COMMISSION OF THE EUROPEAN COMMUNITIES

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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

on

"ENERGY AND THE ENVIRONMENT"

Com 369 f

Contents

Executive Summary

1. This is the first time that Community energy policy addresses environmental problems in a global way. The objective of this Communication is to establish a broad common understanding between Member States and the Commission on main orientations concerning energy and the environment and to highlight the broad objectives in this field as well as the areas for action and the type of Community measures to be considered. Some proposals, like a Special Action Programme for Vigorous Energy Efficiency are already announced in the Communication. However, other necessary actions will be considered when proposing new Community Energy Objectives for the time after 1995. This document does not aim at influencing or judging the national investment programmes in the energy sector, but wants, without prejudging future energy choices, to discuss in an objective manner the interface between energy and environment.

2. The factual part of this Communication presents the impacts of energy cycles on the environment and in a more detailed manner the contribution from fossil fuel use to SO_2, NO_x and CO_2 emissions. **SO_2 emissions have been in decline since the beginning of the eighties and will continue to fall substantially in the future as a consequence of Community and national environmental legislation, energy efficiency improvements and the use of cleaner fuels. NO_x emissions will also be reduced up to the year 2010, however, less drastically than SO_2 emissions. CO_2 emissions are expected to grow continuously up to the year 2010** in the absence of necessary political choices to reduce this problem.

3. The Commission is at present analysing alternative energy policy options to reduce CO_2 emissions to cope with the Greenhouse Effect and Member States are invited to closely cooperate in the execution of this work. While the Commission accepts that there are still uncertainties on some scientific aspects of the Greenhouse issue, nevertheless we should already now pursue vigorously at Community and international level policies aimed at reducing CO_2 and other greenhouse gas emissions to satisfy environmental and energy requirements. In this context it is essential to define a policy which can face future energy demand without necessarily growing supply capacities.

4. The areas for such action are highlighted and it can be concluded that urgent measures to reinforce and expand efforts in energy efficiency improvements and in energy conservation combined with the use of more non fossil fuel energy sources are the priority areas for necessary environmental improvements. Such measures should be coupled with other environmentally friendly elements of energy policy, like the support of renewable energies, the introduction of cleaner and more efficient technologies and the substitution of high polluting fuels by natural gas.

5. Some general guidelines are given to Member States on how to integrate the environmental dimension into energy policy, which are mainly based on the requirements as introduced by the Single European Act in its Articles 100a, and 130r to 130t. In addition energy industries are invited by the Commission to develop within their own responsibility codes of good conduct for energy and environmental responsible behaviour.

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INTRODUCTION

6. The 1995 Community Energy objectives ask for balanced solutions as regards energy and environment. The November 1988 Energy Council again stressed the need to continue efforts for the realisation of this energy policy objective and welcomed the Commission initiative to present a coherent report on energy and environment. In the light of this Council reaction the Commission has undertaken the commitment to present such a report by mid 1989.

7. This Communication, which underlines the Community and the wider international dimension of the problem on energy and environment, contains two main parts which firstly analyse the factual situation concerning energy and environment and secondly present guidelines for Member States and Energy industries on "where to act and what to do".

8. In the first part the general impacts of the energy cycles on the environment and an analysis on the contribution of energy use to air pollution is presented. This analysis focusses on SO_2, NOx and CO_2 emissions. It covers the time horizon from 1980 up to 2010. The results presented have been elaborated in the frame of the ongoing Energy 2010 scenario exercise.

9. The second part covers horizontal guidelines with regard to the integration of the environmental dimension in Community as well as national energy policies and invites the Community's energy industries to elaborate specific codes of good conduct on the basis of guidelines, which preserve, protect and improve the quality of the environment and,at the same time, ensure a prudent and rational utilisation of national resources. Furthermore areas for action are highlighted where environmental improvements could be realized by energy policy measures.

10. The specific environmental problems related to the realization of the internal energy market as presented in the Commission's working document on "The Internal Energy Market" (COM (88)238) will be addressed in the frame of the ongoing work on the internal energy market. Analysis is continuing on the question of whether different national environmental standards create barriers to trade or distortion of competition as already discussed by the Council in the case of the European refinery industry. In the latter case it has been agreed at the Energy Council of 11 May 1989 that the Commission, if necessary, will submit further proposals on the basis of the objectives of the Single Act.

11. The objective of this document is in no way to establish a scale of values between the different forms of energy necessary for our supply, nor to take sides - for or against - such or such source of energy. It aims to present in a factual manner their essential characteristics - today and in the future - in such a way as to stimulate the necessary debate on the environment which is moreover already taking place in other international fora.

First Part

"The Situation"

A. THE GLOBAL CHALLENGE

12. Many of the most serious environmental problems are of a global nature, such as the depletion of the ozone layer and the greenhouse effect. Other problems, such as acid rain are of a more regional character but occur across borders of countries. The complexity and the magnitude of the problems make local or often even regional solutions impossible. International concepts to be developed by multilateral approaches are required. International cooperation on energy related environmental problems with industrialized, developing and centrally planned countries need to be strengthened. The Community will have a key role to play in these developments.

13. Both sufficient energy and environmental quality are essential for the survival of the human race. The field of energy and environment interactions is broad and is likely to grow in importance as results from scientific research improve and as energy demand grows. During the 1970's discussions about energy policy were dominated by security of supply problems. Now it has become clear that environmental constraints may become a very influential parameter determining the Community's future energy balances. "Our Common Future", the report of the World Commission on Environment and Development, has highlighted that present energy consumption trends and policies cannot continue and that the concept of"sustainable development" needs to be accepted and followed.

14. The Commission has always highlighted the close link between environmental protection and secure energy supply, which are objectives of comparable weighting in an overall policy towards economic, social and public welfare. Energy production and use must be carried out in an environmentally acceptable manner. The formulation of energy policy has to give due weight to environmental policy considerations, just as environmental policy must give due weight to energy policy considerations[1]. The greenhouse problem accentuates the importance of the environmental dimension in energy policy and can, in the long term, be the main constraint on energy use. Following the Commission's Communication to the Council on the Greenhouse Effect, the Council adopted the Resolution on the Greenhouse Effect on 9 June 1989. This Resolution invites the Commission and the Member States to inter alia, increase energy efficiency and reduce emissions of greenhouse gases.

15. As energy production and use impacts on the environment by air pollution, water discharges and waste generation, environmental regulations raise the costs of energy, influence the competitive position of fuels or even exclude certain energy options. It is therefore essential to reconcile energy and environmental objectives and to promote policies which foster

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1) Communique of IEA Governing Board of Ministerial Level, 11th May 1987

the objectives of both energy and environment policy.

B. ENVIRONMENTAL IMPACTS OF ENERGY

a) Environment and the Fuel Cycle

16. The environmental impacts of energy production transformation and use extend far beyond local, regional or global air pollution although these are the most crucial problem areas at present. Additional concerns include water demand and pollution, as well as waste generation and disposal. Furthermore impacts on land use and natural resource bases are involved.

17. Major energy-related environmental accidents have been at the centre of most recent discussions. Past events have shown that all large scale energy activities, necessary to meet human needs, bear a certain risk potential having different effects on man and the environment according to the respective source of energy. Blow outs, fires at refineries, maritime oil pollution, nuclear accidents, hydroelectric dam failures and coal mine accidents testify this fact. The full scale of all short, medium and long-term consequences of these accidents are not yet fully understood. It must be admitted however that the consequences of a possible nuclear accident cannot be compared with those of other accidents.

18. Major environmental consequences of routine energy sector activities are summarized in the following table (see page 7a) From this table it can be seen that impacts are manyfold, complex and often interwoven. There are no simple solutions to the problems shown.

19. With regard to the coventional energy sources the various fuel cycles show divergent environmental impacts.

    Oil exploration and production may cause accidental spills, blow-outs and fires whereas the transport and storage of crude and refined oil can cause maritime and territorial oil pollution as well as emissions of unburned hydrocarbons and volatile organic compounds. Oil refining impacts mainly on the environment by the disposal of waste waters and the emission of various airborne pollutants.

    As natural gas is often produced in association with crude oil it is often difficult to differentiate between the environmental impacts of these two fuel cycles. At the production stage blow-outs are the most severe risks. As regards transport and storage pipeline accidents and methane releases have an impact on the environment.

    Coal mining may cause dust, noise and health effects as well as ground water pollution. Land rehabilitation schemes are often required. The handling and storage of coal results in dust releases and coal treatment often causes waste water problems. The combustion of coal and oil is, if not controlled by appropriate technologies, linked to major SO_2 and NO_x emissions. Solid fuels emit the highest amount of CO_2 per unit of energy.

Table 1. SELECTED ENVIRONMENTAL EFFECTS OF THE ENERGY SECTOR

ENERGY SOURCES			AIR	WATERS (surface, underground/inland and marine)	LAND AND SOILS	WILD LIFE	OTHERS: Solid waste, risks, human health, noise, visual...
Fossil fuels	Extraction Treatment Transport	Waste disposal	COAL	– SO_x, NO_x, particulates – CO_2	– Acid mine drainage – Mine liquid waste disposal – Water availability – Wash water treatment – Water pollution from storage heaps	– Land subsidence – Land use for mines and heaps – Land reclamation of open cast mines	– Natural habitat disturbed – Exploitation of wilderness or natural areas for surface mining	– Noise of rail transport of coal – Dust emission – Visual impact of coal heaps – Occupational risks
			PETROLEUM PRODUCTS	– H_2S production – SO_x, NO_x, CO CO_2, HC, ammonia particulates, trace elements – CO_2	– Oil spills – Water availability	– Land use for facilities and pipes	– Natural habitat disturbed – Pipeline impact on wild life – Wild life polluted through leaks or spills	– Blowouts – Explosions and fires – Odour – Pipeline leaks – Spills (accidental and operational) – Visual impacts of pipelines
			GAS	– HC emission (mainly methane – Trace metal emission – H_2S and combustion emissions	Liquid residual disposal	– Land use for facilities and pipes	– Natural habitat disturbed – Impacts of pipelines on wild life	– Blowouts – High leak potential – General safety – Spills and explosions – Visual impacts of pipelines
URANIUM FUEL CYCLE AND ELECTRICITY FROM NUCLEAR POWER PLANTS			– Radioactive dust – Gaseous effluent (radionuclides, F NO_x) – Noble gas, H 3, I 131, C 14 – Local climatic impact of cooling towers	Mine drainage Underground water contamination – Water availability – Thermal releases – Liquid radionuclide emission (H 3, Co 60, Si 90, I 131, Ru 106, Cs 136 and 137)	– Land subsidence (mine) – Land reclamation of open cast mines – Land use for mines	– Secondary effects of impacts on water, land and air	– Radioactive products – Mine water – Mill tailing water (toxic metal liquid and solid chemical wastes, radiological wastes) – Recycled fission products – High level radioactive wastes – Visual impact of cooling towers and power lines – Noise – Occupational risks
			– Decontamination and decommissioning of nuclear power plants				
Renewable energy			HYDROPOWER		Effect on hydrological cycles Water quality and resources	– Land irreversibly flooded – Landslide risks	Wild life habitat of rivers – Change in ecosystems – Fish migration affected	Visual impacts Risk of dam rupture
			OTHERS Biomass, geothermal, wind and solar energies	– Biomass combustion: air pollution, particulates – Geothermal: air pollution	– Biomass conversion: water pollution; water availability – Geothermal: water pollution	– Land use for energy plantations – Land requirement of solar energy	– Biomass: ecosystem disruption by energy plantations	– Noise of wind generators – Visual impact of wind generators – Biomass risk to workers – Photovoltaic toxic pollution when decommissioning
ELECTRICITY GENERATION FROM FOSSIL FUELS (excluding nuclear energy)			– SO_x, NO_x, CO, CO_2, HC, trace elements, particulates, radionuclides Long range transport and deposition of pollutants Climatic impacts of cooling towers	– Water availability Thermal releases	– Land requirement	– Secondary effects on water, air and land	Visual impact of cooling towers and power lines – Solid wastes – Ash disposal – Noise

Notes: a) Excluding energy use in transport, agriculture (see Chapters on Transport and Agriculture) and other uses (heating, etc.)

Source: OECD

W0449M

Uranium mining bears the risks associated to all mining operations together with the release of airborne radon. Certain fuel fabrication processes may cause radiological as well as non radiological impacts. Normal reactor operation produces low-level emissions which are not considered to be harmful. The major focus of environmental concern is the risk of accidental releases of radioactivity into the environment and the problem of nuclear waste disposal which involves varying degrees of hazards depending on the characteristics of the wastes. Environmental damage does not occur as long as the waste is isolated from the biosphere. Experience is limited as regards the decommissioning of nuclear power plants and the related environmental consequences.

20. While all energy cycles have some environmental impact, a distinction can be made between conventional energy sources and renewable energies. One of the main differences is that renewables have a relatively low energy density. This implies that significant exploitation of these renewables has to involve large scale operation, with impacts generally confined to visual intrusion. However, in an overall comparison it can be concluded that generally **environmental impacts from renewable energies are more localised and of a lesser dimension than the use of conventional fuels.** Therefore, renewables are widely perceived as being "clean" technologies. 56% of Community citizens consider renewables as the least polluting energy sources[2)].

21. Substantial parts of the abovementioned environmental impacts and accidental risks can be limited to an acceptable degree if proper environmental impact assessments of energy projects are undertaken in advance. As regards big energy projects this is guaranteed by the Council Directive on the assessment of the effects of certain public and private projects on the environment (85/337/EEC)[3)]. This covers in its Annex I for example crude oil refineries, thermal and nuclear power stations and radioactive waste storage facilities. Further energy activities are the subject of Annex II of the same Directive.

22. Additional factual analysis of the energy sector in its totality with regard to environmental impacts will be undertaken when proposing new Community energy objectives, for the time after 1995.

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2) Public opinion in the European Community on Energy in 1987.
3) OJ L175 of 5 July 1985

b) EMISSIONS INTO THE AIR FROM FOSSIL FUEL USE

23. This chapter presents an analysis of the most important emissions into the air (SO_2, NO_x and CO_2) from energy consumption covering the time span from 1980 to the year 2010. Any emission analysis needs to be based on fossil fuel consumption data for combustion purposes as only this category of energy use is contributing to SO_2, NO_x and CO_2 emissions. The corresponding energy consumption figures referring to scenario one of the ongoing 2010 exercise (for explanations see Annex I) are as follows:

COMMUNITY FOSSIL FUEL USE FOR COMBUSTION PURPOSES

Mtoe	1980	%	1987	%	1995	%	2000	%	2010	%
Solid Fuels	235	26	230	27	247	26	275	28	322	31
Oil	494	54	419	49	480	50	466	47	428	42
Gas	184	20	207	24	236	24	250	25	276	27
Total	913		856		963		991		1026	
Total Primary Energy	1025		1062		1226		1277		1375	
Community Fossil Fuel Use for Combustion as Percentage of TPER		89		81		79		78		75

24. From these figures it can be seen that emission relevant fossil fuel use is growing at slower rates than the Community's total primary energy requirements. A major contribution to this development is the growing use of nuclear power in the Community. A break down by sector of fossil fuel consumption is contained in Annex II. Power generation and transport are the most important sectors of fossil fuel use followed by the residential/commercial sector and industry.

I) SO_2 and NO_x Emissions

25. SO_2 and NO_x are mainly related to combustion of fossil fuels and contribute to acid deposition. Energy activities contribute to about 90% of man-made SO_2 and NO_x emissions. Stationary combustion sources are the largest source of SO_2 emissions whereas transport is the major contributor to NO_x emissions.

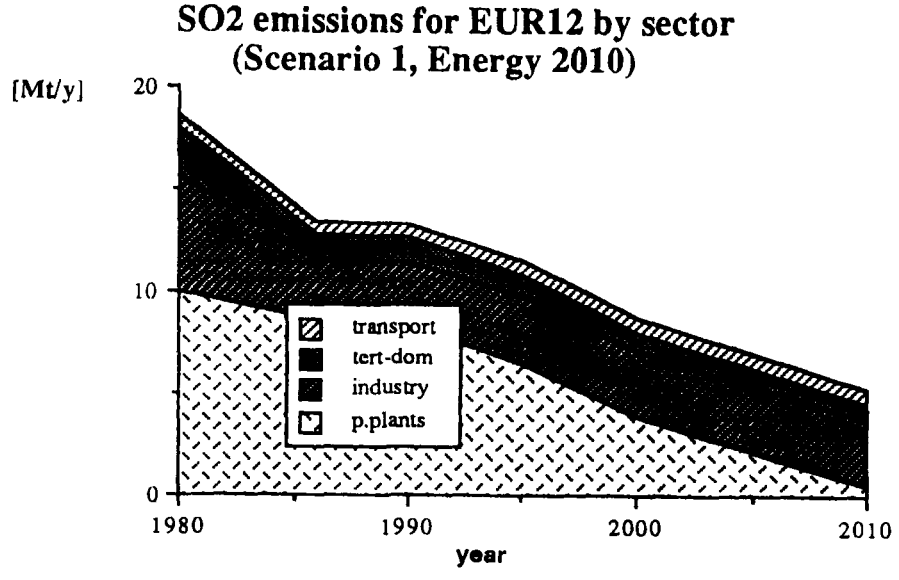
26. Technologies for the control of these emissions are available and improvements have been achieved as regards coal-cleaning processes, the fuel combustion process and post-combustion cleaning of exhaust gases. SO_2 and NOx emission control is technically feasible but cannot be achieved free of costs and sometimes without energy consumption penalties. The IEA has recently estimated that capital costs of Flue Gas Desulphurisation (FGD) and Selective Catalytic Reduction (SCR) account for 15% and 6%, respectively, of a new baseload coal facility[4]. Retrofit costs are substantially higher.

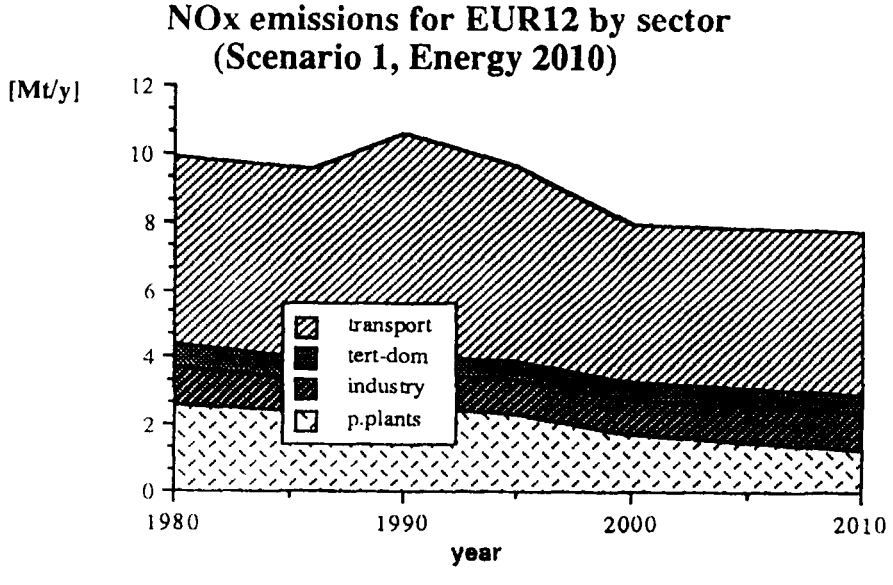
27. Legislation in Member States and in the Community has been adopted to limit SO_2 and NOx emissions from energy use. As regards the Community a major breakthrough on stationary sources has been achieved with the adoption of the Council Directive on the limitation of emissions of certain pollutants into the air from large combustion installations above 50 MW thermal (88/609/EEC).[5] High sulphur coal and oil should now be directed to this category of controlled combustion plants whereas low sulphur fuels could be used in plants below 50 MW thermal. As regards mobile sources substantial emission reductions have been initiated by legislation on the introduction of clean cars and cleaner automotive fuels.

28. However from an energy and environmental point of view the transport sector remains an area of concern. Fuel consumption continues to grow and efficiency as well as legal and technological automotive improvements to reduce emission are counterbalanced by a growing car population and bigger car engines.

4) IEA, Emission controls, Paris 1988.
5) OJ, L336 of 7 December 1988

29. From the following two graphs based on assumptions and provisional results of scenario one of the ongoing 2010 exercise it can be seen that SO_2 emissions from fossil fuel use will decline substantially in the time period between 1980 and 2010 (about minus 70%). However NO_x emissions over the same time period will be reduced at a more modest rate of about 20%.





30. Drastic SO_2 emission reductions will take place in the power generation sector (1980-2010 = minus 90%) and by the year 2010 SO_2 emissions from industry will have grown in importance and will be four times higher than SO_2 emissions from power generation. The transport sector will continue to dominate NO_x emissions and especially the growing car population as well as still largely uncontrolled emissions from lorries and vans make NO_x emission reductions difficult (detailed SO_2 and NO_x emission figures are contained in Annex III).

II) CO_2 Emissions

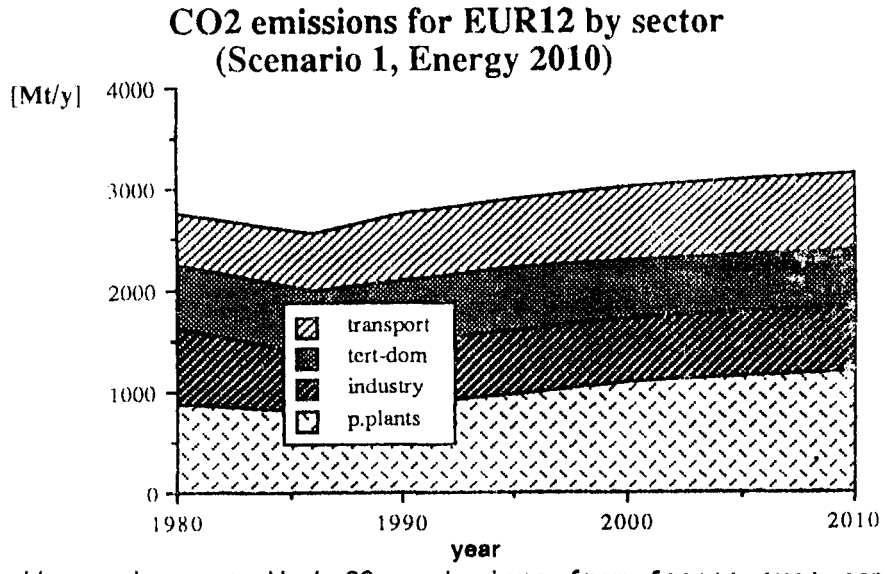
31. Fossil fuels are contributing to green house gas emissions like CO_2, CH_4 and N_2O. CO_2 is presently thought to be responsible for slightly more than 50% of the greenhouse effect and most anthropogenic CO_2 emissions are due to commercial fossil fuel burning. In its Communication to the Council on the Greenhouse Effect and the Community (COM(88)656) the Commission has given an extensive set of factual information. All this is not repeated in this Communication on Energy and Environment. Furthermore the Commission has decided to carry out a three year work programme concerning the evaluation of policy options to deal with the greenhouse effect. The funds estimated as necessary for the implementation of this programme amount to 6 Million ECU. The Environment Council of 8 June has welcomed this Commission initiative and has adopted a corresponding Resolution.

32. Within this overall work programme the Community's energy sector is of special importance as it is energy which is the major source of greenhouse gas emissions. A specific work programme on the analysis of alternative policy options to reduce CO_2 has been defined. Four consecutive interlinked work phases are foreseen:

- Future Community CO_2 emission trend analysis and the definition of suitable CO_2 emission reduction targets;
- Identification of possible CO_2 emission control options and their technical-economic reduction potential;
- Cost-efficiency analysis of available control options by system analysis (identification of most cost efficient energy policy approach);
- Analysis of effects of identified cost-efficient policy options on the economy, social structure, international competition and security of energy supply.

The Council is invited to collaborate closely with the Commission in the execution of this important work. Methane and N_2O emissions will be the subject of a separate study.

33. As in the case of SO_2 and NO_x the following table is based on Scenario I of the ongoing 2010 study.



34. It can be seen that CO_2 emissions from fossil fuel combustion have slightly decreased up to 1986 but will increase again gradually up to the year 2010. By 2010 Community CO_2 emissions will be originated by 39% from solid fuels, by 41% from oil and by 20% from natural gas. The ratio of CO_2 emissions per unit of energy consumption for lignite, hard coal, oil and natural gas is about 121-100-88-58.

35. As actual worldwide CO_2 emissions* are estimated to amount to about 21,000 million tons, the Community share at present is in the order of 13%. However with increasing fossil fuel consumption in the developing world this share may fall to about 10% by the year 2010.

36. Some sensitivity cases were studied to see how various energy policy measures (more natural gas use in power stations, relaunch of nuclear, more energy efficiency gains in all sectors) could influence the development of future CO_2 emissions . First preliminary results show that possible decreases below the 1987 situation only occur in the cases where stronger efficiency gains were assumed (decrease of 2.2% per annum in energy intensity) and where this is combined with an increase of gas (to 100 Mtoe by 2010) and nuclear (to 291 Mtoe in 2010) for electricity generation.

37. With such a combined strategy being based on the above sensitivity case assumptions, CO_2 emissions in the Community in the year 2010 would be about 20% lower than in the case of scenario I and would even fall 5% below present emission levels despite growing overall energy consumption. Actions in the field of energy efficiency improvements seem to be the most promising single policy tool with the most significant CO_2 reduction potential showing immediate results. However if certain ambitious CO_2 reduction objectives need to be achieved reduction efforts on the supply side have to be added.

* To calculate CO_2 emissions as expressed in tons of carbon figures have to be divided by 3.67

38. In connection with CO_2 emissions one should also be aware of CO emissions, mainly originating from combustion engines in the transport sector. In the first instance, CO emissions are gradually converted to CO_2 and in the second instance, and perhaps more significantly, the presence of a certain amount of CO in the atmosphere may play a part in preventing the oxidation of CH_4 to CO_2, thus resulting in higher concentrations of CH_4 which is a more powerful greenhouse gas than CO_2.

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Second Part

"What to do and where to act"

A Horizontal guidelines

a) THE INTEGRATION OF THE ENVIRONMENTAL DIMENSION INTO ENERGY POLICY

39. The Single European Act requests in its Article 130R the integration of the environmental dimension into energy policy:

"Environmental protection requirements shall be a component of the Community's other policies".

Furthermore action by the Community relating to the environment will have "to ensure a prudent and rational utilisation of natural resources". The Community's environment policy follows the objective of attaining a high level of protection, which is reflected in Article 100A, para 3 and the fourth environmental action programme. These objectives, together with the other provisions of the Single European Act, need to be taken into account when translating the objective of integration into more specific energy policy considerations.

40. A high level of environmental protection requires stringent legal measures to be applied in all Member States. Because of differences in environmental conditions of Member States and because of differing industry structures this may result sometimes in unequal cost burdens especially for peripheral Member States, where concentrations of air pollutants are often lower than in the centre of Europe and where different environmental challenges, like soil erosion and forest fires are of prime importance. The need for an accelerated introduction of energy sources with less environmental impact than conventional systems based on solid fuels or oil is reflected in the priorities of the Community Support Frameworks for objective 1 regions. Nevertheless, an appropriate mix of loan and grant finance is necessary. In this way grant aid can be focussed to a greater extent on the prevention of pollution than in the past.

41. It should not be forgotten that other major elements, like economic consequences, security of supply and the priority objective of the internal energy market need to be considered when formulating energy policy. For these reasons it is necessary to evaluate overall economic impacts of any integration strategy and to establish as far as possible adequate cost/benefit analysis as a basis for new policy proposals. The competitive position of the Community vis a vis other industrialized countries need to be taken into account.

42. When assessing the costs of the various energy options it is not sufficient to simply take into account fuel costs and the economics of technology solutions. As far as possible environmental costs have to be integrated into the overall analysis. With regard to environmental control devices, be it FGD, SCR* or the desulphurisation of fuels it is already feasible to quantify the additional costs involved. However difficulties still exist when trying to quantify the overall social/environmental costs of an energy option, be it coal, oil, natural gas or nuclear. Nevertheless efforts should be made to have a broader cost/benefit approach that integrates the environmental dimension of the problem.

43. Member States should aim for closer institutional links and coordination from the earliest stages of analysis and policy definition to assist progress towards meeting both environmental and energy objectives. At present there are still barriers, real or perceived, which result in a lack of joint assessment and political initiatives. To contribute to a better coordination the Commission should at least once a year invite high officials for energy and environment affairs of Member States to have a common meeting of reflection and to and to examine the interrelations between Energy and Environment. Such meetings might even lead to the convening of common informal Councils giving the necessary policy guidelines for future actions.

44. Member States as well as the Community should apply the principles when defining energy policy. This would favour cbalanced solutions as regards energy and the environment, support a common approach with regard to the creation of the internal energy market and guarantee the smooth realization of future energy investment. Clear and stable frame work conditions need to be established by public authorities so that energy industries are in a position to react in an efficient and responsible manner.

b) A CODE OF CONDUCT

45. As shown below there are various energy policy areas for action to improve both the Community's energy and environment situation. However policy action is not enough. We will only be successful if industry and all citizens contribute to a process of sustainable development. This chapter addresses the energy industries to undertake commitments which would make industry an integral part of the solution to the Community's energy and environmental problems instead of being considered as an uninvolved contributor to them. In supplement to existing or still required Community legislation in this field industry would be invited to do more than just fulfil these legal requirements. Such commitments could take the form of Community wide codes of conduct. Such voluntary industrial commitments should indicate clear objectives and appropriate calendars.

46. Energy use has - justifiably - given rise to public concern. This is due to the fact that several energy sectors have been too slow in understanding and then accepting the impact of

* Flue gas Desulphurisation and Selective Catalytic Reduction

their activities on the environment. The energy industry could contribute to a process of better understanding and acceptance by demonstrating that it is working diligently to protect human health and the environment as well as to ensure a prudent and rational utilization of natural resources. Specific codes of conduct accepted by the Community's energy industries would demonstrate such a commitment.

47. Such industrial codes of conduct do already exist. The Canadian Chemical industry for example has engaged in such a commitment called "Responsible Care". The European Energy industry (according to the specific situations in the major branches) should do likewise and should develop Community codes of conduct based on specific Guiding Principles setting clear objectives and calendars. Such codes of conduct could be part of a convention to be concluded by the Community's energy industries. Industry would undertake the engagement to respect this convention on a voluntary basis.

48. From the Commission's point of view such Guiding Principles could cover the following elements which are already partly contained in Community legislative requirements:

- Environmental impact and safety assessments going beyond the Community's legal requirements;

- Use of the best economically available technology to preserve, protect and improve the quality of the environment as well as to ensure a prudent and rational utilization of energy;

- Examination of existing plants and installations under the perspective of major incidents as well as the development of appropriate emergency response procedures;

- Assessment and limitation of risks associated with the transport of energy products;

- Communication with the public and communities concerned on environmental and safety risks;

- Workforce hazardous materials information systems.

49. This listing is not exhaustive but will be completed in consultation with the industries concerned. The energy industries of the Community are invited to develop such codes of conduct within their own responsibility and in cooperation with national authorities and the Commission. Such action would demonstrate to the public that the energy industry is founded on strong ethical principles and that the industries intend to take the actions necessary to live up to them. In parallel to this the Commission will have to reflect on other appropriate measures including binding requirements in case of failure of industries to develop such codes of conduct.

50. However it is obvious that measures to introduce greater self-

discipline by industry or even emission control legislation will be ineffective if not combined with appropriate enforcement mechanisms. Unsocial human behaviour is a fact of life and past experience has shown that for example, automotive catalysts can be bypassed, antipollution devices may not be effectively used and environmental legislation is not always respected. Therefore it needs to be ensured by national authorities that agreed environmental rules are respected and that infringements of laws are heavily sanctioned.

B. SPECIFIC AREAS FOR ACTION

a) DEMAND SIDE

1) Energy efficiency

51. The cornerstone of integration of the environmental dimension into energy policy must be a Community commitment to energy efficiency and energy conservation, which can then be coupled with measures in other areas. In terms of environmental benefit there is no doubt that energy efficiency is the best strategy. The improvement of energy efficiency contributes at the same time to sound energy policy and environmental protection. The importance of energy efficiency improvements has not only been stressed in various Council decisions but also by other international fora, like the World Commission on Environment and Development which believes "that energy efficiency should be the cutting edge of national energy policies for sustainable development". 70% of EEC citizens are still prepared to save more energy.[6] Public

52. Improvement of energy efficiency affects both the production and end-use of energy, although the potential for further gains is far greater on the demand side than on the supply side. It seems to be more useful to invest in end use efficiency improvements than on the supply side. Numerous studies confirm this conclusion, e.g. a Canadian study of 1984 shows that real costs to save a certain amount of energy are half of the costs to produce the same amount of energy. An enquiry of US electricity distributors has shown that in the coming ten years an additional electricity supply of 30 000 MW would represent an investment of 19 billion (10^9) US $ and costs to avoid this additional electricity growth by more efficient end use appliances would be in the order of 6 billion (10^9) US dollars. Shifting emphasis in energy planning from expanding supply to improving the efficiency of end-use is therefore a central element for consideration. The pursuit of a "least cost planning approach" as already implemented by utilities in the United States would support such a shift. It must be emphasized that the aim of a Community strategy to improve energy efficiency is to reduce wasteful use of energy, without necessarily entailing any cut in comfort or production.

53. The main findings of the Commission's review of Member States' energy policies (COM (88) 174 Vol I) clearly highlight that "if no new policy measures are introduced at Community and/or national level it now seems to be clear that the achievement of a minimum 20% energy efficiency improvement by 1995 will not be

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6) Public opinion in the European Community on Energy in 1987.

realized". This statement is still fully valid today. The impressive improvements of the past (more than 20% improvement between 1973 and 1982) have slowed down to a meagre 3% between 1982 and 1987.

54. Low energy prices acting as a disincentive to energy efficiency investments, have not changed fundamentally in recent years and energy is still available in abundant quantities, although this situation is not in line with long term expectations. In this situation security of supply, the realisation of the internal energy market and the commitment for environmental improvements require a more vigorous Community policy on energy efficiency improvements. The Council Decision of 11 May 1989 on a Community action programme for improving the efficiency of electricity use is a valuable contribution for the improvements needed.

55. The Commission will propose a coherent global programme on energy efficiency improvements and energy conservation to be presented as a follow up of this Communication by early 1990. This special Action Programme for vigorous energy efficiency (SAVE) will cover a multiannual period and will have to address priority areas of concern, as well as actions that can quickly yield results. Measures need to be identified which represent the most efficient way of action at Community level and which give the highest value added results. The ongoing non nuclear energy research programme (JOULE) supports a significant action in the field of energy conservation covering both the generation and use sectors.

The following type of measures may be considered in this context:

- least cost planning,
- efficiency standards for energy technologies,
- energy efficiency standards for appliances,
- speed limits,
- automotive fuel consumption standards,
- measures to improve transport systems, like the support of public transport in cities etc,
- assessment of criteria for building insulation standards taking into account the different climatic conditions in the Community,
- elimination of legal and economic barriers to facilitate/ increase sales of power/heat to energy distributors and to end users,
- minimisation of methane leakages from natural gas distribution systems.

The proposed THERMIE Programme (COM89(121) will foster technologies supporting energy efficiency improvements. Member States should be committed for action where Community intervention does not seem to be appropriate.

56. In addition to these more sector specific considerations the realization of the internal energy market will improve the overall efficiency of the total energy system in the Community and thereby yield positive effects for the environment. A better integration of the Community energy systems, the optimisation of existing structures and efforts to better use e.g. transport systems by reducing truck movements without load (suppression of "quotas routiers" and of the interdiction of cabotage) should result in more efficient energy use. In order to reduce vehicular traffic across the Community, the role of railways should be reexamined to see if technology would assist in making that system more competitive in time and costs with transport by truck. For the electricity sector alone it has been estimated that a substantial amount of production capacity would be avoided by information and mutual consultation on the future investments*

ii) Fiscal Considerations

57. The most direct means of allowing markets to incorporate the risk of environmental stress is to assure that energy prices reflect their full social costs. If the latter would be the case energy prices would be raised thus supporting a more rational use of energy and a quicker market penetration of renewables. As there are a number of practical problems in fully internalizing environmental costs (difficulty of putting environmental damage into monetary terms, future value to protect the environment etc.) in the past only selective fiscal instruments, like effluent charges, tax differentiations or fees on polluting products, have been used to partly internalise environmental costs. The use of fiscal instruments which take into account both energy and environmental objectives is therefore an established well known concept.

58. In the frame of the realization of the internal market a series of communications and proposals were submitted to the Council (COM (87) 320-328; COM (89)260) with the aim to abolish fiscal frontiers through the approximation of indirect tax regimes. The Commission has on the other hand adopted on 25th October 1989 proposed directives modifying the 1987 proposals on the approximation of excise taxes.

* see COM (89) 336 final and COM (89) 335 final

These proposals insofar as energy products are concerned have been drawn up to reflect the majority practice in Member States so as to ensure that the minimum amount of changes necessary to national fiscal regimes are required. The proposal on the approximation of excises on mineral oil, moreover, takes into account to some extent, the imperatives of energy and environment policies. These concerns find expression in fact in the level of proposed rates (the fixing of the minimum rate for petrol, the increased differential in favour of unleaded petrol, the level of the narrower range for automotive gasoil).

Nevertheless, in order not to prejudge the guidelines which will be proposed in this area, the Commission has not yet fixed the level of these objective rates. It will do this in a proposal before 31st December 1990. It should be recalled however that the Commission has agreed that the issue of fiscality and the environment will be the subject of study and subsequent proposals.

59. At this stage a global approach of raising existing taxes on energy products has been used. No change to these practices is foreseable in the short run. In the longer term, the introduction of new taxes, like the publicly-discussed CO_2 levy, the modulation of existing taxes, for example on energy efficiency investments, for the achievement of energy and environment policy objectives cannot be excluded. But the analysis on the possible introduction of a CO_2 levy has to be undertaken with a long term perspective and within a broad global context surpassing the Community frame. The subject of countercyclical taxes to support energy efficiency improvement in times of low energy prices and to reduce taxation in high energy price phases would be of specific importance. All such taxes however would have to be in conformity with the Single European Act and in particular avoid giving rise to the need for frontier controls.

60. If the Community were to move towards higher energy taxes on the basis of energy and environmental policies, it would be advisable to examine, in parallel, the use which should be made at Community level of the additional resources eventually thus released.

b) Supply Side

1) Nuclear energy

61. This document does not intend to influence or to judge the national investment programmes in the energy sector. With regard to the specific objective of this Communication, which is to have a neutral and objective discussion on the interface between energy and environment, one has to underline that the main contribution made by nuclear energy to improving the environment is in the fight against the greenhouse effect. None of the greenhouse gases, particularly CO_2, is emitted from nuclear power sources. However radioactive wastes are created with the nuclear fuel cycle and when demantling nuclear

installations at the end of their life span. The problems related to the transport and storage of this waste are extra difficult to resolve. Furthermore there is a risk of radioactive releases resulting from possible nuclear accidents, of which the long term consequences are not yet fully understood and which may be more damaging than the immediate casualties.

62. Nuclear energy is now the major source of electricity production in the Community, accounting for 34%. If the 140 or so nuclear reactors in operation in the Community were closed down and the electricity they generate had to be obtained from coal, this would result in CO_2 emissions of around 550 million tonnes. This represents 70% of the 786 million tons of CO_2 emissions in 1986 in the Community from fuel combustion for electricity production. If nuclear energy was replaced by gas CO_2 emissions would increase by 242 million tons.

    Nuclear energy makes a significant contribution towards combating the greenhouse effect on the global scale too. If the 430 nuclear power stations would produce electricity from coal, this would result in CO_2 emissions of about 1 600 million tonnes per year, of CO_2 which represents 8% of the 21 000 million tonnes produced globally by the burning of fossil fuels.[7)]

63. At present nuclear baseload electricity has the lowest marginal costs. However, in the long term nuclear cost calculations bear a certain element of uncertainty as no practical experience has been gained so far with the precise amount of decommissioning costs. Decommissioning of nuclear facilities has so far mainly concerned research reactors.

    Market forces are in existence that tend to make in the short-term more extensive use of these power plants without any new investments. In the mid and long term, however, the contribution of nuclear energy cannot be possible without new installations.

    Use of nuclear energy varies considerably between the Member States and only two of them are building nuclear power stations at present. Nuclear power is a controversial issue in most countries, with the debate focusing on safety, waste and the transportation of radioactive substances.

64. After the Chernobyl accident, the Commission examined the whole range of its activities in the field of nuclear safety and adopted several measures.

    The Commission has sent the Council and European Parliament a report providing an overview of all the measures taken.[8)] It covers health protection measures, for which legal mechanisms under the Euratom Treaty have been reinforced, and a whole range of measures of a cooperative nature on various issues, including the improved technical safety of nuclear installations.

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7) Source IAEA

8) COM (89) 203 final of 25/04.1989

On the basis of this overview and the discussions arising from it, the Commission will be looking at how it can extend and step up its measures to help ensure that optimum safety conditions are observed in the further development of nuclear energy.

65. Nuclear power production leads, as other industrial activities, to production of waste and included in this is also the so-called decommissioning waste. Moreover the use of radioactive substances for non energy purposes (medecine, industry, research) leads equally to a risk of exposure to radiation as well as the production of radioactive waste in large quantity but which in general has low radiation levels.

The European Community monitors regularly the situation in the field of radioactive waste management and promotes research and common policies through its action plan 1980-1992 (Council Resolution of 18 February 1980, OJ C51). The second report on an analysis of the present situation and prospects in this field has been forwarded by the Commission to the Council in 1987.(9) In this report, the Commission underlines that radioactive waste management is an important feature of safety and environmental protection and assigns a particular priority to the selection and opening of disposal sites. A third report on the situation in this field will be prepared in 1990. Furthermore the Community is conducting research on the decommissioning of nuclear installations.

Research and technical development in the Community in the field of management and storage of radioactive waste is supported through direct research (JRC 1988 -1991 Research Programme) and cost-shared research programme; for the latter - the Commission has recently proposed a fourth programme 1990-1994.(10) It must be underlined that the cost-shared programme devotes an important part of its funding to the work on deep underground pilot facilities: HADES, test drift facility in clay formation at Mol in Belgium and HAW, pilot facility in the Asse salt mines in the Federal Republic of Germany. For high level waste (waste containing the highest amount of radionuclides of all types), the Commission has initiated a multinational assessment of disposal methods, named PAGIS (Performance Assessment of Geological Isolation System). the final report has recently been published* and has been presented to the decision-makers in this field in Madrid on 30 June 1989. According to the PAGIS report, "it may be stated, that with due consideration to all the PAGIS results, there are no reasonable doubts about the possibility of achieving safe disposal of vitrified high level waste in any of the formation examined, provided that appropriate sites are selected and repositories are designed and built according to sound engineering practice".

66. Since 1982, and following a Resolution of Parliament, a Commission Working Party has been responsible for advising the Commission on the drafting of Community measures and examining issues raised by the transportation of radioactive substances. At the end of 1988 the Working Party finalized a second report,

(9) COM (87) 312 final
(10) COM (89) 226 final.
* EUR 11775

which will serve as a suitable point of reference over the next few years for Community action in this field, which is integrated on the global scale by the International Atomic Energy Agency (IAEA).

Following this report, the Commission has just adopted a Community action programme to ensure that the application of international rules complies with the aim of the internal market.[11] This is being coordinated with measures concerning the safety of transporting hazardous substances in general. It is also useful to highlight that the Commission is preparing a proposal on the administrative follow-up of radioactive waste transfers.

67. As to new capacity and the replacement of old electricity generating plants, the situation is different in the various Member States. A few are facing capacity shortfalls whereas others have a significant overcapacity on top of that which is needed to meet peak demand at any time. An expansion of the generating capacity, while not taking into account the vast potential for electricity savings and the optimisation possibilities resulting from the internal energy market, does not seem compatible with a policy of putting a high priority on the efficient use of energy. In future capacity planning the full potential for energy efficiency improvements should be reflected. Outdated capacity will be replaced by new plants with higher efficiencies. This replacement process will in general contribute to the reduction of emissions into the air.

ii) Renewable Energies

68. To maintain the development of renewable energies, as stated by the Community's 1995 energy objectives will not only further the diversification of the Community's energy supplies but also contribute to a limitation of emissions into the air from fossil fuel combustion. However this contribution to environmental improvement has up to today, only managed to make a contribution of limited importance. Even if in certain Member States their share is more important than the average, commercialised renewable energies - which means that waste and wood for combustion in particular are excluded from the statistics - only currently represent 3% of gross internal energy consumption in the Community. To estimate the future potential of renewable energies is especially difficult, as these energies cover such varying sectors like biomass, use of solar energy, hydro, especially mini hydro, geothermal and wind energy. However, even in the most favourable scenarios, this type of consumption would not exceed 8% in the year 2010.

69. Among renewable energies, a larger use of energy derived from biomass could contribute to meeting a part of the energy needs of the Community.

It is estimated that the total amount of biomass capable of being exploited in the Community, essentially in the form of waste, is in the order of 5% of primary energy demand. Forecasts made in the framework of the FAST* programme (1984-1987) show however that biomass in its totality - that is

11) SEC (89) 801 final 23 May 1989

* FAST = "Forecast and Assessment in Science and Technology"

including waste and the use of agricultural products for non-food purposes - could cover in theory 5-10% of Community energy consumption before the year 2000.

It is this order of magnitude which it would therefore be appropriate to have in mind when considering the share that these forms of renewable energies should take.

70. Various studies, including FAST projects, suggest that an integrated and complementary system for the use of biomass (Agro-Chemo-Energy Complex i.e. multipurpose farms, bio-factory, biomass refineries, agro-refineries, etc) could be a technically, economically and socially feasible concept, with energy use again being an important parameter. However, any such form of activity would have to be judged on the basis of a multimedia approach, e.g. not creating problems in ground water from nitrates or indeed producing another greenhouse gas - N_2O - by applying excessively nitrates to soils.

The production of clean automotive fuels from biomass is another possible route. Municipal wastes could also be exploited more intensively as energy sources. More detailed studies will be carried out to assess the economic viability of these options.

71. These studies will have to reflect the results of the Community's research programmes in this area as well as the experience of non Community countries, notably the USA. Especially the environmental consequences from biomass energy use and the energy implications of the whole production cycle need to be assessed in detail. Distinctions need to be made between biomass production that substitutes for agricultural use of land (such as short rotation forestry) and production which maintains the agricultural use of land (such as straw, ethanol, grape seed oil). Such analysis, setting out the pros and cons of biomass use for energy purposes should provide the basis for final judgement.

72. The Community will continue to support the development of renewable energies by its non nuclear energy research and development (JOULE) as well as by its R & D programme ECLAIR, the latter for the production of biomass on agricultural land, and by its demonstration programme, which is proposed to be followed by the THERMIE- programme (COM(89)121). However present conventional energy prices do not provide sufficient incentives for rapid market penetration. The Commission undertakes certain actions to create favorable conditions for the increase in exploitation of renewable energies in addition to the technological development supported by the abovementioned programmes. These actions for example aim at the simplification of procedures, the information of users or sectorial strategies. Nevertheless the financial means for the support of these actions are limited, in future more vigorous action should be developed with appropriate financial means,

including fiscal incentives. Measures taken at present also include the improvement of the statistical database for renewables, which is necessary to better evaluate the potential of these energies and to monitor their progress.

73. The potential for the exploitation of renewable energies, for example solar energy, is especially promising in developing countries and technical as well as economic breakthrough would help to reduce emissions into the air in these countries. It cannot be expected that for a long time nuclear energy would be an appropriate, large scale option for the developing world. Industrialised regions like the Community bear therefore an obligation for continued R D & D support of renewables and need to ensure that economically proven technologies are transferred to developing countries.

iii) Fuel Substitution

74. The switch from high to low emitting fuels is an efficient energy measure to reduce emissions into the air, especially for those emissions, like CO_2, where economic control technologies are not available. In comparison with solid fuels or oil, natural gas is the cleanest fossil fuel which does not produce any ash, dust or smoke and only negligible amounts of SO_2. In addition, gas produces only about half as much CO_2 as coal for the same unit of energy. However methane leakages contribute to greenhouse gas emissions and of course the mining of coal releases equally significant volumes of methane to the atmosphere. Gas combustion only produces significant NO_x emissions which are however lower than NO_xemissions from coal or oil and which can be controlled technologically.

75. An increased use of gas for heating purposes, industrial applications or electricity generation in the Community to replace other fossil fuel use would have positive effects for the environment. However before such a substitution process is launched on a large scale the economic and security of supply implications need to be analysed very carefully. The Commission will analyse all these aspects in detail in the context of the abovementioned work programme on alternative energy policy options to reduce CO_2 emissions. Furthermore the Commission has already announced the review of Directive (75/404 EEC) on the use of gas in power stations when proposing new energy policy objectives. Only after this work has been undertaken will the Commission be in a position to make detailed proposals.

iv) Clean and more Efficient Technologies

76. The Community's 1995 energy policy objective on energy and the environment underlines that balanced solutions as regards energy and environment should be researched, by making use of the best available and economically justified technologies.

The rapid introduction of new and more efficient technologies will not only contribute to a more rational use of energy but can also meet major environmental concerns, such as air pollution arising from stationary and mobile sources. Furthermore the development of emission control technologies, like catalysts to withhold NO_x emissions, continues to be of importance for the Community. Market oriented support of these technologies is a major element of any environmentally conscious energy policy and the Community will face this challenge by its ongoing research and development energy programme (JOULE), energy demonstration programme and in the future by the recently (Commission) proposed THERMIE programme, which will have a key role to play in meeting the environmental challenge by making it possible to reduce energy consumption, by developing new and renewable sources and by ensuring the clean use of coal. The new Framework Programme for Research and Technological Development (1990-1994) will generally provide the technological base for progress in those matters.

77. The obligation to ensure a prudent and rational utilisation of natural resources makes it necessary to keep the use of fossil fuels as low and as efficient as possible. There are various advanced energy generation technologies which offer environmental advantages and/or higher efficiency performance. Fluidised bed combustion, advanced coal gasification and use of natural gas in combined cycle turbine systems are wellknown examples to reduce acid emissions per unit of energy generated.

78. The use of Combined Heat and Power, be it cogeneration by public utilities or industry, has overall beneficial effects, both from the rational use of energy and the environmental point of view. At present only a fraction of the potential for cogeneration is exploited in the Community. Where economically favourable conditions exist the more extensive use of combined heat and power therefore still needs to be encouraged. On 8 November 1988 the Council adopted a Recommendation (88/611/CEE) to promote cooperation between public utilities and auto-producers of electricity. Other specific actions to support the development of combined Heat and Power will be considered under the already mentioned SAVE programme. One should consider in the case of new plants mandatory solutions which prevent all the residual heat being simply released into the environment.

v) Regional Energy Planning

79. In the frame of town and city renovation activities, construction planning and energy supply planning the choice of fuels, especially for heating purposes, is of paramount importance. The use of low emitting fuels and investment for new and more efficient energy technologies are tools to improve the quality of the environment as well as to ensure a rational utilisation of energy resources. The integration of environment and energy in city planning for the transport sector has also been identified as an essential exercise to counteract the trend to more vehicles by providing an efficient public transport system. Energy planning be it on a regional or a city level, is of prime importance to foster these developments.

80. Environmental degradation has become most alarming in big cities, especially in the developing world. For the year 2000 the UN predicts that there will be about sixty cities with more than 5 million inhabitants. In the year 1900 no city with this amount of inhabitants existed and in 1950 only 6 cities with more than 5 million people existed. Fast urbanisation is already having an impact on the environment on a global scale and it is now a matter of planning to mitigate the negative environmental effects of uncontrolled urbanisation.

81. The Community too is affected by this problem. The Commission has already gained substantial experience on regional energy planning be it in the Community or in the Third World. It is necessary to further exploit this experience and to develop a Community integrated work programme for the improvement of Energy/Environmental systems in cities. Such a programme will be submitted to the Council early 1990. The experience gained from this programme needs to be disseminated on a largescale, especially to developing countries to reduce global environmental degradation.

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Conclusions

82. As shown in part one, based on a "business as usual scenario", emissions into the air from fossil energy use will only decrease substantially in the case of SO_2. NO_x emissions will be reduced by about 20% in the time period 1980 to 2010 and CO_2 emissions will increase. This is an inevitable consequence of growth, not only economic growth but also basic growth of population. With the realization of the Community's internal market additional economic growth combined with increasing energy demand may result in accelerated pollution if not counterbalanced by appropriate control and saving measures. Action for environmental improvement in the energy sector is necessary and some of the measures and initiatives highlighted could be financed through the additional economic gains resulting form the realization of the internal market or through new tax systems taking into account both energy and environment. The creation of the internal market for energy should help to positively influence the Community's environment by optimisation of existing energy structures resulting in a more efficient energy industry.

83. From the Commission's point of view, four major initiatives could be undertaken to address energy related environmental issues.

- The first initiative - THERMIE - concerns the promotion of energy technology in Europe and will be based on a Regulation presently before the Council.

- The second initiative called - Special Action Programme for vigorous Energy Efficiency (save) - will be mainly concerned with, inter alia, legal measures at Community level.

- The third initiative will be the drawing up of "codes of conduct" with the energy industries in the Community. These codes of conduct should in addition to existing Community legislation establish on a voluntary basis how energy industries should react on environmental issues.

- The fourth initiative will be the establishment of a Committee of national experts with the mandate of assisting the Commission in analysing taxation regimes which satisfy at the same time energy, environmental and fiscal requirements.

All these initiatives will be integrated with the Commission's proposals for new Community energy objectives for the period after 1995. Furthermore the Commission has proposed a strengthening of R & D concerning fossil and renewable energies, the use and modeling of energy in its proposal for a Framework Programme for Research and Technological Development (1990 - 1994).

84. Recognising the increasing importance of the environmental dimension in energy policy both Member States and the Community's energy industries should follow environmentally friendly energy strategies. Such strategies should be based on the following guidelines:

- Balanced approach as regards energy and environment by making use of the best available technologies not entailing excessive costs;

- Broad environmental impact and risk assessments in the energy sector to reduce the environmental impacts of existing and new equipment in the fuel cycle, from the extraction, production, transport and use of energy to the disposal of energy wastes;

- Economic analysis of energy projects and strategies which ensure that energy costs reflect, as far as possible, the full environment costs and stimulate a more efficient use of energy;

- Definition and harmonisation of policies on the basis of the requirements of the Single European Act which at the same time respect a high level of environmental protection and the specific environmental conditions of Member States, especially in peripheral regions;

- Setting of flexible but stable legislative framework conditions to give to industry a secure basis for compliance and to ensure a smooth realisation of energy investments;

- Improved institutional links and cooperation between administrations responsible for energy and the environment;

- Continued scientific research as regards energy and environment, especially on the Greenhouse issue without delaying necessary preventive or adaptive actions.

- Collection and development of statistical information on the relationship between energy and environment.

85. The respect of these guidelines should contribute to the realisation of energy conditions which ensure a prudent and rational utilisation of finite energy resources as well as a high level of environmental protection.

However improvements will not be realized without specific actions. Energy measures having positive environmental consequences should be initiated in the following areas:

- Energy efficiency: the improvement of energy efficiency, especially as regards the end use is already now contributing to the Community's energy, environmental and economic objectives and needs continued and intensified support. A coherent global programme on energy efficiency improvements will be proposed by the Commission early 1990.

  In a period of low energy prices it has to be analysed whether the conditions are met to launch a policy also based on fiscal instruments to obtain significant results in the area of energy efficiency. This analysis should equally strive to exercise the macroeconomic implications, notably on inflation and economic growth of such a policy.

- Clean fuels: the increased use of renewable energies and environmentally premium fuels, such as natural gas or biomass based fuels, low-sulphur oil and coal, and electricity produced from non-fossil fuel generating plants are important elements of an environmentally friendly energy strategy. The Commission will consider specific follow up actions and will reflect on a programme to support the production and use of agricultural energies from biomass.

- Nuclear Energy: Nuclear power can contribute to a limitation of emissions from fossil fuel combustion. A debate on the safety, transport and waste (including that arising from the de-commissioning process) from nuclear energy should be launched in a broad political framework.

- Energy technologies: The techniques needed to meet certain major environmental concerns, such as SO_2, NO_x and particulates control from coal, oil and gas use in stationary installations have been mastered and available technologies need to be put in operation at a broad scale. Technologies to withhold CO_2 emissions are not yet available. The rapid introduction of new and more efficient energy technologies will substantially contribute to a more rational use of energy thereby reducing emissions and the production of waste. The proposed THERMIE

-Programme will have a major role to play to support these technologies in a market orientated way .

86. The Commission will consider the elaboration of specific proposals to advance balanced solutions as regards energy and environment where national actions are insufficient because of the global dimension of problems involved and where the inclusion of the wider Community dimension will give the highest value added results. For the near future it is necessary to establish a common understanding in the Community on the problems raised in this Communication so that progress can be quickly realized on the basis of broad consensus. To achieve this the Council is invited:

- to support the Commission's work to deepen the analysis on past and future emission trends;

- to collaborate with the Commission in the execution of the work programme on alternative policy options to reduce CO_2 emissions and other energy related greenhouse gas emissions;

- to take into account the horizontal guidelines concerning the integration of the environmental dimension into energy policy;

- to support the initiative proposed by the Commission on the analysis of taxation regimes which satisfy at the same time energy, environmental, fiscal and macroeconomic requirements;

- to support the Commission in its call for the establishment of a code of conduct with energy industries;

- to agree on the areas identified for action to improve the environment;

- to cooperate with the Commission in setting priorities for follow-up action, based on the guidelines in the Communication.

Annex I

SCENARIO ASSUMPTIONS

The energy balances presented in annex III and the corresponding emission estimates in annex IV have been prepared as part of the report "Major Themes in Energy to 2010" and are derived from the scenario "Conventional Wisdom". The key components of this scenario are:-

SCENARIO I "CONVENTIONAL WISDOM"

DEFINITION

1. INTERNATIONAL SETTING

1.1. ENERGY PRICES (1987 US dollars):

Oil	$17.5/bbl in 1995; $20/bbl in 2000 and $30/bbl in 2010;
Gas	indexed to oil up to 2000 and to coal thereafter;
Coal	$49/tce in 1995; $50/tce in 2000 and $60/tce in 2010.

Economic outlook:

1.2. GDP

World at 3.2% average annual growth from 1990 to 2010;
CPEs at 2.7% average annual growth from 1990 to 2010;
LDCs at 4.0% average annual growth from 1990 to 2010;
OECD at 2.8% average annual growth from 1990 to 2010.

2. EUROPEAN COMMUNITY

2.1. INTERNAL MARKET

moderate, but positive macroeconomic effect. The economic outlook up to 1993 is similar to that indicated in the report "Europe in 1993" prepared by BIPE et al (2.6 % annual GDP growth rate).

2.2. GDP

2.6% average annual growth from 1990 to 2010 (that for 1968-88 averaged 2.8 %).

2.3. SECTORS

Industry	some industrial growth; stability of energy-intensive branches;
Tertiary	strong growth of services;
Domestic	2.5% growth in private consumption from 1990 to 2010.

3. ENERGY-RELATED ASPECTS

3.1 RESOURCES; assumes that over the next 20 years there are no physical resource limitations.

3.2 TECHNOLOGY

further penetration of new (although existing) industrial processes (e.g. electric furnace, continuous casting); penetration of more efficient industrial equipment (10% improvement); efficiency of domestic thermal uses improving by 10%; renewal of equipment at end of normal life time; penetration of electric appliances at a faster rate thus improving efficiency.

3.3. BEHAVIOUR

industrial energy demand following economic climate; wealthier people facing relatively low prices leading to reversible behaviour (e.g. car mileage; higher space heating) up to 1995 and more rational behaviour thereafter.

4. POLICY ASPECTS

4.1. ENERGY INTERNAL MARKET

following most of current views in Member States and uncertainties about final decisions of the Council, there is no explicit assumption of a complete internal market in energy, such as in the fields of tax harmonisation and electricity and gas trade; some convergence of both pre tax fuel and investment costs between Member States is anticipated.

4.2. ENVIRONMENT

application of Community legislation; this is not expected to significantly constrain the energy demand and supply system (balance and fuel mix).

4.3. ENERGY

no special concern on energy, allowing market forces to drive the whole system within the existing policy framework.

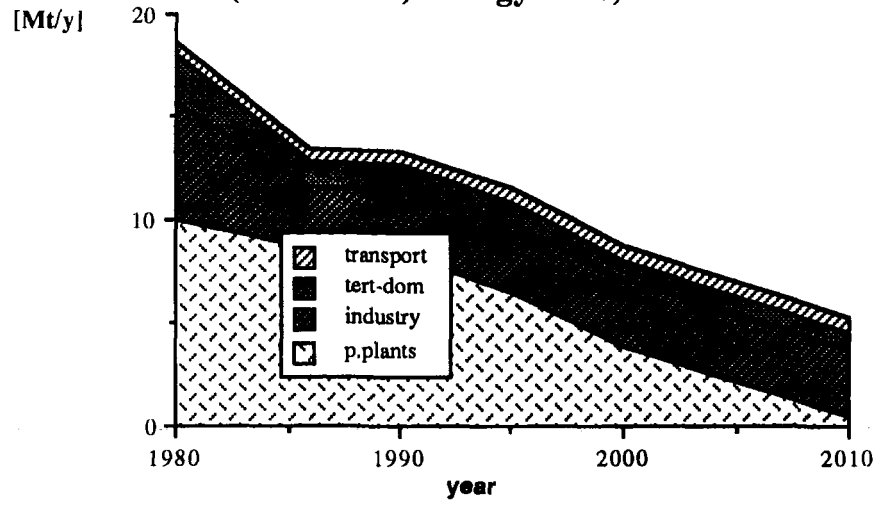
ANNEX II

CONSUMPTION OF FOSSIL FUEL FOR COMBUSTION PURPOSES

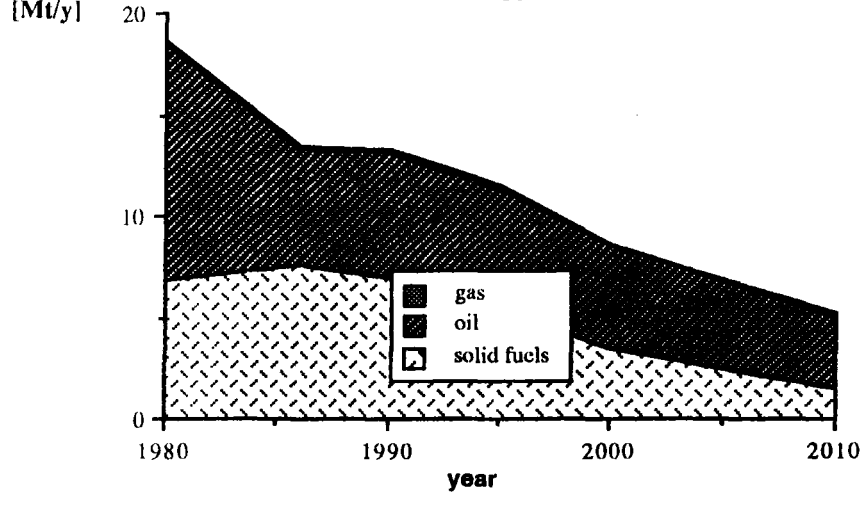
Break down by Sector

Mtoe	1980	1987	1995	2000	2010
Power Generation	243.8	211.5	259.3	287.4	319.0
Solid fuels	140.5	146.3	170.8	203.0	250.8
Oil	71.1	36.3	55.3	46.5	21.0
Gas	32.2	28.9	33.2	37.9	47.2
Other Transformations	36.4	27.8	27.7	25.8	24.6
Solid fuels	30.2	24.7	23.4	21.9	21.7
Oil	6.2	3.1	4.3	3.9	2.9
Gas	0	0	0	0	0
Energy Sector	45.7	40.3	39.5	39.4	37.9
Solid fuels	1.3	0.6	0.6	0.5	0.8
Oil	33.9	28.3	29.9	29.5	27.5
Gas	10.5	11.4	9.0	9.4	9.6
Industry	195.4	159.1	170.2	170.2	177.2
Solid fuels	41.1	40.8	38.1	37.9	39.7
Oil	90.9	50.3	54.1	51.4	49.5
Gas	63.4	68.0	78.0	80.9	88.0
Residential/Commercial	223.8	221.3	232.9	227.3	219.2
Solid fuels	21.6	17.3	13.9	11.5	9.2
Oil	124.9	105.4	103.7	93.8	79.3
Gas	77.3	98.6	115.3	122.0	130.7
Transport	167.8	195.9	233.0	240.9	247.5
Solid fuels	0.2	0.1	0.1	0.1	0
Oil	167.4	195.6	232.7	240.6	247.3
Gas	0.2	0.2	0.2	0.2	0.2
TOTAL	912.9	855.9	962.6	991.0	1025.4

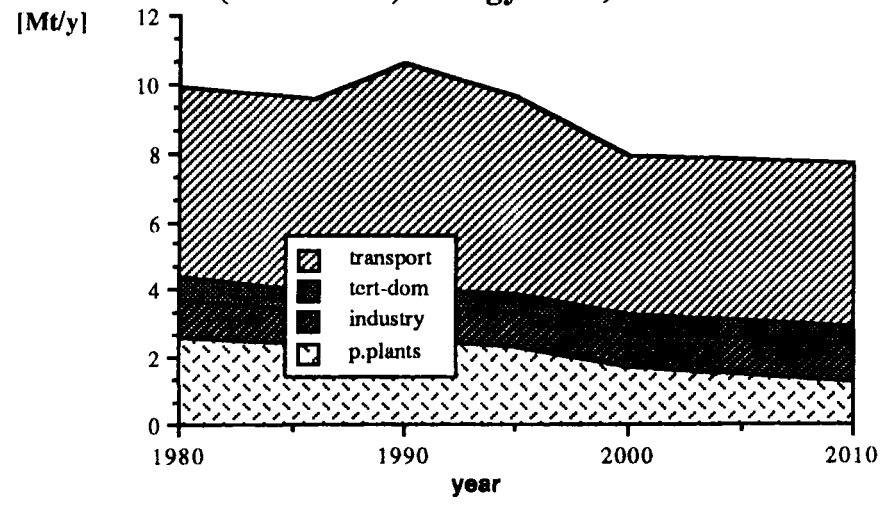
SO2 emissions for EUR12 by sector (Scenario 1, Energy 2010)



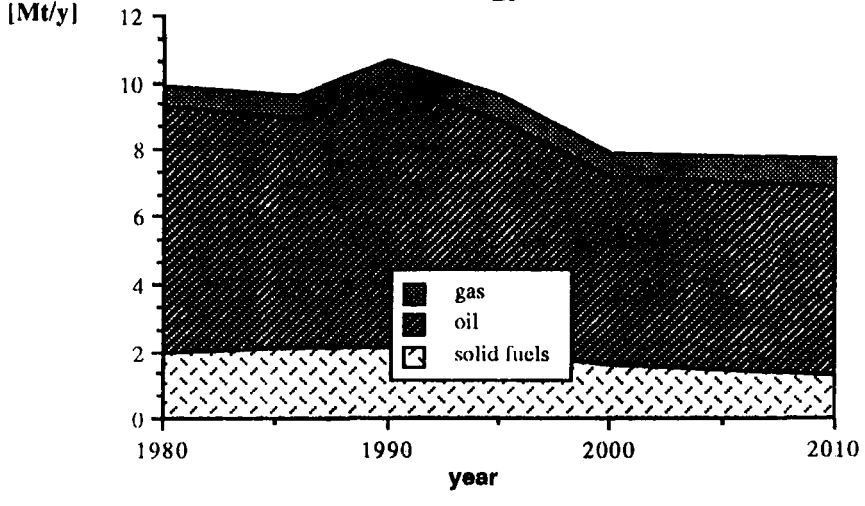
SO2 emissions for EUR12 by fuel (Scenario 1, Energy 2010)



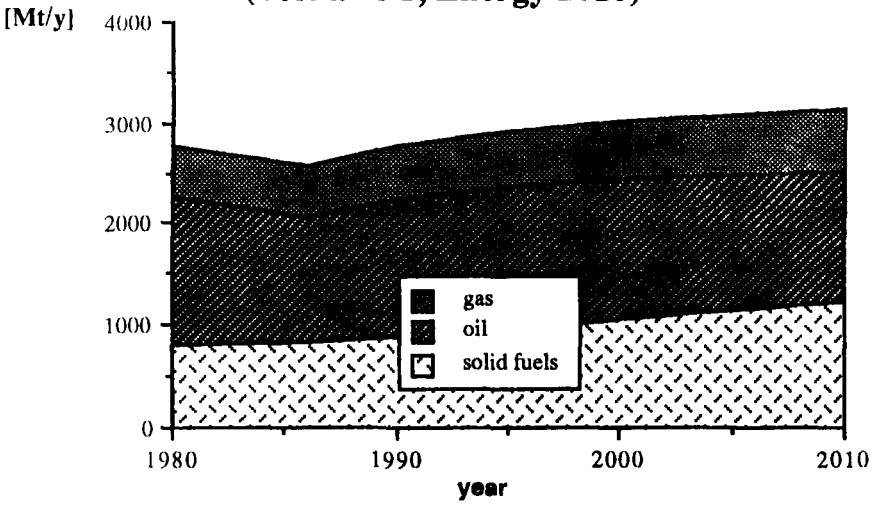
NOx emissions for EUR12 by sector (Scenario 1, Energy 2010)



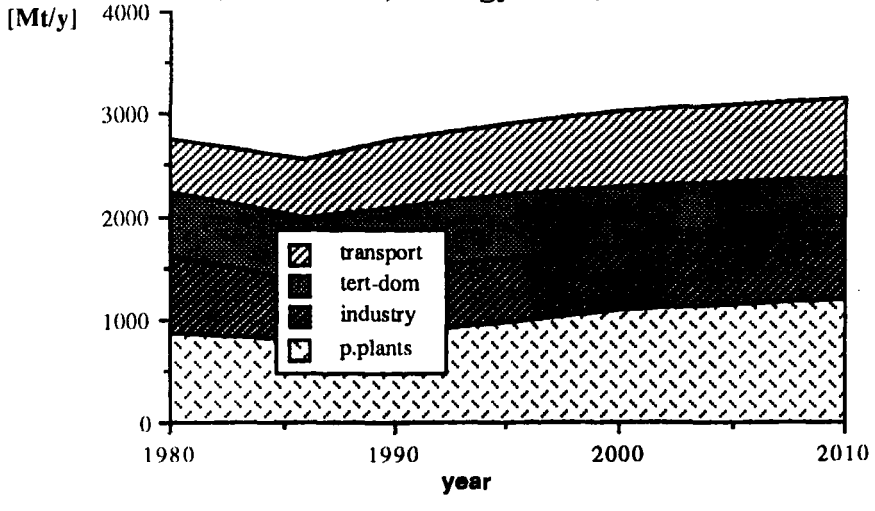
NOx emissions for EUR12 by fuel (Scenario 1, Energy 2010)



CO2 emissions for EUR12 by fuel
(Scenario 1, Energy 2010)



CO2 emissions for EUR12 by sector
(Scenario 1, Energy 2010)



Emissions by sector, by fuel category and by pollutant
(Scenario 1, Energy 2010)
CEE *1000 tons*

1980	SO2	NOx	CO2
Power generation	**9 946**	**2 578**	**870 700**
Solid Fuels	5 896	1 782	568 405
Oil	4 022	607	201 917
Gas	29	189	100 378
Other transformations	**0**	**0**	**0**
Solid Fuels	0	0	0
Oil	0	0	0
Gas	0	0	0
Energy sector	**1 495**	**270**	**124 039**
Solid Fuels	39	8	4 979
Oil	1 400	228	89 445
Gas	55	34	29 615
Industry	**4 243**	**904**	**626 593**
Solid Fuels	457	106	159 401
Oil	3 743	550	272 239
Gas	43	248	194 954
residential/commercial	**2 307**	**662**	**620 223**
Solid Fuels	571	76	78 012
Oil	1 735	426	382 834
Gas	1	160	159 377
Transport	**615**	**5 488**	**514 947**
Solid Fuels	1	0	0
Oil	614	5 488	514 947
Gas	0	0	0
Total	**18 606**	**9 903**	**2 756 502**
Solid Fuels	6 964	1 972	810 797
Oil	11 514	7 300	1 461 381
Gas	128	630	484 323

Emissions by sector, by fuel category and by pollutant
(Scenario 1, Energy 2010)
CEE *1000 tons*

1986	SO2	NOx	CO2
Power generation	**8 610**	**2 395**	**786 414**
Solid Fuels	6 508	1 894	590 119
Oil	2 081	337	107 226
Gas	21	164	89 069
Other transformations	**0**	**0**	**0**
Solid Fuels	0	0	0
Oil	0	0	0
Gas	0	0	0
Energy sector	**819**	**210**	**93 320**
Solid Fuels	23	5	3 228
Oil	758	172	63 422
Gas	39	32	26 669
Industry	**2 116**	**718**	**496 479**
Solid Fuels	657	164	167 994
Oil	1 404	314	157 687
Gas	55	241	170 798
residential/commercial	**1 296**	**611**	**606 715**
Solid Fuels	501	69	68 945
Oil	794	345	338 947
Gas	1	197	198 824
Transport	**559**	**5 621**	**577 527**
Solid Fuels	0	0	0
Oil	559	5 621	577 527
Gas	0	0	0
Total	**13 400**	**9 556**	**2 560 455**
Solid Fuels	7 690	2 132	830 286
Oil	5 594	6 790	1 244 810
Gas	116	634	485 359

Emissions by sector, by fuel category and by pollutant
(Scenario 1, Energy 2010)
CEE ***1000 tons***

1990	SO2	NOx	CO2
Power generation	**8 301**	**2 513**	**871 576**
Solid Fuels	6 012	1 927	658 290
Oil	2 270	429	137 521
Gas	19	157	75 765
Other transformations	**0**	**0**	**0**
Solid Fuels	0	0	0
Oil	0	0	0
Gas	0	0	0
Energy sector	**714**	**214**	**83 964**
Solid Fuels	15	4	1 887
Oil	699	198	75 903
Gas	0	12	6 173
Industry	**2 473**	**772**	**528 143**
Solid Fuels	544	149	154 252
Oil	1 871	333	157 785
Gas	58	290	216 106
residential/commercial	**1 131**	**539**	**611 449**
Solid Fuels	447	52	66 579
Oil	685	263	321 836
Gas	0	223	223 034
Transport	**669**	**6 580**	**671 616**
Solid Fuels	0	0	0
Oil	669	6 580	671 616
Gas	0	0	0
Total	**13 288**	**10 617**	**2 766 748**
Solid Fuels	7 017	2 133	881 008
Oil	6 194	7 802	1 364 661
Gas	77	682	521 078

Emissions by sector, by fuel category and by pollutant
(Scenario 1, Energy 2010)
CEE *1000 tons*

1995	SO2	NOx	CO2
Power generation	**6 495**	**2 303**	**966 047**
Solid Fuels	4 410	1 746	711 397
Oil	2 072	392	164 430
Gas	13	165	90 219
Other transformations	**0**	**0**	**0**
Solid Fuels	0	0	0
Oil	0	0	0
Gas	0	0	0
Energy sector	**752**	**229**	**90 312**
Solid Fuels	13	3	1 723
Oil	739	212	81 744
Gas	0	14	6 844
Industry	**2 516**	**795**	**533 090**
Solid Fuels	584	160	155 214
Oil	1 879	331	155 482
Gas	52	304	222 394
residential/commercial	**1 064**	**545**	**611 403**
Solid Fuels	390	45	57 749
Oil	675	259	312 634
Gas	0	241	241 020
Transport	**719**	**5 716**	**715 134**
Solid Fuels	0	0	0
Oil	719	5 716	715 134
Gas	0	0	0
Total	**11 546**	**9 589**	**2 915 986**
Solid Fuels	5 398	1 954	926 083
Oil	6 083	6 911	1 429 425
Gas	65	724	560 478

Emissions by sector, by fuel category and by pollutant
(Scenario 1, Energy 2010)
CEE *1000 tons*

2000	SO2	NOx	CO2
Power generation	**3 855**	**1 735**	**1 085 234**
Solid Fuels	2 561	1 383	846 418
Oil	1 287	213	151 724
Gas	7	139	87 092
Other transformations	**0**	**0**	**0**
Solid Fuels	0	0	0
Oil	0	0	0
Gas	0	0	0
Energy sector	**760**	**231**	**88 356**
Solid Fuels	12	3	1 518
Oil	748	213	79 569
Gas	0	15	7 269
Industry	**2 415**	**797**	**531 647**
Solid Fuels	620	170	154 646
Oil	1 746	309	145 579
Gas	49	318	231 422
residential/commercial	**925**	**528**	**582 750**
Solid Fuels	309	35	45 483
Oil	616	237	282 242
Gas	0	255	255 025
Transport	**750**	**4 595**	**739 746**
Solid Fuels	0	0	0
Oil	750	4 595	739 746
Gas	0	0	0
Total	**8 705**	**7 884**	**3 027 732**
Solid Fuels	3 502	1 591	1 048 065
Oil	5 148	5 567	1 398 860
Gas	56	727	580 808

Emissions by sector, by fuel category and by pollutant
(Scenario 1, Energy 2010)
CEE *1000 tons*

2010	SO2	NOx	CO2
Power generation	**552**	**1 298**	**1 202 582**
Solid Fuels	487	1 085	1 032 470
Oil	61	45	59 896
Gas	4	169	110 216
Other transformations	**0**	**0**	**0**
Solid Fuels	0	0	0
Oil	0	0	0
Gas	0	0	0
Energy sector	**721**	**247**	**86 781**
Solid Fuels	9	2	1 108
Oil	712	231	78 780
Gas	0	14	6 892
Industry	**2 394**	**846**	**553 113**
Solid Fuels	732	201	162 699
Oil	1 616	290	138 951
Gas	46	356	251 462
residential/commercial	**775**	**504**	**547 187**
Solid Fuels	248	28	36 300
Oil	526	204	238 003
Gas	0	273	272 883
Transport	**790**	**4 804**	**760 891**
Solid Fuels	0	0	0
Oil	790	4 804	760 891
Gas	0	0	0
Total	**5 232**	**7 700**	**3 150 552**
Solid Fuels	1 476	1 316	1 232 577
Oil	3 706	5 573	1 276 521
Gas	50	811	641 453

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