 70 billion Euro cost difference can be seen as the cost of addressing fossil-fuel related externalities, including climate change. As mentioned earlier the European Commission estimates that these costs amount to between 85 billion Euros and 170 billion Euros per year today, not including the cost of global warming and climate change.

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[4] ZEW ( ). *Long-term integration of renewable energy sources into the European energy system*

[5] United Nations Development Programme, United Nations Department for Economic and Social Affairs, World Energy Council (2000). *World Energy Assessment: Energy and the challenge of sustainability*.

The sustainable scenario also generates an estimated 340,000 to 580,000 net jobs in the EU-15. Furthermore, the sustainable energy scenario would create an indigenous energy base in the Community.

Recognising the Shift to Distributed Generation and the Potential of a Hydrogen Economy
Security of energy supply as a long-term issue must be considered within the context of the shift now underway towards distributed generation. This is revolutionising the energy supply sector, and whilst resisted by some companies is clearly embraced by a number of large companies, who are investing heavily in wind energy, other renewables but also in micro-generation.

The use of hydrogen as a fuel is seen as an important element in the move towards distributed and micro-generation. Hydrogen offers a solution to the storage needs for intermittent renewables such as wind energy, and offers the means for a renewables-based energy supply for the longer term. The Green Paper fails to recognise the link between renewable energy use and hydrogen. A wider, more objective perspective, looking beyond the fossil fuel and nuclear past to a sustainable future is needed amongst those making key decisions about our future energy supply, to ensure that all energy related investment decisions, especially the allocation of RD&D funds, are not determined by past developments but by the options available for the future.

It takes time to stop an oil tanker at full speed, but it is not an impossible task. With less narrow thinking, added courage to look beyond yesterday's technologies, and greater political will, it is not too late to steer the ship safe to harbour.

14 Any other questions or proposals:

Appendix 1
NOTE ON THE RES CONTRIBUTION AS PREDICTED BY PRIMES
(Written in 2000, wind energy figures updated in 2001)

The 1990 to 2020 scenarios presented in both the "EU ENERGY OUTLOOK TO 2020" and the "Top-down analysis of emission reduction possibilities in the power sector" are flawed. The modelling systematically underestimates both the current status of the contribution of renewable energy sources (RES) and the expected future development.

The purpose of this note is to show the validity of the above statement, using the official statistics of the EU (Eurostat). These exist only up to the year 1998. In addition, for some renewables such as wind energy, where reliable data exists beyond 1998, non-Eurostat figures are also used.

We present below a systematic comparison of the existing Eurostat and other well-accepted data on the existing development of RES, with the figures produced by the Primes model. All the data we have presented are real figures for RES use, not estimates.

Overall contribution of renewables

In the Primes baseline scenario, renewable energy sources increase their contribution from 71.7 Mtoe in 1995 to only 88.2 Mtoe in 2010, equivalent to 5.7% of the projected gross inland consumption in 2010. (The figure used in Primes for 1995 is 2 Mtoe less than the figures for that year now provided by Eurostat. This difference is most probably due to corrections, made to the Eurostat figures after their use in the Primes model.)

In 1998, according to the Eurostat figures, renewable energy sources made a contribution of 85.1 Mtoe, or 5.9% of that year's gross inland consumption.

Therefore, according to the Primes baseline scenario, renewable energy sources would increase their contribution in the period 1999-2010 by 3.1 Mtoe (plus 2 Mtoe coming from the different starting base in 1995), implying a 0.2% decrease in the share of renewables by 2010 with respect to 1998!!

Table 1: Renewable Energy in Primary Energy Supply (Mtoe)

Year	Eurostat	Primes
1995	73.7	71.7
1996	76.3	
1997	81	
1998	85.1	
2000		79
2005		82.6
2010		88.2
2015		93.8
2020		99.8

Given that RES use increased by 4 Mtoe in 1998, and by 4.7 Mtoe in 1997, it is most probable that the Primes estimate for 2010 was really reached in 1999. And, according to Primes, RES will reach 5.9% of the gross inland consumption in 2015. Even in the

most advanced scenario (S6), the contribution of renewable energy sources increases only to 109.1 Mtoe in 2010. The corresponding figure in the Commission's White Paper on Renewable Energy for the year 2010 is 182 Mtoe.

This problem is not a result of an underestimation of the contribution of individual RES technologies, which have shown unexpectedly high growth in use during the last few years (e.g. wind energy), but from a systematic underestimation of all renewables. The following presents the situation technology by technology.

Table 2: Comparison of Primes Projection and Eurostat data, by technology.

Year	Biomass Mtoe		Hydro GW		Wind GW		Photovol-taics MW		Solar Collectors Mtoe	
	Eu-ros-tat	Primes	Eu-ros-tat	Primes	Eu-ros-tat	Primes	Eu-ros-tat	Primes	Eu-ros-tat	Primes
1995	45.4	44.2	92	106.8	2.5	2.5	32	0	0.26	0.2
1996	47.7		95		3.4		41		0.29	
1997	52.5		93.5		4.6		50		0.32	
1998	54.2		98.9		6.2		80		0.35	
1999					9.3*					
2000		47.1		109.8	12.8 *	9.0		0		0.3
2005		48.8		110.7		15.4		0		0.5
2010		52.5		110.7		22.6		0		0.6
2015		54.3		111.1		33.9		0		0.8
2020		56.6		111.8		47.1		0		0.9

**EWEA figures*

Biomass

Numerically, the largest underestimation is for Biomass (Table 2). The contribution to energy supply achieved by biomass in 1998, as recorded in the Eurostat statistics, should only be reached by 2015 according to Primes projections.

By coincidence, the 1996 Eurostat figure is very close to the Primes figure of 2000, the Eurostat 1997 figure is the same as the Primes figure for 2010, and the 1998 Eurostat figure corresponds with that of Primes for 2015. In other words, the increase in biomass

use, predicted by Primes to occur between 2000 and 2010, in reality happened between 1996 and 1997, and that predicted to take place between 2010 and 2015, was achieved between 1997 and 1998.

The term 'Biomass' refers to a number of different technologies. The underestimation applies across the board for biomass technologies. The two following examples are of particular interest:

- In the Commission's 1997 White paper on Renewable Energy, electricity from biomass I was expected to make a significant contribution to achieving the target of doubling renewable energy use. According to Eurostat figures, electricity production from biomass increased by almost 40% between 1995 (23.3 TWh) and 1998 (31.9 TWh). This is a significant increase, but not at the rates foreseen in the White Paper. On the other hand, Primes forecasts a capacity expansion for biomass (including waste) of just 0.8 GW between 1995 and 2010 and an additional 1.8 GW from 2010 to 2030.

- Liquid biofuel technology has been developing slowly but steadily in the EU. According to the Eurostat figures, biofuel use grew to 0.45 Mtoe in 1998 from 0.27 Mtoe in 1995 (an increase of 66%). Yet, what does Primes predict? From 0 Mtoe in 1995 to 0 Mtoe in 2020. The existing contribution (even if it is small) is ignored and the Primes modeling results suggest that nothing will happen until 2020.

Hydro

Hydropower is the second most important RE technology in terms of its present contribution. It is widely accepted that its development will be limited in the future and will involve mainly small-scale hydro.

The figures concerning hydro installations vary considerably. One source of confusion is pumping (and whether or not it is included in the hydro figures). This is the reason for the difference in the figures from Eurostat and Primes in 1995. It is important to take the differences into account.

From the Eurostat figures we note an increase of almost 7 GW between 1995 and 1998. Primes forecasts an increase of 3 GW up to 2000. Then, amazingly, it predicts an increase of just 0.9 GW between 2000 and 2010 and of another 1.1GW from 2010 to 2020. Even if we accept that no new large hydro installations will take place after 2000 (although there are 3-4 projects that are under preparation or discussion), this means that the small hydro installations in the next two decades will amount to only 2 GW. From the existing figures we know that 1 GW of small hydro plants was installed between 1992 and 1997. It is difficult to accept that a mature technology with very good economic prospects in several locations, and with a considerable unused potential in several member states, will achieve only this almost insignificant level of development.

Wind Energy

Wind energy has developed tremendously during the last decade with a 40% average increase in annual cumulative capacity. It is the only RE technology for which Primes predicts a significant growth over the next two decades. The predicted rates of increase, though, are far below those that we have actually seen in the last few years. For example:

- By the end of 2000, a total of 12.8 GW of wind power capacity were installed in the EU. Primes predicts 9 GW for the end of 2000.
- more than 3.5 GW were installed in the EU during the year 2000. Over 2.8 GW were installed during 1999.
- The Primes prediction for 2005 (15.4 GW) will certainly be reached during the course of 2001.
- The EWEA estimates that total European wind power capacity will reach 60 GW by 2010, almost three times the Primes projection of 22.6 GW.
- In the decade 2000 – 2010, Primes foresees an installation of an additional 13.5 GW in the EU. On average this means 1.35 GW per year. This means that the current rate of installation has to fall by more than 60% on average.

It has been suggested in discussion of the Primes results that developments in wind energy are the result of recent policies and an increase in support. The support mechanisms responsible for the largest increase, for example in Germany and Denmark, have been in place since the beginning of the 1990s, and support levels have not recently increased. On the contrary, they have actually been reduced to reflect the lower production costs of modern wind turbines.

Photovoltaics

PV is one of the most promising RE technologies. In 2000, the industry has a turnover of over 1 billion Euros. During the last few years an important expansion of production facilities has taken place, with big international companies such as BP and Shell investing in the sector. The level of installed capacity in the EU is still very low (presently around 150 MW), but the market experienced a 25% annual growth during 1998 - 1999. Several EU member states (Germany, Spain, Italy, Netherlands etc.) have programmes for active support of PV, with Germany expected to achieve a 150% growth in 2000 -2001. Cost remains the main handicap for a large-scale development of PV. On the other hand, the 45% reduction in PV system prices during the period 1995-1999 constitutes a guarantee that the high growth rates will continue.

The predictions from Primes of 0 MW installed up to 2020 are therefore unacceptable. It is expected that up to 2010 no more than 2 to 3 GW (but more than zero) will be installed in the EU. The development thereafter, if expected cost reductions are achieved, could be of a much larger scale.

Solar Collectors

Solar collector cumulative capacity has been increasing by an average of 15% per annum over the last five years. The annual installation rate passed from half a million square meters installed in 1994 to more than a million in 1998. There is potential for a much larger increase since the present development is taking place mainly in northern European countries (Germany, Austria), with the exception of Greece. The value predicted by Primes for 2000 has already been achieved in 1996. Here again there is a clear underestimation, although to a much smaller extent than biomass or wind energy.

Assumptions which may affect the Primes results for Renewable Energy

Crude modeling of support mechanisms- these are modeled as capital subsidies, whereas most EU support mechanisms apply to operating costs, with a different impact on availability of financing.

Fossil Fuel Price Assumptions- underestimation of the price of oil and gas and failure to properly consider the risks associated with volatile fuel prices (through sensitivity analysis over the full possible price range, including extremes) will lead to underestimates of the uptake of renewable energy, which do not use these fuels.

Poor modeling of technological progress and cost reductions in Primes are especially significant for renewables as relatively new technologies. Renewable technologies progress over time (lower capital cost) at rather smooth rates, without experiencing any major technology breakthrough.
What is meant by smooth? Is, for example, the 45% cost reduction of PV in 4 years considered smooth?
Commercial wind turbines have increased in size by more than 20 times in a decade (from 100 kW to 2.5 MW) with the incorporation of several innovations (for example gearless machines). Is that considered technology breakthrough or not? The major manufacturers are presently preparing the next generation of turbines in the order of 5 MW, mainly for off-shore applications.

The baseline scenario does not assume public authorities to impose strong constraints favouring renewables.
Are the support schemes applied in Germany and Spain considered strong or not? Is the 10% renewable obligation on electricity producers under discussion in the UK considered as strong or not?

Assumptions about prices of RE

The only reference found on this subject is table 9-8 on pg. 163 of the "EU energy outlook to 2020" document. There are major objections for the prices used especially for wind energy and PV.

The average cost of the installed kW of wind turbine generators is today around 950 Euro. It varies from 700 Euro/kW for flat onshore sites to 1,600 Euro/ kW for offshore applications. The costs of wind energy have already been reduced dramatically as manufacturing and other costs have fallen. They are continuing to fall. The continuous increase in size of commercial wind turbine, the improved cost effectiveness and improved design gained from R & D as well as the benefits of better logistics and economies of scale suggest a steady reduction in costs over the coming years. Different studies and analysis indicate that the average cost of the installed kW could be in the order of 700 EURO/ kW by 2010.

In the document referenced above the capital cost for wind turbines is assumed to be 1,043 EUR90/MW (approx. 1,350 current EURO) in 1995, 936 EUR90/MW (approx. 1,200 current EURO) in 2010 and 842 EUR90/MW (approx. 1,100 current EURO) in 2020. The differences between these and real, current prices are enormous. The prices projected in 2020 are higher than the current prices. We can imagine that this fact will have a significant effect in the projected deployment of wind energy.

For PV it is assumed a decrease in capital prices of 10.5% from 1995 to 2010 (from 3,750 EUR90/MW to 3,360 EUR90/MW) and another 25% from 2010 to 2020 (from 3,360 EUR90/MW to 2,550 EUR90/MW). However, as mentioned above, we have seen a decrease in PV prices of 45% (IEA figures) between 1995 and 1999.

FINAL COMMENTS AND CONCLUSIONS

The assumptions regarding oil and gas prices have a tremendous impact on the credibility of the whole exercise, and underestimation of fuel prices is particularly serious as regards the case for renewables, which do not use fossil fuel. The baseline assumptions of 15.1 EUR98/BOE in 2010 and 18.0 in 2020 are questionable. Even under the sensitivity analysis presented in the "EU energy outlook to 2020" oil prices were allowed to approach the 20 EUR98 per barrel mark in 2010, and 25 EUR98 in 2020.

It is clear that the prices used in the model for the different fuels as well as for the different technologies (see comments above for wind and PV) have an effect on the most cost effective actions necessary to achieve CO_2 reduction objectives. Wind energy offers today one of the cheapest options for reducing CO_2 emissions from electricity generation.

As was shown above, we believe that the renewable energy potential has been severely underestimated in analysis based on using the Primes model. Modelling being a tool to help policy decisions, we fear that the underestimation of renewables could lead to incorrect conclusions about their potential and, consequently, to mistakes in policy decisions. We were astonished to see, in the sensitivity analysis presented in the »EU energy outlook to 2020«, a »Nuclear Renaissance« scenario, but not a scenario with larger penetration of renewables. The conclusion that »RE technologies are nice, but they can achieve little, so we must look for other energy solutions for the future« is an obvious conclusion that someone might make when reading documents such as those commented on in this note. That would be a wrong conclusion to draw. The solution for a sustainable energy future is directly connected with the large-scale deployment of renewables.