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TO THE COUNCIL, THE EUROPEAN PARLIAMENT,  
THE ECONOMIC AND SOCIAL COMMITTEE  
AND THE COMMITTEE OF THE REGIONS

**THE ENERGY DIMENSION OF  
CLIMATE CHANGE**

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**COMMISSION COMMUNICATION TO THE  
EUROPEAN PARLIAMENT, THE COUNCIL, THE ECONOMICAL AND SOCIAL  
COMMITTEE AND THE COMMITTEE OF THE REGIONS ON  
THE ENERGY DIMENSION OF CLIMATE CHANGE**

## **THE CHALLENGE**

### **The commitment to reduce emissions**

1. **Climate change is a subject of widespread public concern.** There is a growing public expectation and political pressure that climate change issues are dealt with in the wider framework of sustainable development. Policy makers have to respond to the need to take action to reduce emissions. **The real challenge facing the European Union is to adopt policies which are effective, realistic and implementable. The political commitment to objectives therefore needs to be supported by the political willingness to act.**
2. The Third Conference of the Parties to the United Nations Framework Convention on Climate Change (COP-3) to be held in Kyoto in December 1997 needs to produce decisions that the Parties and society at large can accept and can carry out. In the context of the Berlin Mandate, the parties are at present engaged in negotiations aimed at stepping up the commitments of the industrialised countries through the adoption of quantified limitation and reduction objectives within specified time frames such as 2005<sup>1</sup>, 2010 and 2020, to be achieved by implementing policies and measures. The ultimate goal of these negotiations is to establish a legally binding protocol at the COP-3.
3. The Council conclusions on climate change of 3 March 1997 showed the Community's determination to act, agreement having been reached that the Community will propose that the OECD member countries and the countries with economies in transition (Annex X to the Framework Convention) should commit themselves to a 15% reduction in their emissions of the main greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O)<sup>2</sup> by 2010, both compared with the reference year 1990. If we consider that CO<sub>2</sub> emissions, assuming the application of current policies and measures, are estimated to increase by some 8% in 2010 compared with 1990, **there would be a divergence of more than 20 points over the negotiation position that the Council has set itself.** To cover this significant gap, policies and measures will have to be ambitious, in particular in the field of energy, and could lead to a reorientation of society's objectives. It will require genuine political will to bring the necessary policies into being.
4. The decisions that will be taken at the Third Conference of the Parties will therefore have major repercussions, if the targets that will be negotiated are to be achieved. The Council has taken the view that the decisions on the policies and measures to be adopted should be taken at the Council meetings responsible for the Community policies in question. The Commission is in favour of an approach whereby other policies which cut across environmental protection policy are involved in the decision-making process. It intends to produce later this year a broad based Communication on climate change, outlining all the policy implications and actions necessary across a range of policies. **This present Communication, dedicated to the energy dimension of climate change, aims to**

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<sup>1</sup> The Council has not yet taken a negotiation position for 2005

<sup>2</sup> CO<sub>2</sub> is the major greenhouse gas in the basket

stimulate the Kyoto process debate and focuses on the implications for energy in preparation of a broader Commission Communication covering all relevant sectors to follow in the autumn. The objective is to outline the challenge posed to energy policy makers, identify a number of areas of policy action which may help face this challenge and seek to stimulate a debate as to how the commitments we undertake for emissions reduction can be fulfilled in a cost effective manner.

5. There clearly exists within the Community a political will to achieve a substantial rate of reduction, but the success of this determination will only be demonstrated once the emission reduction figures indicated by the Council have been reached. On the basis of its position in Kyoto, the Union will call upon other Annex I parties to the Convention, namely the industrialised countries and the countries in transition, to make comparable efforts. The Union itself must however also show its political willingness to take the necessary, often difficult, decisions to implement its targets.
6. As a starting point, the contribution of common and co-ordinated policies is necessary both for the Community and for the Member States so that appropriate action can be decided upon in the various Councils dealing with policies and measures in the field of economic instruments, taxation, energy, RTD, industry, transport and agriculture. This communication provides a first analysis of the contribution that the energy sector would need to make in order to achieve the objective agreed upon. Given the extent of the structural changes which could result from the decisions which would be required to implement the Kyoto Protocol, we need to be aware of the fact it will not be through gradual change, but through radical changes in the political choices, that the imperatives of environmental protection and of sustainable economic development could be met.

#### CO<sub>2</sub> Emission trends

7. As background for the debate the Commission has recently had a study carried out to analyse how energy trends could evolve if the current situation continues. This *pre-Kyoto* scenario is designed to examine the necessary scale of policies and measures to achieve a limitation and reduction of greenhouse gases.<sup>3</sup> The *pre-Kyoto* scenario is based on "business as usual" with no new policies and measures to reduce CO<sub>2</sub> emissions<sup>4</sup>. With economic growth of over 2% per annum after 1990, this scenario indicates a steady increase in CO<sub>2</sub> emissions of 8 % between 1990 and 2010 for the European Union as a whole. A sectorial projection of CO<sub>2</sub> emissions gives the following figures (in millions of tonnes of CO<sub>2</sub>) :

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<sup>3</sup> A meeting on this study was held on 19 March between Member States' energy analysts and the Commission Services.

<sup>4</sup> There are other scenarios such as PRIME or BAT which, based on other assumptions and very specific policies and measures indicate that a reduction of 10% in CO<sub>2</sub> emissions compared to 1990 can be achieved by 2010.

*Percentage change compared with 1990*

	1990	1995	2000	2010
Industry	626	- 10%	- 14%	- 15%
Transports	743	+ 9%	+ 22%	+ 39%
Domestic/Tertiary	654	- 3%	- 1%	+ 4%
Electricity/heat production	1036	- 5%	- 2%	+ 2%
Energy industry	141	+7%	+ 9%	+ 12%
<b>Total emissions</b>	<b>3200</b>	<b>- 2%</b>	<b>+ 2%</b>	<b>+ 8%</b>

8. It should also be noted that global CO<sub>2</sub> emissions are predicted to increase substantially over the next two decades. This strong CO<sub>2</sub> emission increase is due to population growth and industrialisation in Asia, Latin America and Africa. About three quarters of the projected CO<sub>2</sub> emission increase by 2020 will originate from developing countries. The share of Annex I countries in global emissions of some 70% in 1990 is bound to decrease significantly in the next few decades. By 2020, the contribution of Annex I countries to global CO<sub>2</sub> emissions could be reduced to slightly over 50%. **The Union is at present responsible for about 16% of global energy related CO<sub>2</sub> emissions with only 6 % of the world population.** In a conventional wisdom development this share is bound to decrease to some 12%. In the case of strong policy action, this share would be even lower since most of the action must be undertaken in Annex I countries and the European Community. The global analysis shows that even strong action in the Community can change world trends only to some extent. Co-operation with developing countries is essential. Nevertheless, strong Community action is needed to initiate and support global endeavours.
9. The results of the *pre-Kyoto* analysis quoted are based on the following main assumptions:
- economic growth of 3% p.a. in the next years and over the whole period between 1990 and 2020 average GDP growth of slightly over 2% p.a.;
  - continued increased output of heavy industry;
  - no new policies for influencing energy and transport demand;
  - price for imported energy rise until 2020; the oil price is assumed at 32 (95)\$ / bbl in 2020, with natural gas prices increasing in line with the oil price development, and coal prices increasing at a slower pace;
  - electricity generation investments determined on the basis of long run marginal costs; the lifetime of nuclear power stations is assumed to be as long as 40 years.

As a consequence,

- energy intensity is assumed to fall at an average rate of 1.3 % p.a. between 1990 and 2020.. (Energy intensity should improve by 1.3 % p.a. between 1995 and 2005, by 1.6 % p.a. over the following 5 years up to 2010, and by 1.4 % p.a. between 2010 and 2020).
- there is no significant carbon intensity reductions. The rate of carbon intensity improvement of 1.0% p.a. in the first half of the 1990s is not expected to continue. It is assumed that carbon intensity will improve at a rate of only 0.4 % p.a. between 1995

and 2005, and by 0.3% in the following 5 years to 2010, there might be a reversal of trends leading to an increase of carbon intensity by 0.4% p.a. between 2010 and 2020.

### **The need for policy decisions**

10. The desired degree of CO<sub>2</sub> emission reduction determines the scale of the policies and measures to be adopted. With the post 2000 trend as predicted in the *pre-Kyoto* scenario, achieving a 15% reduction in greenhouse gases by 2010 in the Union will require major energy policy decisions, focusing on reducing energy intensity (in particular through energy management and energy saving) and carbon intensity (in particular by promoting renewables) at constant GDP.
11. There are different combinations of policies and instruments which can be applied in order to reduce greenhouse emissions. Decisions will need to be taken as to the directions that should be taken. The most cost-effective package of measures to achieve the desired environmental result need to be identified.
12. In determining the best of the available options, more specific decisions need to be taken as to what legislative and voluntary measures may be required, whether we should adopt a specific fuel mix strategy, whether to set targets for energy intensity or renewables penetration, and to what extent implementation of the measures will be shared between governments and industry and other economic sectors.
13. We must be aware of the fact that facing this major challenge will require mobilisation of resources. The questions of what are the costs involved and what resources the Union and individual Member States are prepared to allocate need to be addressed.
14. The purpose of this Communication is to stimulate this debate both inside and outside the Community Institutions, as regards specifically the energy sector. There are no easy answers, but the magnitude of the problem of facing anthropogenic climate change must not impede us from searching for the most effective and practicable solutions. In order to provide a basis for discussion on policy decision to be taken, some potential areas of action are presented in this Communication.

## **POTENTIAL AREAS FOR ACTION IN ENERGY POLICY**

### **Energy Efficiency and Energy Saving**

15. Energy saving is as a very effective and often "cost-free" way of reducing greenhouse gases. "Unused" energy sources in fact correspond best to the concept of sustainable development. In addition they reduce energy imports and increase security of supply while creating related jobs. Energy consumption does not necessarily have to grow, even if GDP is growing. However, in the *pre-Kyoto* study, a steady increase in demand is predicted despite the assumption of a fall in energy intensity of 1.3% between 1995 and 2005, and 1.6% between 2005 and 2010. A proactive energy management policy promoting energy saving and energy efficiency is needed to realise the often numerous cost free opportunities and to curb this demand growth. This has to be complemented by measures based on the price mechanism.
16. The SAVE programme is an important element of the Community's CO<sub>2</sub> reduction strategy. The JOULE-THERMIE also supports research and demonstration for new energy saving technology. However, it should be recognised that the obstacles to energy efficiency and energy saving are not mainly technological. That is why under SAVE I a series of legislative proposal were made. A European energy consumption labelling

system for household appliances has been introduced and efficiency standards for boilers, refrigerators and freezers have been set but there is scope for much more action to promote energy saving.

17. The experience of SAVE shows that the Council has not always been willing to play its role in the adoption of certain energy efficiency legislation and the provision of financial resources commensurate with the energy saving potential in the Community and the climate change issues. **New commitments for emission reductions must lead to serious reflection on how to go well beyond what has been achieved in recent years for energy saving.**
18. The Commission has attempted to encourage electricity and gas distribution companies to regard themselves not as suppliers but as service companies; this could lead to significant reduction in energy demand which will be particularly effective in the domestic sector. To this end, the Commission has submitted a proposal for a directive encouraging the use of rational planning techniques in the supply and demand cycle. This has not yet been adopted by Council. **Energy undertakings need to be transformed into energy service companies to offer consumers a whole range of energy services which will ultimately save them energy while offering a better quality of service.** The Commission will promote the dialogue with the energy supply industry with the view to promoting energy saving services and more efficient energy production. Priority also needs to be given to the concept of efficient and economic energy services in RTD activities, especially for the short and medium terms.

#### **Greater co-operation with economic operators; role of environmental agreements**

19. While recognising that progress towards energy saving and energy efficiency has been made in recent years by industry, more action is needed, including in the area of environmental agreements. Long-term agreements are tools which should be developed where appropriate. Successfully applied throughout the Union, this instrument could improve energy efficiency and bring about a significant reduction in CO<sub>2</sub> emissions. In addition, there is a considerable scope for reducing CO<sub>2</sub> emissions in the motor vehicles sector and large firms should be encouraged to get involved in this process on a voluntary basis<sup>5</sup>.

#### **Accelerating the penetration of renewable energy sources**

20. Although efforts have been made in Europe, and elsewhere, for more than 20 years to encourage the use of renewables, the economic potential available has been far from fully exploited. In November 1996 the Commission published a Green Paper<sup>6</sup> on a strategy to increase the penetration of renewable energy sources which are capable of underpinning sustainable development in the long run since they generally do not produce net CO<sub>2</sub>, they do not entail technological hazards, they are, indigenous energy sources and present many other advantages.
21. **The Commission takes the view that a doubling of the share accounted for by these energy sources by 2010 (from 6% to 12%) could be an ambitious but realistic objective.** The implications of increasing the share of renewables are analysed for

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<sup>5</sup> Example : Commitment on the part of FIAT towards the Italian government to reduce by 20 % CO<sub>2</sub> emissions

<sup>6</sup> COM(96) 576 of 20 November 1996.

- example under the TERES II study, in particular with respect to parameters including CO<sub>2</sub> emissions, security of supply and employment. With respect to CO<sub>2</sub> emissions, the "Best Practice Policy" scenario of 12.5% share of renewables predicts a reduction in CO<sub>2</sub> emissions of 386 million tonnes per year by 2010 (representing 12 % of CO<sub>2</sub> emissions), calculated using the SAFIRE model.
22. Political determination is needed to take actions which will help increase significantly the share of renewables. Not only would these energy sources make a significant contribution towards limiting our own greenhouse gas emissions, but given the even greater potential in the developing countries, they would also make it possible to ensure the supply of energy with a low environmental impact in areas not yet connected up to energy networks. **In the context of the Community programmes, and especially the JOULE-THERMIE programme, several technologies in the field of renewables have been developed and their competitiveness proved (e.g. for biomass, wind energy and photovoltaic energy).** Many of the latter are deployed in decentralised systems. To increase their market integration, it is important that they should also be integrated in the centralised systems; this will be facilitated by stepping up demonstration and dissemination activities.
  23. **The links between agriculture and forestry, environment and energy need to be highlighted.** Biomass is an energy source which could make a significant contribution towards the efforts to combat climate change. Agriculture and forestry could help to absorb CO<sub>2</sub> through the development of carbon sinks which could then be used for energy purposes. Research, technological development and demonstration activities and tax measures should be stepped up so that this option becomes an economic reality through an reinforcement of research, demonstration and dissemination activities, and also by social and economic research activities in the field of market integration process.
  24. The continuation of the process of removing barriers to the more widespread use of renewables through harmonisation, standards, and financial assistance for pilot and information schemes are objectives set out in the Commission's new proposal concerning the **ALTENER programme**. The Council needs to adopt this programme rapidly, and, in order for it to make a valid contribution to the promotion of renewables, sufficient resources must be allocated to the programme.
  25. It is important to promote dialogue with the electricity generating companies aiming at achieving an undertaking on their part to produce a non-marginal quantity of electricity from renewable energy sources. Schemes in progress in certain Member States in this area show that this obligation helps to create a climate favourable to the penetration of renewables. Additional consideration also needs to be given to various incentives for promoting renewables. The Commission is reflecting on proposals in this connection, in particular by examining the possibility of guaranteeing a minimum price for these energy sources.
  26. The reaction to the Green Paper so far from the vast majority of interested parties supports the Commission's point of view on the need to significantly increase the share of renewables. **The Commission will make concrete proposals in the White Paper and Action Plan in preparation.** The measures to be taken should be commensurate with the objectives to be set. Member States also need to develop their own national strategies for the promotion of renewable energy sources.

#### **Better energy management at island, local, and regional level**

27. Greater decentralisation of energy management and increased public involvement will contribute towards better management of global issues and greater control over the



increase in energy demand. The June 1996 Habitat II Conference in Istanbul recognised that the bulk of population growth will take place in towns and cities which now account for 75% of the population of the Union and 70% of its energy consumption. This means that attention should increasingly be focused on the problems of energy management in urban centres. The Commission and the Member States should give priority to RTD activities in towns and cities, taking full account of the energy aspects in preparation for the key action of the 5th FP "City of Tomorrow".

28. The local and regional authorities have many powers in the services, housing and transport sectors. As a result of its programme of energy management at regional and local level, which is now part of the SAVE programme, the Commission is encouraging the involvement of elected representatives, alongside the other local partners concerned, by supporting the establishment of energy management agencies in regions, islands and cities. The main role of the Energy agencies is to promote energy saving and renewables. There are also useful networks set up<sup>7</sup> whose role should be expanded in order to promote transnational schemes.
29. All the public contracts awarded by the local and regional authorities in the Union represent an enormous energy saving potential. They should take account of the energy dimension and of climate change. The public authorities could thus play a leading role in the adoption of products entailing less energy consumption and hence producing fewer greenhouse gas emissions. The local and regional authorities could also automatically incorporate energy management principles in their new buildings. Studies have shown that certain public buildings in one and the same area can consume up to four times as much energy as others.
30. There is significant CO<sub>2</sub> reduction potential to be exploited at the local and regional level. The Committee of Regions could play an important role particularly in promoting energy saving and renewable energy sources alongside the other relevant levels of decision making.

#### **Promoting combined heat and power production initiatives**

31. The technologies for electricity production and cogeneration has been progressing rapidly, so that considerable efficiency improvements can be expected through the deployment of best available technology. In many cases, such advanced technologies also offer advantages in terms of cost-effectiveness. The Commission is preparing a communication on cogeneration in order to promote its use. There are already many examples in certain Member States which demonstrate the merits of this technologically mature option though there is great variation between Member States as regards its penetration.
32. The synergy between combined heat and power production and district heating or cooling networks needs to be better exploited. The use of biomass in cogeneration is a factor facilitating the penetration of this option. One way of accelerating the introduction of cogeneration is the third party financing (TPF) concept which should be promoted among the financial institutions so that they make greater use of it. In a market economy context, in the long run cogeneration is likely to be developed if there are transparent and fair rules with regard to the quantity and price of the electricity produced; and if the new gas contract situation ensures competitiveness.

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<sup>7</sup> FEDARENE for regions, ENERGIE CITES for towns and cities, and ISLENET for islands.

33. It is worth noting that even a significant penetration of cogeneration would not be sufficient to avoid an overall increase in CO<sub>2</sub> emissions. However, the Commission believes that there is scope for cogeneration to contribute to emission reduction

### Electricity generation

34. **Developments in the electricity /heat generation sector are crucial for overall CO<sub>2</sub> emission trends. This sector not only accounts for about a third of total emissions, but it is capable of limiting CO<sub>2</sub> despite growing electricity and heat demand.** In the *Pre-Kyoto* scenario, power station CO<sub>2</sub> emissions are expected to remain close to their 1990 level up to 2010.

In addition, the process of establishing transeuropean networks now in progress is intended to ensure optimum utilisation of electricity generation capacities throughout the Union and supply low carbon fuels to regions of Europe in which such products were not hitherto available.

35. However, while there is little scope for fuel switching in the transport sector, the electricity sector offers various possibilities for introducing or maintaining zero carbon fuels or increasing the use of low carbon fuels. CO<sub>2</sub> policies and measures should consider the role that electricity can play as one of the major elements in the development of innovative means of production, communication and mobility which could abate CO<sub>2</sub> emissions by reducing carbon intensity and energy intensity. The following table shows in detail the development of CO<sub>2</sub> emissions from the production of electricity and heat as well as energy intensity and carbon intensity in this sector.

*Average annual change (% per annum)*

	1990-2000	2000-2010	1990-2010
CO <sub>2</sub> emissions	- 0.2%	+ 0.3%	+ 0.1%
Energy intensity	- 0.5%	- 1.5%	- 1.0%
Carbon intensity	- 1.7%	- 0.5%	- 1.1%

*(pre-Kyoto study)*

The services of the Commission are completing with the European Electricity Supply Industry a major review of the potential contribution of electricity to sustainable development and in particular meeting the challenge of climate change.

36. As a result of technological progress since the industrial revolution, there has been a **constant improvement in the efficiency of power stations.** This improvement should continue or even increase, since there is still an insufficiently exploited theoretical potential. For example, the penetration of clean and efficient natural gas, coal and lignite combustion technologies could improve electricity generating efficiency by 5-10%, resulting in a reduction in fuel costs and a 15-30% reduction in greenhouse gas emissions. The overall impact will depend to a large extent on the degree of penetration of technologies in the Union and in a large part of the planet which will be making greater use of solid fuel (China, India, ASEAN, etc.). A Community programme for clean and efficient technologies using solid fuel and other heavy products could be appropriate.
37. Mention needs to be made of the contribution of nuclear energy to limiting greenhouse gases. According to current plans, the installed nuclear capacity in the Community is likely to increase only slightly in the next few years. Between now and 2010, nuclear energy can be expected to continue to contribute, although to a lesser extent, towards limiting the growth of greenhouse gas emissions. After 2010, a number of nuclear power

plants will enter the decommissioning phase. The longer term issues concerning nuclear power are outlined in the Commission's Indicative Nuclear Programme.<sup>8</sup>

38. There is currently rapid penetration of the electricity sector by natural gas, but this will probably have reached a maximum rate of penetration in 2010. After that in particular for reasons of security of supply, serious consideration will need to be given to this level of penetration.
39. It is clear that the current overall energy consumption is incompatible with the long-term requirements for sustainable development. **A significant limitation of the use of fossil fuels is required to ensure that the Community can meet its emissions reduction objectives contemplated in the Protocol on the Climate Change Convention.** This is by now widely recognised by main international organisations, national governments, and perhaps most importantly, large segments of the energy industry itself.

### **Integration with other policies**

40. Since energy demand is dependent on other economic activities, it is important that energy demand management principles should be applied so that, for a given quality of energy service, the increase in demand is as low as possible and efficiency as high as possible. In this context, other policies, in particular agricultural and forestry policy, environmental protection and waste management policy, transport policy, research and development policy, fiscal policy, regional planning policy, and regional and local development policy should gradually incorporate objectives regarding the reduction of greenhouse gas emissions and the development of carbon sinks. The Commission will provide an overall view in a Communication later in 1997 which will integrate all the measures in relation to climate change in all the policy areas.
41. It is important to consider how the **Structural Funds and the Cohesion Fund might be used to an even greater extent to provide funding for projects reducing greenhouse gas emissions, particularly in relation to renewable energies and carbon sinks.** In addition to energy projects *per se*, infrastructure projects could also make a contribution to the action to combat climate change. Future programmes and measures under the Structural Funds need to take account of this.
42. **Measures to combat climate change will also entail the creation of jobs in specific related sectors.** The Commission in co-operation with Member States should make a detailed study of the job-creation impact of measures to combat climate change. Greater effort should be also made concerning training. For example, the ECDVT (European Centre for the Development of Vocational Training) should establish energy management orientated profiles.
43. Where the common agricultural policy (CAP) is concerned, **an initiative concerning the use of biomass to produce energy in the context of the reform of the CAP** could represent another practical option which is virtually neutral from the point of view of greenhouse gases emissions. Properly thought out, this solution could also contribute towards furthering the objectives of the CAP. Improving energy efficiency and developing biofuels in agriculture are also viable solutions which should be studied in greater detail. The development of CO<sub>2</sub> sinks should also be carried out in those countries where it is needed.

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<sup>8</sup> COM(96) 339 of 25 September 1996 - Indicative nuclear programme with the meaning of Article 40 of the Euratom Treaty.

## Technology and Innovation

44. **The recent adoption of the Commission proposal for the fifth research and technological development framework programme (FP 5) coincides with the Kyoto Agenda.** Close and continuous co-ordination of RTD policy and energy policy is essential. Clean technologies can make a positive contribution, the results of which are lasting. The FP 5, and in particular the key action "systems and advanced energy services" and the current "JOULE-THERMIE" and "Environment and Climate" RTD Programmes, should assign an important role to activities promoting technologies whose energy efficiency and carbon efficiency represent major improvements compared with what is currently available on the market.
45. **Efficient and sustainable energy services should be developed through the use of various energy technologies.** On the energy supply side, mention can be made of the following: combine cycles, clean coal, fuel cells, renewables (wind, biomass, solar-thermal, solar photovoltaic), new thermodynamic cycles, etc. On the demand side, efforts should continue to be made in the field of new vehicles and engines, improvements in the efficiency of household appliances (in particular cooling equipment), electrotechnical equipment, electronic energy-control devices in the home, development of the City of the Future, etc. Social research, should also be reinforced since not enough attention has yet been paid to examining consumer behaviour when faced with energy choices, in particular the reaction of the public as energy consumers.

### Limiting other greenhouse gas emissions

46. Apart from CO<sub>2</sub> emissions, **coal-mines are a major source of methane emissions, and natural gas production and distribution inevitably entails gas leakage's.**<sup>9</sup> Where emissions due to coal-mining are concerned, preventive techniques are used to a large extent within the Union. This should be disseminated to our partners in the associated countries. Where natural gas is concerned, it is necessary to tighten up controls with regard to the quality of distribution networks, so as to limit leakage's. In this area, the Commission will encourage voluntary agreements with the gas industry.<sup>10</sup> Here too, it is necessary to increase the transfer of know-how and good practices to third countries. Applied research in the gas production and transportation sector should also be stepped up to bring about improvements which are also economically justified.
47. Although the waste sector is not directly connected with the energy sector, there are sometimes synergies between these sectors. With the abundance of energy sources, this sector can quite easily do without the production of energy from waste. However, waste management is a major concern of local authorities and while giving top priority to recycling, there may remain a final fraction to be landfilled, which will inevitably produce methane emissions. In such cases, landfill gas should be recovered and used to produce energy, or at least burned. Composting the organic fraction of waste can also make a significant energy contribution. On the other hand, where economically and environmentally justified, certain waste could be burned with a net energy recovery. In

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<sup>9</sup> In its communication COM(96)557 final on methane dated 15 November 1996, the Commission proposed various measures that it intends to promote in order to limit such emissions:

<sup>10</sup> For example, the gas industry in the Netherlands has concluded a voluntary agreement with the government, undertaking to reduce methane emissions by 10%.

the framework of the waste strategy, legislative and technological actions in favour of minimising greenhouse gases emissions will be presented.

48. Last but not least, with regard to emissions of N<sub>2</sub>O, fluidised bed combustion, one of the most promising technologies as regards the clean combustion of solid fuels, produces small quantities of greenhouse gas. In the context of the research programmes, greater importance should be given to understanding the mechanisms giving rise to this gas and means of mitigating it. Several research projects from the "Environment and Climate" programme deal with emissions, atmospheric balances and impacts on climate of greenhouse gases other than CO<sub>2</sub>.

#### Fiscal instruments and resourcing

49. On 12 March 1997 the Commission adopted a proposal for a directive extending the Community system of minimum rates of excise duties to all energy products. By differentiating between renewable energy sources, energy efficiency and innovation, the proposal endorses the approach pursued in this Communication. In addition to restructuring the tax system, it also contributes towards the complex task of internalisation of external costs. The Commission advocated applying this principle in 1993 in its White Paper on growth, competitiveness and employment.
50. If greenhouse gas emissions in the Union are to be reduced by approximately 20% compared with the *pre-Kyoto* scenario, **an ambitious programme of policies and measures will be required. The experience in certain Member States can provide guidance as to the direction to be taken.** Measures such as "green loans" in the Netherlands or "green electricity" purchased by certain consumers in Germany should be examined and made use of, where appropriate, at Community level, as should the French biofuels pilot projects. Another idea was put forward in the Green Paper on a Community strategy for renewable energy sources: a renewable energy credit system.
51. **If a major new policy initiative is required, we may need to examine very carefully the merits of mobilisation of funds at the appropriate level so as to provide resources for funds earmarked for energy management and renewables. In 1995 energy expenditure in the Union amounted to over ECU 500 000 million which shows that it should be possible to raise funds to finance at the appropriate level energy management and the penetration of renewables. Consequently, a minimum contribution would be sufficient to raise funds to ensure that the policies and measures adopted post-Kyoto are implemented.** Experience in the United Kingdom with regard to *non-fossil fuel obligations* and the other trials mentioned above justify an examination in the general interest.

#### REQUIREMENTS AND IMPLICATIONS OF FUTURE POLICY CHOICES

52. The table below indicates the annual average change in GDP, energy intensity, carbon intensity and CO<sub>2</sub> emissions, which illustrates the scale of the challenges we face.

	1990-2000	2000-2010	1990-2010
GDP growth	+ 2.1%	+ 2.4%	+ 2.2%
Energy intensity	- 1.0%	- 1.6%	- 1.3%
Carbon intensity	- 0.90%	-0.2 %	- 0.5%
CO <sub>2</sub> emissions	+ 0.2%	+ 0.6%	+ 0.4%

(*pre-Kyoto* study)

53. The impact and cost of a commitment at Kyoto of a 15% reduction in greenhouse emissions has not yet been fully assessed. It could however be considerable. As background to the debate on the implications of choices made, it is worth noting that there are several Commission studies, based on different assumptions, exploring the possible scenarios for a reduction of greenhouse gas emissions. One of the studies undertaken by the Commission is the "European Energy 2020 study"<sup>11</sup>, where the "Forum" scenario indicates that considerable changes will need to be made to the current structures in order to achieve an emission reduction of some 6% in 2010. This scenario presented an attractive energy future, especially for the environment and the security of energy supply.
54. It is also worth noting, that in order to achieve the 6% emission reduction under this *forum* scenario it is assumed that there is a change in the sources of government finances, with a gradual switch in taxation from labour to natural resources, reaching 1,5 of GDP by 2005. Compared to the *pre-Kyoto* scenario outlined in this Communication, under the Forum scenario the cost of energy in 2010 will be higher.
55. For a *Forum* scenario to be achieved by 2010, the following are prerequisites:
- considerable intensity and efficiency gains in all end-use sectors and in power generation;
  - a clear decoupling of CO<sub>2</sub> emissions from GDP growth, because of combined results in energy savings and carbon-free energy supply actions;
  - new supply structures in power generation, in favour of decentralised generation (heat, renewables, biomass, fuel cells), in biofuel production, in hydrogen production and the market penetration of fuel cell and electric vehicles.
  - agricultural policy in favour of biomass;
  - a combination of taxation policy and favourable conditions in capital markets resulting in low discount rates, despite an international environment characterised by low import prices for fuels;
56. An estimation of investment requirements in *Forum* indicates that more than 391000 MECU investment for electricity generation and refineries would be necessary for the period 1991 to 2010.
57. The example of this *Forum* scenario shows that there are ways of reducing by some 6% the CO<sub>2</sub> emissions in 2010 if we take quite radical measures. This is one of many possible scenarios, mentioned here by way of illustration. This does not imply that the Commission favours the specific policy proposals in any particular scenario.

Another scenario using the PRIMES model, indicates that a 10% reduction of CO<sub>2</sub> emissions by 2010 compared to 1990 can be achieved by a combination of measures. These include promotion of energy efficiency and energy saving, higher penetration of combined heat and power, changes in fuel mix and reduction in fuel consumption in transport. The achievement of 10% emission reduction under this scenario also implies a 10% share of renewable energy sources by 2010. Another ongoing analysis of the Kyoto emission reduction targets, using the PRIMES model, indicates that the application of

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<sup>11</sup> SEC (95) 2283 of 20/12/95

Best Available Technologies, (BAT), though not enough by itself, can make a significant contribution to emission reduction.

58. **The policies and measures that the Community should launch in order to make up the 20% gap** between the expected rise in emissions of 8% and a committed reduction of 15% will have to take account of the constraints imposed by the Union's new financial perspective. The Commission needs to address as a matter of urgency the quantification of the cost - at least on investment - of the current EU negotiation position.
59. **The financial implications also need to be examined in the light of their impact on economy both at micro-economic and macro-economic level** which will inevitably be examined by the various economic operators involved. The complexity arising from the number of variables will require innovative solutions that should be examined case by case with the parties involved. It will be necessary to develop a methodology which takes account of this multi-dimensional approach (e.g. objective - time frames - instrument - cost), together with reliable evaluation and analysis tools. Certain Member States are already adopting greenhouse gas emissions limitation strategies backed up by specific programmes of policies and measures and an evaluation of costs. It is necessary for all the Member States and the Commission to benefit from this experience, particularly as regards the evaluation of the financial implications and the methodologies adopted. Joint analyses work will be a necessary tool for assessing better the implications of the decisions taken.
60. **In the context of the internal market, a sound joint analysis of the energy situation by the Member States and the Commission is also indispensable** in order to determine more clearly the issues and solutions related to climate change. For a better definition of policies and measures, it is necessary first of all to have a better understanding of the sectors and actors consuming energy and producing greenhouse gas emissions. Through its research programme, the Commission is developing the capacity to evaluate Policies and Measures taking into account social, economic and scientific aspects of Climate Change (JOULE, Environment and Climate programmes).
61. **A stronger energy policy, taking account of its impact on climate change, should be backed up by better co-ordination of all measures directly affecting energy**, including those taken in the context of other sectorial policies. The Union needs to demonstrate its ability to adopt a comprehensive strategy. **It also needs to involve the economic actors.** One of the roles of the Consultative Committee on Energy established by Commission decision will be to look to how the Energy dimension to the Community's climate change strategy can be reinforced by the economic actors.
62. **The climate change challenge is by definition an international one.** In particular, substantial efforts will need to be undertaken on the part of the Union and the associated States to ensure that energy efficiency in those countries reaches a level comparable to that observed in recent years in the Union. The decisions that will be taken in Kyoto will ultimately have to be applied to the Associated Countries which want to join the Union. One of the objectives for the Central and Eastern European Countries during the current transformation process is to reform their energy sectors. These reforms remain their responsibility. However, co-operation between the Union and these countries has been established in different forms i.e. to promote energy saving and energy efficiency. The efforts made by the countries concerned are of importance in view of their compliance with the *acquis communautaire* in this area, i.e. emission reductions of greenhouse gases.

63. In the context of the **structured dialogue** of 3 March 1997, the Council and the Environment Ministers of the associated countries of Central and Eastern Europe stressed the importance of close co-operation between them and the Union, in particular in the context of activities implemented jointly and the requisite strengthening of the mechanisms to promote policies to combat climate change and encourage energy efficiency. In this context, it was acknowledged that programmes of technological co-operation as INCO-RTD and the JOULE-THERMIE programme should place greater importance on climate change issues, regarding as priority the energy measures foreseen to respond to the objective of reducing greenhouse gas emissions. It is also necessary to provide for greater support from the EIB, the EBRD and the World Bank. The Community will focus the structured dialogue on reinforcing efforts to improve Energy efficiency and to the adaptation of the Energy system to reduce emissions.
64. The Union will also need to insist that our industrialised parties make a firm commitment to combat greenhouse gas emissions by agreeing to strong reduction objectives in the future Kyoto Protocol since there can be no question of our European economy suffering the consequences of an unilateral global environmental protection policy while our trading partners could avoid measures influencing energy prices and hence the competitiveness of industry and employment.
65. **In the general context of energy relations, the reality of the common challenge in the field of energy between OECD and non-OECD partners requires a response which specifically takes account of the major impacts of energy supply.** The Energy Charter Treaty and its protocol on energy efficiency and related environmental aspects could serve as a joint basis for co-operation. Equally, the implementation of the Partnership and Co-operation Agreements with the majority of the countries of the NIS as well as the execution of technical assistance programmes would contribute to energy efficiency and energy saving. Energy co-operation with the developing countries should also incorporate the dimension of climate change policies. To this end, the 3 March 1997 Council recognised that the rules governing joint implementation should be part of the Kyoto Protocol, even if initially it is necessary to await the results of the pilot projects in progress.
66. The initiatives concerning co-operation with the **Mediterranean countries** should also as soon as possible, focus to a large extent on energy projects and in particular projects relating to renewable energy sources and energy efficiency. This will provide a lasting solution, enabling industry in those countries to adopt and adapt appropriate technologies. In addition, the Committee on Co-operation between the Union and the Gulf Co-operation Council countries reiterated the two parties' interest in this issue on 16 December 1996. The possibilities as regards joint analysis, co-operation and exchange of scientific information and experience were recognised as useful instruments in this area. Their deployment should now be formalised in the context of appropriate programmes.
67. **The challenge of climate change is such that the development of policies and measures need to be pursued jointly by the Member States and the Community at Community, national, regional and local level in order to achieve the agreed reduction targets and the burden-sharing decided upon between the Member States.** Common policies and measures, or policies and measures requiring co-ordination between Member States at Community level, are necessary and will need to be the subject of an **integrated approach**. But in order to develop this approach, the questions outlined in the first section of this document (para. 10-14) need to be addressed.



68. The Commission wants a strong political signal from the European Parliament and the Council, with the support of the Economic and Social Committee and the Committee of the Regions. It believes that the Community should do all that it can to ensure that the Conference of the Parties to the United Nations Convention on Climate Change in Kyoto in December adopt a protocol that will reduce greenhouse gas emissions significantly through policies adopted and measures taken by all the Annex X parties. But we must be certain that the commitments can be fulfilled, and that the political will and resources required are indeed forthcoming.

## ANNEX

Energy related CO<sub>2</sub> emissions (mill. t CO<sub>2</sub>) in the *Pre-Kyoto* Scenario:

Assuming no new policy initiatives in the Member States nor at the Community level, CO<sub>2</sub> emissions would change in the following way <sup>12</sup>:

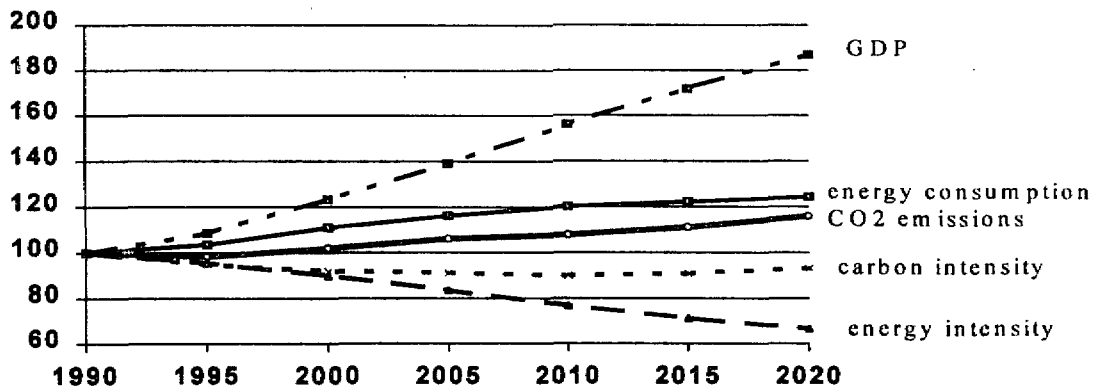
Mt CO <sub>2</sub>		percentage change over 1990				
	1990	1995	2000	2005	2010	2020
EUR	3200	-2%	+2%	+6%	+8%	+16%

Energy related CO<sub>2</sub> emissions by sector (mill. t CO<sub>2</sub>)

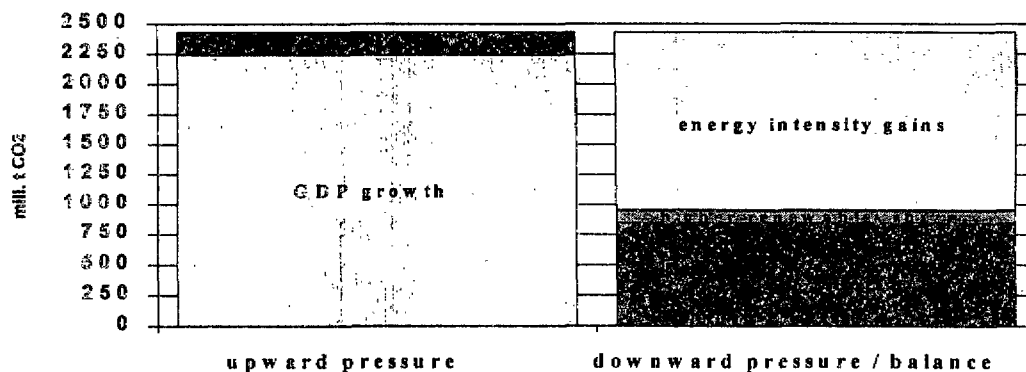
	1990	percentage change over 1990				
	1990	1995	2000	2005	2010	2020
industry	626	- 10 %	-14%	-14%	-15%	-15%
transport	743	+ 9 %	+22%	+31%	+39%	+49%
domestic/tertiary	654	- 3 %	- 1%	+ 2%	+ 4%	+ 6%
power/heat production	1036	- 5 %	- 2%	+ 2%	+ 2%	+17%
energy branch	141	+ 7 %	+ 9%	+ 11%	+12%	+13%
total emissions	3200	- 2 %	+ 2%	+ 6%	+ 8%	+16%

<sup>12</sup> The EU analysis is based on modelling results with the MIDAS model undertaken by Prof. Capros of the National Technical University of Athens, study commissioned by DG XVII, April 1997

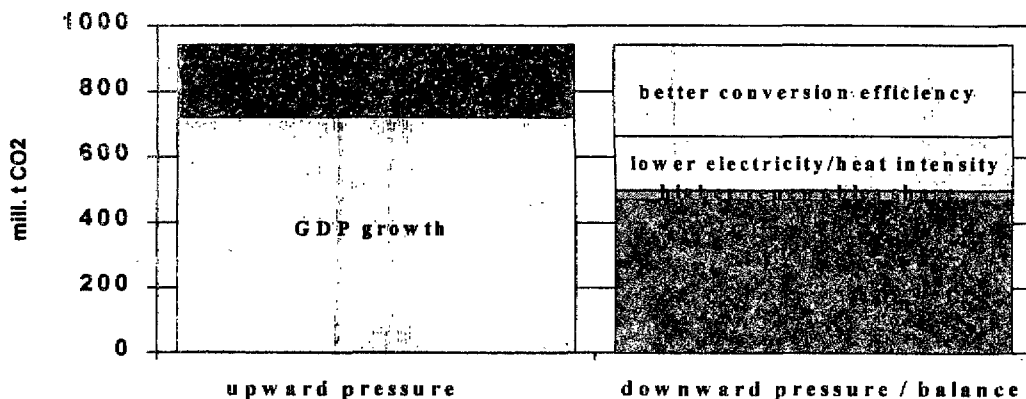
EU: pre-Kyoto scenario: development of GDP, CO<sub>2</sub> emissions, gross inland consumption, energy and carbon intensity  
1990 = 100



EU: pre-Kyoto scenario: total energy consumption 1990 - 2020  
Illustration of underlying factors for CO<sub>2</sub> emission change



EU: pre-Kyoto scenario: power/heat production 1990 - 2020  
Illustration of underlying factors for CO<sub>2</sub> emission change



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