

# COMMISSION OF THE EUROPEAN COMMUNITIES

SEC(95) 288 final

Brussels, 01.03.1995

## COMMISSION WORKING PAPER ON THE EU CLIMATE CHANGE STRATEGY: A SET OF OPTIONS

**COMMISSION WORKING PAPER ON THE EU CLIMATE CHANGE STRATEGY:  
A SET OF OPTIONS  
SEC 95/288/Final**

---

*In Berlin, will be held in March 1995 the first Conference of the Parties to the Framework Convention on Climate Change, which was set up at the U.N. Conference on Environment and Development at Rio de Janeiro, 1992. In this convention, the developed regions in the world committed themselves to a gradual limitation of their greenhouse gas emissions, in particular concerning CO<sub>2</sub>, which is by far the most important and best known greenhouse gas. In this process, the EU decided to stabilise its CO<sub>2</sub> emissions in 2000 at 1990 levels.*

*Current analyses indicate that with prevailing expectations concerning energy prices and economic growth, the EU could fall short of its stabilisation commitment by 5% to 8%. The Commission underlines, therefore, the very importance of reaching this objective. It will require a more vigorous implementation of current Community and Member State programmes.*

*In response to the request of the Council, the Commission presents in this document a preliminary analysis of the policy options which it should consider for CO<sub>2</sub> limitation in the perspective of 2005-2010. In the light of the deliberations in Council and at the Berlin Conference, the Commission will elaborate a more detailed Communication at a later stage. From this preliminary analysis, it is already clear that a significant technical potential exists to limit and reduce CO<sub>2</sub> emissions beyond the year 2000. If this potential is to be exploited, substantive measures will have to be taken: the improvement of energy efficiency and the penetration of renewable energy sources, completion of the internal energy market, a change of transport modes, an upward review of energy taxes, a better focus of its R&D policies, and an intensified cooperation with third countries. The Commission underlines, however, that many of those measures can be introduced with a view to achieve substantial benefits in other policy areas, like energy, R&D and transport, as well as growth, competitiveness and employment, as already indicated in the Commission White Paper of December 1993.*

*In conclusion, the main message of the Community to the Conference of the Parties should be the following: it is committed to implement the necessary measures, first, to stabilise its CO<sub>2</sub> emissions in the year 2000 and, second, to limit and reduce CO<sub>2</sub> emissions beyond the year 2000. It also stresses the importance of designing cost-effective strategies, in the hope that other nations will pursue a more sustainable policy in the future.*

---

## A. INTRODUCTION

1. The Council conclusions of 15-16 December 1994 regarding the preparations for the first Berlin Conference of the Parties to the Framework Convention on Climate Change (Berlin, 28 March- 7 April 1995) included the request to the Commission for the elaboration of "a set of options in terms of policies and measures to be taken at Community level and by Member States and the resulting emissions for the European Union as a whole, aimed at progressive limitations and reductions of CO<sub>2</sub> and other greenhouse gases at the horizon 2005 and 2010".
2. At the same time the Council asked the Commission to review the relevant programmes of the Member States in order to assess whether progress in the European Union is sufficient to ensure the fulfillment of the Community CO<sub>2</sub> stabilisation target for the year 2000, and submit appropriate proposals before the next meeting of the Environment Council.
3. The present paper will deal with the set of options for actions in the time frame of 2005 to 2010 while covering at the same time ways to achieve the stabilisation target of the Community. For some of the key measures envisaged in the past at EU level, such as the carbon/energy tax, there may be a need for a MS response in absence of a Community decision. The overview of the national programmes and their assessment will be the subject of a separate paper. This paper is concerned mostly, although not exclusively, with policy areas to be considered at Community level,
4. Energy related CO<sub>2</sub> emissions in the Community by 2000 are expected to increase some 5 to 8% over the 1990 level (see annex 1). This projection is based on the assumption of healthy economic growth for the rest of the decade and the continuation of the present energy situation. New measures taken at the Community level, because of the time required for the proposals to be elaborated, agreed by the Council and implemented by the Member States, will only have a limited impact on the year 2000 emissions. Therefore, at this stage, **assurance for achieving the Community stabilisation objective, rests with the implementation of current national and Community programmes**, including the introduction of the carbon/energy tax. Many measures to be taken in the framework of existing national programmes can still contribute to the stabilisation objective, e.g. demand side management programmes, investments in cogeneration, fiscal measures as well as specific measures, like third party financing, included the SAVE directive. Due to the delays in the implementation of national and Community programmes, a more important effort is now required in these areas. So, while our attention is now called by the Council to be focused on the perspective beyond 2000, the Commission underlines the importance of reaching the 2000 objective. Failure to do so could damage our ability to convince developing nations in particular to pursue a more sustainable future.
5. New measures taken at Community level will be primarily useful for further CO<sub>2</sub> and other greenhouse gas limitations beyond the year 2000. Our list of options will take its departure from the list included in the Council conclusions of 15-16 December 1994. Although not yet exhaustive, our list has been enlarged to include the most important national or Community actions for effective control. This working paper is not meant to provide an

evaluation of the costs and the impact on emissions of *individual* policy measures. A detailed evaluation will have to be undertaken before concrete policy proposals can be made and the Commission intends to present a working paper on this subject. Particular effort has been made, however, to integrate lessons from past experience.

5.1. **First, in strategic terms, the goal of integrating the CO2 limitation objective in other policy areas needs to be pursued and reinforced.** The *benefits of integration* do exist: CO2 abatement policies should, in many cases, be implemented on their own right, as they bring substantial secondary benefits in different policy areas. In this context, it is pertinent to emphasize that preference be given to precautionary measures. As already put forward by the White Paper on growth, competitiveness and employment, it is possible to integrate economic and social objectives of the Community with those related to the environment. As a result, our list of options is presented in a way which highlights possible strategies linked to key areas of Community activity, where ongoing processes can be reinforced.

- **Energy policy**, as put forward in the Green Paper for a European Union Energy Policy, is concerned with balancing -and developing synergies between- environment protection, energy security and competitiveness. Competitiveness and welfare should be improved by bringing down the costs of energy services to the final consumer through a rational use of energy, which will decrease energy use and reduce other environmental problems (air pollution).
- **Transport policy** has set as its goal to achieve a sustainable mobility. This will inevitably imply structural change in the transport sector, likely to limit substantially CO2 emissions.
- As already recommended by the Commission White Paper, **fiscal policies** have a important role to play in reducing unemployment, while at the same time limiting CO2 emissions.
- **RTD policy** has now identified the environment, and CO2 limitation in particular, as the main driving force for the technological change. New energy technologies will play a crucial role after 2000 for the mitigation of CO2 emissions; their implementation would also improve competitiveness of the european industry through the creation of markets and products.
- Progressively, other policy areas integrate a greenhouse gas abatement dimension: in particular, it will increasingly become a dimension of our **external relations**. Possible synergies with other policies - such as **agricultural as well as structural policies** need also to be emphasized. At Member State level, **housing, urban renewal and land-use planning policies** have also an important impact on the development of CO2 emissions.

5.2. Second, the challenge of integration, in policy terms, has perhaps been underestimated. **A considerable political commitment is required in all these policy areas if CO2 limitations are to take place effectively.** This challenge forces us to concentrate our efforts on the implementation of concrete measures rather than on the setting of long term targets. As a result, when looking *beyond* 2000, it must be stated that even CO2 stabilisation will remain very challenging given present energy and economic structures and the expectations for economic growth. It needs to be remembered that CO2 stabilisation means that a growing GDP has to be produced with the same amount of CO2 emissions. On the other hand, in the longer term, the range of cost-effective possibilities to limit CO2 emissions also becomes larger, as a larger part of the stock of equipments is being replaced by new, cleaner and more efficient technologies issued from

the RTD activity. In this context, we need to recall that many of the potential actions identified in the early 1990s, and in particular by the Community strategy to limit CO<sub>2</sub> emissions and improve energy efficiency, have not yet been utilised, if at all taken place. Taken together, the options developed in this paper could in principle allow achievement, beyond the CO<sub>2</sub> stabilisation of 2000, of reductions of 5 to 10% in the time frame of 2005-2010. The effective results will, however, depend on concrete action being undertaken in time at Community as well as national level.

## **B. OPTIONS**

### **1. Changing market structures: completing the internal market of energy**

- 1.1 Electricity generation from fossil energy sources and gas account for nearly 50% of energy related CO<sub>2</sub> emissions in the Union. Market structures have therefore an considerable impact on total CO<sub>2</sub> emissions.
- 1.2. The role of **market liberalisation** in limiting CO<sub>2</sub> emissions needs to be further emphasized. The internal energy market may allow the increased efficiency of the system through a better allocation of resources and the development of autoproduction, which is particularly suited to be undertaken in an energy-efficient (cogeneration) or renewables mode. Its completion could therefore give the opportunity to increase the production as well as exchange of electricity produced in an energy efficient and/or low carbon mode.
- 1.3. **Transeuropean networks** optimise the use of electricity generation capacity (including low carbon capacity) throughout the EU and bring low carbon fuels to regions where they could not be used before. A rapid implementation of these networks is therefore needed.
- 1.4. While market liberalisation will improve the economic efficiency of energy supply, it is essential to take advantage of the demand side potential for CO<sub>2</sub> abatement as well. **Integrated resource planning** for electricity and gas is therefore to be actively promoted in the framework of the completion of the internal market for energy. Utilities should therefore investigate supply side and demand side management options (energy efficiency and renewables at consumer level) on an equal footing. This requires that utilities be able to obtain profits, not only from selling gas or electricity, but also from *energy services* they provide in the form i.a. of energy efficiency investments in end-use sectors. Towards this direction, a community measure is in preparation.
- 1.5. Market liberalisation is expected to bring about cost-effective options to limit CO<sub>2</sub> emissions, provided energy prices integrate external costs. At the same time, **dialogue with the power generation sector** needs to be strengthened. Such a dialogue would integrate different aspects, such as energy security, environmental protection and competitiveness and would result i.a. in an integrated approach of greenhouse gas and acidification objectives. The strengthening of this dialogue should encourage the use, in appropriate circumstances, of **voluntary agreements**.

## 2. **Removing barriers to energy efficiency improvements and to penetration of renewables**

2.1. There is a considerable Community dimension in improving **energy efficiency**, not only in view of the internal market dimension, but also as this is a strategic objective which impacts on many aspects of EU life (e.g. competitiveness, employment, environment, regional development and energy security). Energy efficiency improvements in end-use sectors remain undoubtedly the most important and attractive CO<sub>2</sub> limiting option in the medium term. By removing specific barriers to energy efficiency improvements in industrial, domestic and tertiary as well as transport sectors, billions of ecus could be saved throughout the economy, by bringing down the cost of energy services. The options 2.2. to 2.4 are designed to give a Community contribution to the removal of barriers to energy efficiency improvements.

### 2.2. Energy efficiency measures could be strengthened within the forthcoming **SAVE II**.

- Improving the energy efficiency of energy using equipment has a strong internal market dimension. There is large scope for improving energy efficiency of appliances used in the domestic/tertiary sector, which are responsible for about 17% of CO<sub>2</sub> emissions in the Community (heating use not included). Minimum standards, voluntary agreements, international negotiations and/or legislation, are key measures to remove from the market the *least efficient* technologies, which continue to be sold to those consumers who remain unaware of the long term benefits of purchasing more efficient ones. Complementary to standardisation, energy labelling provides information to encourage the use of the *most efficient* appliances. The adoption of Commission directives, in the framework of directive 92/75/EEC, should therefore be accelerated and extended. It is furthermore essential to ensure the rapid and full implementation in the Member States of the SAVE Directives already adopted (in particular concerning heating requirements of households). In a different context, the implementation of the European ecolabel scheme may also be speeded up with a view to limit the overall impact on the environment, including CO<sub>2</sub> emissions.
- There is also a strong Community dimension in disseminating information through networks and supporting pilot actions on e.g. transport, buildings, cogeneration, regional and local energy efficiency initiatives and third party financing.

2.3. **Community support to urban and regional energy management** could also be strengthened, through harnessing the experience within the Member States in the frame of cohesion policies. The bottom-up approach in the field of energy management contributes to CO<sub>2</sub> abatement. The Commission has financed the setting-up of energy agencies at regional and city level for the diffusion of energy management. Recognising and strengthening the role of local authorities, particularly well placed for influencing citizens' behaviour, is a base of acting locally on global issues.

2.4. As regards the **industrial sector**, which is directly responsible for 18% of CO<sub>2</sub> and indirectly for about 30%, energy efficiency improvements are usually brought about by the market. However, in different sectors, energy efficiency measures by individual companies could be further promoted. Combining the scattered expertise on energy efficiency with private financial resources can create a market offering business opportunities, on the one hand, and lower energy costs on the other.

- The ongoing **dialogue** of the Commission with industrial sectors should be reinforced, with

a view to removing uncertainty for economic actors, facilitating strategic developments for providing energy services, as well as making operational the issues of partnership and co-responsibility as set out in the Fifth Action program.

- The strengthening of this dialogue should encourage the use, in appropriate circumstances, of **voluntary agreements** with the aim of improving energy efficiency and limiting CO2 emissions. In this respect, the development of a **framework at Community level** to cover the use of these voluntary agreements should also be considered, taking into account the Community competition policy.
- The implementation of the **Environment Management and Audit Scheme** may also be speeded up with a view to limit the overall impact of industrial activities on the environment, including CO2 emissions.

2.5. The integration of **renewable energies** into the energy market is also a strategic goal with many dividends and a significant share of these energies in the whole energy balance has to take place by 2010. Technical (both supply and demand side aspects), economic and social aspects of renewable energies have to be addressed in cooperation with professional organisations, authorities at the local, regional and national levels and industries (including SMEs). Synergies should be sought with other relevant EU instruments, such as Structural and Cohesion Funds, Common Agricultural Policy, etc...

2.6. Removal of non-technical obstacles to greater use of renewables including harmonisation, standards, financial support for pilot action, information, i.e. continuation and strengthening of **ALTENER** is a straightforward option. The contribution of renewables to reducing CO2 emissions might be expected by the year 2010 to amount 6.5% of the 1990 level of CO2 emissions through existing programmes like **ALTENER**, **JOULE-THERMIE**, the implementation of carbon/energy taxes, like the one proposed by the Commission, and the completion of the internal energy market. In parallel with problems of cost-effectiveness, issues of acceptability as regards environmental impacts should also be addressed, as this is a prerequisite for making renewables a significant option for greenhouse gas abatement.

### **3. Transport: changing market structures, improving vehicle efficiency and fostering behavioural change**

3.1. The transport sector in the European Union accounts for about 25% of total CO2 emissions; it is the second-most important sector in terms of CO2 emissions. Other air emissions from transport will be limited under current and proposed Community legislation. Transport-related CO2 emissions, however, are forecasted to increase significantly under a "business-as-usual" scenario, in relative as well as absolute terms, as transport demand is likely to continue its upward trend. Options to limit and reduce CO2 emissions from traffic can focus on improving the fuel-efficiency of vehicles, developing alternative fuels and engine systems as well as enhancing the efficiency of the overall transport system (e.g. by a shift to more fuel-efficient transport modes). In the longer term, more efficient land-use planning and advanced forms of communication, i.e. teleworking and information highways, could limit the demand for mobility. Economic and fiscal instruments, technical measures, RTD for new advanced technologies (electric vehicles), voluntary commitments, transport planning and infrastructure investments are undoubtedly the main types of instruments to achieve these objectives. The following policy areas are particularly promising to limit CO2 emissions.

3.2. The Commission is called on by the Council to make a proposal concerning a Community measure to reduce **CO<sub>2</sub> emissions from passenger cars**. Important elements to consider in this respect are commitments by industry to produce more efficient cars, economic and fiscal measures to modify consumer behaviour through fuel excises and vehicle taxes, as well as reference standards. From a technical point of view, a substantial improvement in the fuel economy of new cars is possible over a period of 10 to 15 years. The technical potential for improving the fuel efficiency of new cars over a period of 10 to 15 years is estimated up to 40%. Preliminary evidence suggests that a major part of this potential could be realised at current market prices without increasing the overall costs of car ownership and usage to consumers. Measures for improving fuel efficiency of heavy-duty vehicles could also be investigated, as well as accompanying measures at Member State level to improve driver behaviour.

3.3. The reduction of CO<sub>2</sub> emissions will have to be part of a **comprehensive policy package** to reduce the large external costs of the current transport system, in particular congestion, accidents and air pollution. To that end, the Commission is currently preparing a Green Paper on the internalisation of external costs.

- Clearly, it is necessary to carefully analyse appropriate instruments for internalising external costs and more effort should be devoted to gauging their magnitude. In this context, the use of road pricing will undoubtedly have to be considered more attentively, at Member State level, and the Community will have to work with the Member States towards ensuring compatibility between various systems.
- A modal shift in both the passenger and the freight sectors while maintaining high loading ratios is important. Although loading ratios and technical factors are important, under most circumstances, rail and waterway transport is more fuel-efficient than road and air transport. Public passenger transport is in principle more fuel-efficient than private passenger cars. Such a shift will require, as a precondition, an improvement in the infrastructure and in the service levels of railways, waterways, combined transport and public transport, including a higher interoperability and intermodality of the transport system across the Union. In this context, the Community is prepared to strengthen its efforts towards the improvement of the environment, including the assistance for environment-friendly transport infrastructures. Also, in the context of structural policies and of transeuropean networks, the Commission intends to apply with rigour the Community legislation on environmental matters including environmental impact assessments for infrastructure projects.
- Travel distances and associated traffic and energy consumption are partly determined by land-use planning. The modal split is influenced by the accessibility to transport users of the different means of transport. Integrated transport and land-use planning can therefore help to reduce traffic, where appropriate, especially on the less fuel-efficient modes. This measure will have an effect only over the medium to long term. Member States could review the corresponding transport and land-use planning guidelines.
- Government-industry agreements could contain commitments for sectoral CO<sub>2</sub> reduction or specific measures to be taken by both sides. Voluntary measures by industry could include a code of conduct on the advertisement of vehicle performance, the integration of transport aspects into eco-auditing and improved coordination between road haulage operators to improve loading ratios.

#### 4. **Fiscal instruments: integrating environmental concerns in the fiscal system**



- 4.1. In parallel with and reinforcing the measures to improve users' and consumers' energy efficiency, the Commission still considers, as agreed with the Council, that **economic measures remain necessary**. In particular, the scale of the emissions still warrants wider use of instruments taking fuller account of the external costs in the future policy on the greenhouse effect. In this context, recourse to fiscal instruments, as advocated since 1992, is still on the agenda. Many of the non-fiscal options discussed elsewhere in this paper will in fact only attain their full emission abatement potential in a context of higher final energy prices. Taxation, whether at the national or the Community level, is likely to play an important role in this context. Finally, the approach put forward by the White Paper on growth, competitiveness and employment should be strongly underlined. The reduction of non-wage labour costs, financed by carbon/energy taxes, would reduce unemployment and, in particular, facilitate the integration into the labour market of low and non skilled labour.
- 4.2. The delays in implementing the Commission proposal to introduce a CO<sub>2</sub>/energy tax (COM(92) 226 final of 30 June 1992) combined with the specific problems encountered in devising a fiscal instrument meeting the general requirements and the Member States' more specific requirements have prompted the Commission to fine tune its approach to make the most of the **complementary features of the various fiscal measures** which could be envisaged.
- 4.3. The Commission maintains the approach in its 1992 proposal on the CO<sub>2</sub>/energy tax, but it notes that the proposal poses serious short-term implementation problems for a number of Member States. Without changing its nature as an objective of high relevance for the Union, the Commission believes that, for the Member States which wish to press ahead with environmental taxes on energy, this is an appropriate time to propose an amendment introducing a transitional phase providing the degree of flexibility for which a desire was expressed at the Essen Summit and at various Council meetings. However, the guidelines which it intends to submit to facilitate implementation of a fiscal instrument call for a close, detailed review of the needs and possibilities, based on the lessons which can be learnt from the situation in the Member States which already apply such fiscal measures, whether on their own or alongside long established excise duties. Generally, the use of economic instruments should be decided in a common framework, including minimum rules, to avoid potential distortions of competition within the Union, while giving Member States the possibility to go forward on environmental policies.
- 4.4. In the context of this review, the Commission will also take account of the options offered by harmonized excise duties on mineral oils, with regard to both structure, where extension of the range of products liable could be considered, and rates, where environmental concerns could add to the demands of the internal market for greater harmonization. The advantage of this option is that it fits into a largely harmonized, tried and tested framework, systematically revised every two years. An increase, in real terms, in the excise duties on mineral oils would contribute to the awareness-raising needed amongst consumers.
- 4.5. This combination of a CO<sub>2</sub>/energy tax, where applied, and of predictable, repeated increases in excise duties would have a powerful effect on user behaviour. In this connection, monitoring of any national fiscal measures taken by the Member States

before or after the Community measures would be of great benefit for evaluating the Community policies. When applying the monitoring mechanism, the Commission will therefore keep a particularly vigilant watch on the fiscal measures adopted by the Member States.

## 5. New technologies and RTD

5.1. The will to stabilize or reduce CO<sub>2</sub> emissions beyond the year 2000 gives technological development a crucial role: in particular, the timescale is long enough to bring the new technological options on to the market and increase their overall efficiency. In addition to the Member States' RTD programmes, the Community has another key instrument for development of new energy technologies in the form of the framework programme. Under this, a specific programme on non-nuclear energy - the **Joule/Thermie programme** - is now in place for the period from 1994 to 1998. It is supplemented by a specific programme on nuclear energy under the Euratom Treaty.

5.2. These programmes are based on a **technology strategy** with the following principal terms of reference:

- Energy technology is a decisive component in our economies, since it yields multiple dividends in terms of welfare, social and economic cohesion, industrial competitiveness, job creation, security of energy supplies and environmental protection.
- The environment in general and climate change in particular is one of the driving forces behind technological change. This principle implies stepping up RTD activities, taking account of the energy requirements of the developing countries or the countries converting their economies.
- The third principle of the energy RTD strategy is to coordinate the entire process from the R&D stage through to market penetration. Economic instruments to accompany the technologies lie at the heart of these new strategy guidelines.

5.3. The JOULE-THERMIE programme has an important role to play in limiting/reducing greenhouse gas emissions beyond the year 2000 as far as it will contribute strongly to the improved conversion of fossil fuels and to the development of efficient technologies in the short/medium term and to a substantial integration of the renewable energies in the longer term. The relative importance of **new and improved technologies** depends of course on critical factors, such as economic growth, international energy prices, or environmental policies. Also, it is essential to address the environmental impacts of all these options to ensure that their implementation on the market will not find obstacles. However, cost-effective energy technologies and CO<sub>2</sub> abatement strategies can be identified for further research and introduction on the market.

- As far as the short and medium term is concerned (2000-2010), these technologies include on the supply side: gas combined cycles plants, new cleaner and more efficient solid fuel technologies for electricity production and CHP, cogeneration technologies, most renewables like biomass for decentralized electricity production (including cogeneration), passive solar, wind, small scale hydro and waste for energy use.
- On the demand side, the cost effective options aim essentially at improving the efficiency of existing technologies and at reducing fuel consumptions; they include new vehicle and engine designs, more efficient heating systems, appliances (refrigerators, cookers, washing

machines,...) and lighting, advanced insulation and glazing, and in industry waste heat recovery, recycling process control and energy management systems. On top of that, some new fuel end-use technologies, namely biofuels for transport and solar water heaters, would also contribute to CO<sub>2</sub> limitation, as would the development of electric vehicles, whose battery technology systems first need to be optimised.

- In the medium and longer term (2010-2020), further technological progress can be expected in the following areas: large scale photovoltaics, biomass combined cycle plants, advanced heat pumps (gas and electric), more ambitious efficiency improvements of appliances, insulation and glazing and, finally, fuel cells for transport and electricity production (as far as hydrogen would be considered as another major contributor to CO<sub>2</sub> abatement).

- 5.4. The CO<sub>2</sub> effects of the future retirement of **nuclear power plants**, which is likely to happen in the horizon of 2010, compared with the actual very limited construction of new units, will have to be addressed in due time. Possible answers to this problem include life-time extension, new types of nuclear plants or replacement with best-available technology, in particular with regard to nuclear safety. Failing the previous options, strong measures on other zero carbon content fuels would be required, assuming that actions for additional energy efficiency improvements or a reinforced switching to natural gas would not be sufficient to compensate for the loss of nuclear over time.
- 5.5. Specific instruments like public procurement and subsidies for dissemination and economic demonstration, e.g. through the proposed **THERMIE II** programme, could accelerate the penetration of technologies. The introduction of new technologies can also be fostered significantly through the development of synergies with other policies, e.g. Common Agricultural Policy, Regional and Cohesion Funds and Internal Market.
- 5.6. The Joule-Thermie programme and the EU countries' programmes are designed to bring the abovementioned technologies on stream in good time to harness their potential which, on extrapolation of current trends, could be equivalent to a 10 to 20% reduction in CO<sub>2</sub> emissions between 2010 and 2020. Naturally, the figure attained will depend not only on the technology but also on the economic instruments which can be introduced to encourage penetration by these technologies. Here too the Community research should contribute to clearer identification of the most effective and acceptable combinations of instruments.

## 6. External relations

- 6.1. The Community's greenhouse gas limitation strategy has to be seen as part of a global effort to limit anthropogenic climate change. The CO<sub>2</sub> emissions of the Union represent about 16% of global emissions, and given economic and population development in third countries this percentage is bound to decline over the coming decades. In this context, exploiting cost-effective options to limit CO<sub>2</sub> emissions within the EU is essential as far as it can convince other countries to pursue a more sustainable future. However, as the potential for reducing emissions in the Union countries is tapped, it should become more attractive for third countries to introduce cleaner, more efficient technologies to reduce CO<sub>2</sub> emissions. **Cooperation with non-Union countries**, particularly the developing countries and the countries converting their economies, will therefore play a crucial role in the Community's strategy, particularly in its development cooperation policy and in the

energy RTD strategy and the Community programmes.

- 6.2. Great strides have been taken already, particularly with the establishment of organizations for the promotion of energy technologies in the leading developing countries and countries of Central and Eastern Europe. Cooperation on energy planning and capacity building has also been established with countries in most of the major regions of the world to produce tools for energy analyses and decision-making aids in the countries concerned. Cooperation in energy matters is a significant component of the Lomé Convention and the agreement with Asian, Latin American and Mediterranean Countries. The protection of the environment is also one of the major objectives of this cooperation.
- 6.3. Far closer technological cooperation with non-Union countries is planned, in conjunction with the Joule-Thermic programme and the cooperation programme on RTD. It should cover the following aspects:
- integrate the measures to transfer technologies and knowhow into the cooperation programmes under way with a view to genuine industrial cooperation based on partnership. To achieve this, extensive campaigns targeted on the technologies and countries offering the greatest potential for a rapid, significant reduction in CO<sub>2</sub> emissions could set an example: clean combustion of coal in China, use of biomass for electricity generation in Latin America or the introduction of renewable energy technologies in the Mediterranean countries;
  - secure third-country participation in the preparation of technology strategies, notably by means of joint development and use of analysis tools similar to those developed in the European Union. A forum and fully fledged research activities would be established, in conjunction with the specific programme on scientific and technical cooperation under the framework programme and with the cooperation programme on energy.
- 6.4. The (forthcoming) **CARNOT programme** for diffusion of clean coal technologies, is expected to bring about global CO<sub>2</sub> abatement, especially in Asia, where countries like China and India will continue to use large amounts of coal in any case. External energy relations can also be strengthened with a view to greenhouse gas containment in the framework of other Community programmes and agreements (SYNERGY, PHARE, TACIS, ALTENER, Energy efficiency protocol in the frame of the European Energy Charter).
- 6.5. In addition to Community programmes mentioned above, other forms of cooperation will be necessary in order to exploit the cost-effective emission limitation potential in developing countries. Among other initiatives, joint implementation initiatives, e.g. through international quota trading, and the Global Environment Facility, are likely to play an important role.

## 7. Other policy options

- 7.1. Other policy options need to be further identified, as regards their Community dimension concerning the limitation of other greenhouse gases. The Commission needs to undertake further analysis on this point and on issues, such as the enhancement of carbon sinks. Greenhouse gases like CFCs and ozone are already covered by international agreements. The remaining gases, methane and N<sub>2</sub>O, represent about 8 % and 4 % of the total

greenhouse gas emissions in the Community respectively. Options on the control of these gases will be communicated to the Council in the context of the post-Berlin developments. As far as research is concerned, coal research can be used to develop methane abatement possibilities. Methane from coal mining should be used for energy purposes to the largest possible extent rather than being released to the atmosphere.

- 7.2. Other policies need to integrate progressively the objectives of greenhouse gas abatement and carbon sink enhancement, in particular, agricultural and forestry policy, structural and cohesion funds, nature protection and waste management policies in the time frame of 2005-2010. As regards the Common Agricultural policy, an initiative on biomass for energy in the frame of CAP reform (e.g. on set aside land) would be another option for virtually carbon neutral use. If properly designed, this option might also contribute to the objectives of the CAP. Energy efficiency improvements and biofuel development in agriculture are also a viable option to be considered in more detail. Additional synergies in terms of regional development and energy security could be developed.

### C. EXPECTED RESULTS OF POLICIES

1. The level of CO<sub>2</sub> emissions in the year 2000 and beyond will depend on several factors whose estimation contains unavoidable uncertainties. These factors are, among others, the growth of GDP and population, the evolution of fuel prices, the level and structure of industrial production and transport activity. Last but not least, the effectiveness of concrete measures taken is crucial to the development of CO<sub>2</sub> emissions.
2. As regards the year 2000, assurance for achieving the Community stabilisation objective rests with the implementation of current national and Community programmes. New measures to be decided at Community level will only have a limited impact on emissions in the year 2000.
3. As regards the years 2005 and 2010, different assumptions concerning the above factors lead to different CO<sub>2</sub> emission projections. It is, however, useful to give a rough indication of the amount of CO<sub>2</sub> emissions which could be avoided *if all the cost-effective technical potential were to be exploited*. Existing studies undertaken for the Commission have been used, in particular within the CRASH programme, to provide estimates of the technologies which could be introduced in all sectors of the economy and which would reduce the total discounted costs of the energy system, (i.e. costs of technologies plus total energy bill). A variety of (non-technological) costs and benefits, not incorporated in the above studies, need, however, to be taken into account to judge the overall desirability of exploiting this potential:
  - *Transactions or other hidden costs* (in terms of i.a. information, time) often act as barriers preventing private individuals to undertake these investments. Many policy measures presented in this paper are precisely aimed at removing, or at least reducing, these barriers, so that these investments will not only be considered cost-effective for the energy system as a whole, but also for the private individual. This technical potential will only be achieved if these measures are adopted, whose costs of implementation also need to be taken into account.
  - *Costs and benefits in many different policy areas* also need to be taken into account. Some

transitional costs of using less energy could occur. However, secondary benefits, such as energy security, reduction of air pollution, improved industrial competitiveness and employment also need to be considered. Many policy measures are, in fact, desirable on their own, without consideration of their effect on CO<sub>2</sub> emissions. In particular, increases in energy prices, through tax measures, provide the means to finance the reduction of non-wage labour costs, in order to reduce unemployment and facilitate the integration in the labour market of low and non skilled labour. At the same time, they would internalise external costs e.g. of air pollution and improve the attractiveness of investing in energy saving and CO<sub>2</sub> limiting technologies.

- 3.1. The above studies indicate that the cost-effective technical potential of emission reductions for the Community as a whole has been estimated to up to 20% of CO<sub>2</sub> emissions in the year 2010<sup>1</sup>. About half of this potential concerns the power generation sector through actions in the fields of fuel switching, energy efficiency improvements (including cogeneration) and penetration of competitive renewables. The other half concerns energy savings in industrial, domestic/tertiary and transport sectors. Part of this potential will be exploited to achieve the stabilisation of CO<sub>2</sub> emissions in the year 2000. The remaining potential can be considered as potentially sufficient to offset the effects of economic growth on CO<sub>2</sub> emissions *after* the year 2000. The realisation of this cost-effective technical potential is therefore consistent with a stabilisation of CO<sub>2</sub> emissions throughout the period 2000-2010. Such a strategy is to be considered as the extension of the no-regret strategy, as it was set out in the Commission Communication of October 1991 concerning the Community Strategy to limit CO<sub>2</sub> emissions and improve energy efficiency.
- 3.2. If overall benefits, such as energy security, reduction of air pollution, improved industrial competitiveness or employment are taken into account, the tackling of more costly energy saving and renewable technologies, which do imply, however, net costs to the energy system, could become desirable. According to the same studies, this would lead in 2010 to a reduction of 5% of CO<sub>2</sub> emissions compared to 1990 levels. Finally, potential benefits related to the transport system need to be taken into account: several studies indicate that a strong and ambitious policy aiming at changing substantially the structure of the transport sector by encouraging modal shift and integrated transport as well as altering land-use planning, could save another 5% of total CO<sub>2</sub> emissions, thereby bringing the total reduction of CO<sub>2</sub> emissions to up to 10% in 2010 compared to 1990 levels. The latter policy would require high levels of investment costs, which could, however, be considered necessary, regardless of Climate Change, if mobility in the EU is to become sustainable in the longer term.
4. The abovementioned evaluation concerned only technical options, *as opposed to policy options considered in this document*, due to the fact that their concrete features have not yet been decided upon. As a result, this technical potential will only be achieved if there is a political will to adopt a wide-ranging package of measures, effective enough to remove all existing barriers to CO<sub>2</sub>-limiting investments. In this context, it is essential to stress the complementarity of all policy options proposed, if the potential for CO<sub>2</sub> abatement is to

---

<sup>1</sup> The cost-effectiveness of these options is assessed assuming a rate of return of 5 to 8% per year and oil prices increasing gradually to 20\$/bbl in 2000 and 30\$/bbl 2010 (1987 prices)

be realised. The figure quoted above can, therefore, only be interpreted as an *indication* of the expected results of policies and not as targets or commitments to be achieved by the year 2005 and 2010.

#### **D. CONCLUSION**

1. There is a window of opportunity to reduce CO<sub>2</sub> and other greenhouse gas emissions. *Technical options* are available which could in principle achieve the stabilisation of CO<sub>2</sub> emissions in a cost-effective way throughout the period 2000-2010. Beyond the stabilisation, a technical potential exists to reduce CO<sub>2</sub> emissions by up to 10% in 2010. It could prove to be cost-effective, provided secondary benefits are taken into account, in terms of energy security, reduction of air pollution, sustainable mobility as well as competitiveness and employment, in line with recommendations of the Commission White Paper.
2. *Policy options* proposed in this document should, therefore, be developed, with a view to allow achievement, beyond the CO<sub>2</sub> stabilisation of 2000, of reductions of 5 to 10% in the time frame of 2005-2010. These figures cannot, however, be considered as targets or commitments, because such reductions can only be achieved if there is a political will to adopt a wide-ranging package of complementary measures, for which a detailed economic evaluation, including cost-effectiveness analysis, still needs to be undertaken.
3. The main elements for a coherent strategy are largely known - innovation (RTD), energy efficiency, more sustainable transport system, taxation reform and cooperation with third countries. The goal of integrating CO<sub>2</sub> abatement options into sectoral policies at Member State and Community level needs, therefore, to be pursued. Required is an involvement of - and cooperation between- different actors, Community institutions, Member State authorities (national, regional and urban), the international community and the economic actors in view of implementing an efficient strategy.

## **Annex 1: Expected CO2 emissions from the Community in the year 2000 - Current forecasts**

Assessing the expected CO2 emissions in the year 2000 is an exercise which needs to reflect the many uncertainties of economic forecasting and, therefore, is bound to be revised frequently. CO2 emissions, unlike other pollutants, are closely linked to the level of economic activity as well as to the level of energy prices. At the same time, the effectiveness of measures cannot easily be evaluated, as it depends on the decisions of millions of consumers and business, in the course of their economic activity.

In October 1992, the expected CO2 emissions in the year 2000 for the Community as a whole was evaluated to be about 11% above the 1990 level, prior to the implementation of national and Community measures and programmes.

In June 1994, the Commission Working Paper SEC(94)922 forecasted an increase of CO2 emissions for the Community as a whole of about 4 to 12%. It reflected the range of uncertainty as far as forecasts of economic growth, on the one hand, and the effectiveness of measures on the other hand. The lower range reflected an optimistic view of the effectiveness of measures already taken combined with low estimates of economic growth. The higher range reflected the hypothesis of high growth rates for the rest of the decade (above 3%) compatible with a creation of at least 15 million new jobs, as put forward by the White Paper.

### **Impact of economic growth**

The economic growth factor is critical in assessing expected CO2 emissions. The Commission services have revised the range of emissions to reflect short and medium term forecasts as they have been issued by the economic service of the Commission. With economic growth for the rest of the decade at about 2.5% to 3% for the Community as a whole, CO2 emissions are likely to be 5% to 8% higher than those of 1990.

### **Impact of national and Community programmes and measures**

As far as Community measures and programmes are concerned, the situation as regards their implementation has not changed since the last assessment. As far as national programmes are concerned, almost all Member States have now developed comprehensive strategies to achieve their national CO2 limitation targets. However, most programmes contain little information on the time frame for implementation of measures described therein and some include no evaluation of the effects of individual measures by the year 2000. Therefore, there is no evidence that *measures already taken* will be sufficient to offset the increase in CO2 emissions driven by economic growth. Fortunately, there are plenty of opportunities to implement measures already foreseen as well as new measures before the end of the decade: fiscal instruments (in the post-Essen context), investments in cogeneration, demand-side management, third party financing (in the context of the SAVE directive). By contrast, new measures, which could be decided at Community level, will have little effect by the year 2000.

Current forecasts of economic growth point to an increase of 5% to 8% of CO2 emissions compared to 1990 levels. Those figures are subject to uncertainty. On the one hand, medium term forecasts of economic growth can still be revised and, on the other hand, national programmes can in the end prove to be more effective in limiting CO2 emissions.