

**Specific actions for greater penetration
for renewable energy sources**

ALTENER

- A. Introduction and explanatory memorandum
- B. ALTENER - Community action programme for the period 1993 to 1997
- C. Proposal for a Council Decision concerning the promotion of renewable energy sources in the Community (ALTENER programme)

(presented by the Commission)

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A. INTRODUCTION AND EXPLANATORY MEMORANDUM

I. INTRODUCTION

1. To help combat global warming as a result of the greenhouse effect, the joint Energy/Environment Council, meeting on 29 October 1990, set as a Community objective the stabilization of carbon dioxide emissions in the year 2000 at their 1990 levels.

In its communication "A Community strategy to limit carbon dioxide emissions and to improve energy efficiency",¹ the Commission subsequently proposed a strategy to achieve this objective.

After examining the communication, the Joint Energy/Environment Council, meeting on 13 December 1991, invited the Commission to put forward proposals for concrete measures to reduce CO₂ emissions. The Council specifically asked the Commission to propose measures designed to increase the development of renewable energy sources. This communication is submitted in response to that request.

2. In its resolution of 16 September 1986 concerning new Community energy policy objectives for 1995,² the Council stated that "the output from new and renewable energy sources in place of conventional fuels should be substantially increased, thereby enabling them to make a significant contribution to the total energy balance."

Only a few months later, on 26 November 1986, a Council resolution was entirely devoted to a Community orientation to develop new and renewable energy sources.³

3. The Council subsequently confirmed in detail its desire to pursue its policy of developing alternative energy sources in its recommendation of 9 June 1988 on developing the exploitation of renewable energy sources in the Community⁴ and its recommendation of 8 November 1988 to promote cooperation between public utilities and auto-producers of electricity,⁵ and in particular those using renewable energy sources.

1 SEC (91) 1744 final, 14.10.1991.

2 OJ No C 241, 25.9.1986, p. 1.

3 OJ No C 316, 9.12.1986, p. 1.

4 OJ No L 160, 9.6.1988, p. 46.

5 OJ No L 335, 8.11.1988, p. 29.

4. These texts already contain the essential elements of a Community policy for renewable energy sources and form the basis for a coherent and balanced programme of promotion, namely:

- (a) implementation, where appropriate, of legislation and administrative procedures for removing obstacles to the development of renewable energy sources;
- (b) promoting the completion of national inventories of the potential of renewable energy resources and widest possible dissemination of these inventories at regional and local level to inform the public about the practical possibilities for exploiting these energy sources;
- (c) preparation and starting up of a statistical recording system for renewable energy sources, in conjunction with the Statistical Office of the European Communities;
- (d) preparation of uniform standards for products and equipment in the field of renewable energy sources to facilitate the free movement of such products and equipment within the Community;
- (e) promotion to launch opportunity and feasibility studies concerning projects to exploit renewable energies, especially to benefit local authorities and small and medium enterprises;
- (f) promoting cooperation between the industries manufacturing equipment for the exploitation of renewable energy sources, and promoting the transfer of technologies;
- (g) promoting exchanges of information about the development of renewable energy sources between Member States;
- (h) taking into account in public investments the possibility of using renewable energy sources in conjunction with energy-saving measures.

5. On 8 November 1988, when reviewing the progress made towards achieving the energy objectives for 1995, the Council issued the following conclusion:

"The Council attributes particular importance to new and renewable energy sources, taking account of their economic viability, for future energy supplies, even if, despite the efforts already made in the past, only a small increase in their contribution can be anticipated by 1995. The competitiveness of these forms of energy has suffered as a result of falling prices of traditional energy sources."
6. In 1991 commercialized renewable energy sources (including the electricity produced by large hydroelectric facilities), the only ones to be statistically recorded, covered less than 2% of primary energy demand. Including fuel-wood, which now represents 20 million toe in the Community, renewable energy sources' share may be estimated at nearly 4%, with a total in absolute terms of 43 million toe/year (see Statistical Annex).
7. Where research and development and the promotion of energy technologies are concerned, the specific programme in the field of non-nuclear energy sources⁶ and⁷ and the THERMIE programme,⁸ which run until the end of 1994, will continue to supplement the national programmes in an effective way and help ensure the wider use of renewable energy sources.
8. Since the level of prices does not at present favour the development of alternative energy sources, the price mechanism could be used, without bending the economic rules unacceptably, in such a way as to encourage the use of new energy sources. There can be no doubt that indirect energy taxation, with a tax payable by the final consumer being levied on polluting emissions and carbon dioxide, could be a way of helping to protect the environment and expand the use of renewable energy sources. The Commission made a proposal to this effect in its communication on a Community strategy to limit carbon dioxide emissions and to improve energy efficiency.⁹
9. However, these technology-promotion and tax measures will not be sufficient to enable renewable energy sources to play a significant role in the strategy for the stabilization of CO₂ emissions. They should be supplemented by other, flanking measures which come under this programme and which will have to be underpinned by national measures.

6 OJ No L 185, 17.7.1990.

7 OJ No L 257, 9.9.1991.

8 OJ No L 185, 17.7.1990.

9 SEC(91)1744 final, 14.10.1991.

II. PROMOTING THE PENETRATION OF RENEWABLE ENERGY SOURCES:
LIKELY GAINS

Security and diversification of supplies

10. After the coal era and the oil era, when at a particular moment in time each of these two energy sources had a market share of around 50%, the world is increasingly moving towards a multi-energy scenario.

World energy demand will in future be met by a broader range of energy sources and technologies than has been the case so far. New and renewable energy sources will have their role to play in this scenario. However, unless vigorous action is taken their rate of market penetration will inevitably be undermined if oil prices remain at their present levels protractedly.

11. Whereas in the short term we must keep a sense of proportion about the contribution that renewable energy sources can make to the Community's overall energy balance, in the longer term their contribution could be far from insignificant (5 to 6% in the year 2000 and 8% in 2005 or shortly thereafter).
12. Within the limits of their possibilities, alternative energy sources can also help to reduce fossil fuel imports: the extra 66 million toe that could be produced in 2005 from renewable sources compared with now would represent a foreign-exchange saving of over ECU 7 billion (at 1991 crude oil prices).

Environment

13. While they cannot all be placed on the same footing, renewable energy sources offer undoubted benefits in terms of protection of the environment. Admittedly, fierce local opposition to the establishment of hydroelectric power stations, even small-scale ones, has been encountered, as has often been the case with municipal waste incineration plants, and noise and visual intrusiveness have sometimes hampered the development of wind power.

In general, however, the environmental impact of renewable energy sources is slight. When used instead of fossil fuels they make a considerable contribution towards reducing emissions of greenhouse gases.

14. Of all the renewables, the use of biomass in particular is likely to expand considerably.

This source of energy has major advantages: the great variety of its end-uses, encouraging the development of new and sustainable technologies, and the possibility it offers of favourably influencing emissions of carbon dioxide into the atmosphere and establishing synergy with agriculture in the Community.

15. Very large areas are needed in order to obtain significant quantities of energy from the sun, the wind and biomass. However, land-use intensity should not be an argument against using renewable energy sources when it is clear that with solar energy, for example, the main obstacle is not the amount of land involved but the intermittent nature of production and the difficulties regarding economic storage.

16. Reducing air pollution and combating the greenhouse effect are global problems.

The countries now moving towards a market economy and the developing countries continue to depend on fossil fuels for a considerable proportion of their supplies. In the global struggle to combat the greenhouse effect the industrialized countries will not only have to reduce their own CO₂ emissions but also make an extra contribution to offset unavoidable emissions in the rest of the world.

It is the responsibility of the developed regions, such as the Community, to keep up R, D&D in the field of renewable energy sources and to ensure the transfer of economically-proven technologies.

Economics of renewable energy sources

17. Certain technologies for exploiting renewable energy sources are already competitive today, while others could become competitive within five to ten years. However, it should be pointed out that the economic comparisons normally made with fossil fuels are biased because they only take direct costs into account. If all the external costs that society has to bear (damage to the environment and public health, social charges) were taken into consideration the economic assessment would be substantially different, making it easier for alternative energy sources to increase their share of the market.
18. Because of their scattered nature, renewables are particularly suitable for regional or local applications. Also, the regions with high levels of exploitable potential are often to be found in the countries with the highest degree of dependence on imported energy. It is very important to make use of alternative energy sources in the Community's peripheral regions in order to further the objective of economic and social cohesion enshrined in the Treaty on European Union.
19. Developing a renewable-energy industry in the Community may have positive effects on industrial activity and on the balance of payments, bearing in mind the scale of the market outside the Community. Many countries throughout the world with particularly favourable conditions for the wider use of renewables have neither the engineering expertise nor the industrial structures required to produce the equipment needed to harness these resources. The Community industry, which in this sector mainly comprises labour-intensive small and medium-sized enterprises, could secure significant outlets.
20. An increase in supplies of equipment and services relating to the exploitation of renewables, both within the Community and outside, will have a considerable impact on employment in small and medium-sized enterprises. The equipment to be supplied is very varied, ranging from turbines and generators for hydroelectric, wind and geothermal power stations and waste incinerators to boilers, gasifiers, digesters, stills, plants for the esterification of vegetable oils, photovoltaic generators, and solar collectors, not to mention the whole gamut of auxiliary and control equipment.

The impact on employment in rural areas as a result of developing the use of biomass and biofuels will be no less important. If, instead of lying fallow, agricultural land can be used to produce biofuels this will obviously have a beneficial effect on employment in agriculture.

Biomass harvesting can bring farmers extra income; it may slow down the flight from the land and thus be of benefit in terms of regional development; last but not least, in the medium term it may generate tax gains.

III. POTENTIAL OF RENEWABLE ENERGY SOURCES IN THE COMMUNITY
AND IN THE WORLD AS A WHOLE

21. Research, development and demonstration in the field of renewable energy sources since the first oil crisis in 1973 has proved that in many cases renewables are technically and economically viable. Significant progress has been made in all subsectors: production and harvesting of biomass, solar collectors, photovoltaic conversion, geothermal energy, wind power and mini-hydro. The state of the art is now well advanced and there are numerous examples of applications which are already economic.

Renewables' exploitable potential is considerable and the annual market for production equipment was recently estimated (1990) to amount to ECU 40 billion worldwide.

Hydro-power

22. The technically exploitable hydroelectric potential of watercourses in the world as a whole has been estimated at some 10 000 TWh/year. In 1985, with a total production of 2 200 TWh/year, the rate of exploitation was barely above 20%. Hydro-power's contribution towards world electricity production has steadily declined: 36% in 1950, 23% in 1974 and 18% in 1985. It is estimated that it will be as low as 14% in 2010. The reason for this trend is that the rate of growth in electricity demand is far in excess of the rate of development of hydro-power resources. In 1991 the capacity of large hydroelectric power stations in the world amounted to nearly 650 GW and that of small plants below 10 MW amounted to 25 GW.

In the Community the total installed capacity of hydroelectric plants (including pumping plants) is at present around 80 GW; that of small power stations below 10 MW is only 5 GW. While the rate of utilization of the economically-exploitable potential of large power stations is at present almost 95%, that of power stations below 10 MW is only 20%. It is this marked difference in the rates of exploitation of large and small-scale hydro-power which justifies taking action concerning small-hydro power stations.

WIND POWER

23. The strategy document for the development of wind energy in Europe¹⁰ indicates that wind power is a particularly important renewable energy source. The European wind-power equipment industry, which is growing considerably, already occupies a significant position on world markets. In July 1991 the installed capacity for the production of electricity from wind power totalled 509 MW in the Community, of which 360 MW in Denmark, 55 MW in the Netherlands and 55 MW in Germany. According to the equipment plans known about at present, the installed wind-power capacity in the Community in 2005 should be between 4 000 and 5 000 MW. The cost per KWh produced is comparable to the cost of electricity generated by a coal-fired power station fitted with flue-gas purification equipment. Some 80% of the plants in the Community have been built using Danish materials, the remainder being produced in Germany, the Netherlands and Belgium. In 1990 the world market was shared almost equally between the Community on the one hand and the United States and Japan on the other.

The most widespread capacity class at present is the medium range: 200-250 KW and 25-30 m rotor diameter. Equipment technology has now reached maturity to some extent. There is a ready market for units in this range for the generation of electricity for small local networks or large grids.

Outside the Community much of the production of electricity from wind power is concentrated in California. At the end of 1990 the total installed wind-power capacity in the United States was estimated at 1 500 MW, with over 15 000 wind turbines. The Department of Energy is forecasting a very substantial increase in installed wind-power capacity for the next decade. India and China also have ambitious development programmes.

Biomass

24. The renewed interest in the world as a whole for the use of biomass as a source of energy is attributable to the efforts to secure sustainable energy supplies for a rapidly growing world population.

In the industrialized countries the greatest interest in the development of biomass is at present being shown in the following sectors: timber end-uses, treatment of organic waste and manufacture of new energy products (ethanol, methanol, esters of vegetable oils, etc.).

¹⁰ Study financed by the Commission, the European Wind Energy Association, and the Governments of Denmark, the Netherlands and the United Kingdom.

25. The Community consumes some 20 million toe of fuel-wood per annum, of which 9 million toe in France. Production could double or even treble if an intensive production/utilization policy were implemented (short-rotation coppices - forest policy). The main applications, some of which are competitive with conventional sources, concern domestic heating and the production of steam and heat. Advanced technologies, in particular gasification combined with gas turbines, offer interesting prospects for the production of electricity.
26. The development of the use of organic waste by means of anaerobic digestion basically depends on resolving problems relating to protection of the natural environment. Waste-water regeneration techniques, with energy recovery, have rapidly spread in all European countries. For several years there has been a considerable expansion in the case of plants for the production of biogas from agro-industrial waste (distilleries, sugar refineries, livestock farming, etc.). The number of such facilities in Europe can be estimated at over 600.
- Extraction of biogas from controlled landfill sites is also becoming widespread within the Community. Over 200 sites fitted with biogas-recovery systems now produce some 400 000 toe/year, representing 9% of the Community's potential. Burning the methane produced by the sites rather than simply discharging it into the atmosphere helps reduce emissions of greenhouse gases.
27. Where the treatment of municipal waste is concerned, the situation varies quite considerably from one Member State to another. Of the most widespread practices, incineration is the solution most frequently employed to recover energy. In the Community some 20% of waste is disposed of by means of incineration, and it is often possible to derive energy in the form of heat and/or power production. District heating networks, in particular in France, Germany and Denmark, distribute nearly one and a half million toe of heat produced from municipal waste.
28. The use of agricultural products as motor fuels has started to spread throughout the world following the interest aroused in the United States and Brazil. In the United States it seems likely that the production of ethanol mixed with petrol, which totalled 3.4 million m³ in 1990, will increase in future. In Brazil, on the other hand, ethanol production from sugar cane is stagnating at around 11 million m³/year. A dozen other countries, especially in Africa and Latin America, have launched programmes for ethanol as a fuel. Specific schemes to produce methanol and ethanol from agricultural and forest crops have been devised in the Community. Oilseeds, in particular rape and sunflower, are also very attractive, since their oil can be used in the unaltered state in special engines or in the form of methyl esters to replace (partially or totally) gas oil in conventional diesel engines.

29. Last but not least, biomass offers very interesting development prospects not only in terms of direct energy results, but also in terms of all the spin-offs which may result from research into plant physiology and pathology, biogenetics, new technologies for transforming agricultural products into energy, and the automation of biomass harvesting, transportation and storage processes. Innovations may also be possible in the processes for the combustion or transformation of biomass into new fuels for various thermal applications and the production of electricity.

Solar energy

30. Over the last decade significant progress has been made in all the basic applications of active solar energy: heating of swimming pools, production of domestic hot water, space-heating, heat for commercial, agricultural and craft end-uses. As a result of the progress made, certain technologies, such as the heating of swimming pools and the production of domestic hot water, have reached a high level of maturity. The efficiency of commercial solar panels has increased by 30% compared with the last decade and certain new types of solar collectors (vacuum tubes) have been developed and launched on the market. In the world as a whole there are some 30 million m² of solar panels installed, of which 4.5 million in the United States, 5.0 million in Japan, 2.3 million in Turkey, 1.5 million in Australia and 340 000 in Cyprus.

In the Community, the total surface area of solar panels installed at the end of 1990 was 3 million m², of which 1 300 000 m² in Greece, 490 000 m² in France and 350 000 m² in Italy.¹¹ Their annual production can be estimated at 200 000 toe.

11 "Solar Thermal Equipment in Europe in 1991", a study co-financed by the Commission of the European Communities and the French Agency for the Environment and Energy Management.

31. Annual world production of solar collectors (glazed and unglazed) is now estimated at 3 million m². The production volumes achieved in 1983 and 1984 in the United States and Japan have fallen considerably in recent years (600 000 m² in Japan and 400 000 m² in the United States in 1989). The ending of tax allowances granted by the Federal Government in the United States and the comparative stability of energy prices have had an adverse effect on sales of solar thermal equipment.

In Japan, on the other hand, government policy on solar energy (subsidies and low-interest bank loans) did not change until 1989. Consumer disaffection is mainly attributable to the trend in the price of oil and to the economic slowdown.

At present a considerable proportion of the total production of solar panels is in the countries of the Near and Middle East. Turkey and Israel in particular, each with a production of 400 000 m²/year are among the world leaders, followed by Jordan (200 000 m²/year) and Cyprus (33 000 m²/year). While Israel exports a lot of its production, Turkey's is mainly for the home market.

In the Community, the biggest manufacturing industry in this sector is in Greece, which at present has the biggest home market in the European Community. With a production of 130 000 m² per annum, Greece is well ahead of Germany which in 1990 manufactured 40 000 m² of solar panels. In 1990 Community production totalled some 250 000 m² of solar panels. In the Community, 500 firms manufacture, sell and install solar collectors and employ 3 000 people, with a turnover estimated at ECU 180 million. However, the market prospects are encouraging only in Greece, Germany, the Netherlands, the United Kingdom and Denmark. In the North of the Community, the sensitivity of public opinion to environmental problems is a major stimulus. In countries such as Italy, France, Spain and Portugal, sales of solar collectors are falling even though the climatic conditions favour this form of energy. This trend may be explained by current energy prices, bad experiences with first-generation solar panels and inadequate promotion campaigns.

32. In the world as a whole, there is a rapidly growing market for the manufacture and installation of photovoltaic systems for the production of electricity. The photovoltaic industry, initially linked with monocrystalline silicon as the basic element of the cell for converting solar radiation into electricity, is now making greater use of less expensive materials, such as polycrystalline silicon and amorphous silicon. The cost of cells and modules has fallen

considerably in recent years. Since 1973 the cost of photovoltaic systems has been divided by 15 in real terms. This fall in prices has enabled the world photovoltaic market to grow rapidly from 1 MW in 1978 to 56 MW or thereabouts in 1991, having increased by more than thirty-fold in the ten-year period after 1978.

An annual growth rate of 20 to 30% should be achieved in the medium term through applications in isolated sites (telecommunications, rural and village electrification, water pumping), and then by the beginnings of the commercial development of grid-linked applications. By the end of the decade the world photovoltaic market should already represent over 300 MW/year, giving a turnover of about ECU 2 billion/year, i.e. four times the 1990 figure. In the Community, annual sales are forecast to increase from 10.2 MW in 1990 and 13.4 MW in 1991 to approximately 50 MW in the year 2000. At present Japanese companies have 36% of the world market, but the Community industry, which is also established in the United States, is - with 25% of the market - in a very good position. European demand is at present well in excess of its production capacity.

33. Heliothermal conversion technology (high-temperature active solar power) makes it possible to obtain, using various types of concentrators, high-temperature fluids which can be used for the production of steam for industrial processes and electricity. As a result of several projects under study throughout the world, this technology, which had been marking time, is now arousing renewed interest. However, it is impossible at present to evaluate the real chances of economic success for these production methods.

34. In most industrialized countries, passive solar heating is already a proven technology in new dwellings and in modernized housing. A vast information and data-collection network has resulted in detailed knowledge of the application of passive solar heating in the residential sector.

Passive solar contributions are not normally taken into account in energy balances, but they nevertheless play an important role in the heating of buildings, and are estimated for the Community as a whole at 24 million toe in 1986.

Other passive solar techniques now under study concern air cooling and conditioning but the research is less advanced. An increasingly important role in air conditioning is being played by household automation, resulting in energy savings as well as increased comfort.

Geothermal energy

35. World electricity production from geothermal sources has increased considerably, rising 50% from 3 900 MW in 1980 to 5 850 MW in 1990. In the Community, France (4.2 MW in Guadeloupe) and Portugal (3 MW in the Azores) have joined Italy (545 MW in 1991) as geothermal electricity producers. Between 1990 and 1995 the world production potential should increase by 50%. The biggest contribution to this will be in the countries with the longest-standing tradition in this area: the United States, the Philippines, Mexico, New Zealand, Japan and Italy. New producer countries will emerge in Central America (Costa Rica, Guatemala and Salvador). In the Community, Italy has a programme to double capacities by the year 2000, and France is continuing to exploit geothermal resources in the Antilles (25 MW in 1994). As a result of the investment programme of the Greek Public Power Corporation in the islands of Melos and Missipos, the installed power in Greece could amount to 100 MW in the year 2000.
36. The direct end-uses of low and medium-temperature thermal energy (heating of buildings, district heating, agriculture, etc.) are estimated at 370 000 toe (1990). France has carried out several projects to exploit geothermal reservoirs for district heating (170 000 toe). Thermal end-uses of this resource have also spread in a few regions of Italy (200 000 toe) for domestic heating, agriculture and industry. Germany, Spain, Portugal and Greece have significant potential in terms of commercial low-temperature geothermal energy resources.

In the world as a whole, consumption of low and medium-temperature geothermal heat remains modest, and can be estimated at about 2 million toe (1990). The main countries concerned are Japan, China, Iceland and Hungary, in that order.

Long-term overall prospects for renewable energy sources

37. Given the shortage of statistics, it is no easy task to determine the prospects of renewable energy sources. The Statistical Office of the European Communities, in conjunction with the national offices, has already carried out a project to collect statistics on renewables. The Commission has also launched a study concerning the Community and the countries of Central and Eastern Europe which, by the end of 1992, should provide it with a solid basis for a detailed evaluation of economically-exploitable renewable energy sources in 2010.

38. On the basis of first estimates, renewable energy sources, which today contribute about 43 million toe/year, covering barely 4% of the Community's primary energy needs, should at least double their share over the next decade, reaching 109 million toe/year, or 8% of the energy consumption forecast in 2005 in Scenario 1 (Conventional Wisdom) in the Commission study "Energy for a New Century - The European Perspective". The additional output of around 66 million toe will mainly be from biomass and biofuels, energy from municipal and industrial waste, wind power and small-hydro. These figures are based on the statistical conventions of the Statistical Office of the European Communities. According to the "substitution" convention, which is also used by the OECD, the contribution from renewable energy sources in the Community amounts to 5.4% in 1991 and 9.6% in 2005. These figures should be compared with those given for the United States and Japan for those two years, namely: 8% and 10% for the United States and 1% and 4% for Japan.

IV. ACTION BY THE MEMBER STATES

39. Over the last decade there have been numerous initiatives by the Member States in favour of renewable energy sources. With the fall in energy prices in 1986, the competitive position of renewables deteriorated compared with conventional energy sources. However, most of the Member States have kept up their efforts in the field of renewable energy sources. The situation, country by country, emerging from a survey conducted by the Commission at the end of 1991, is given below.
40. Since the introduction, in Belgium, of financial incentives for the rational use of energy in the industrial sector, renewable energy sources have qualified for the same general aid arrangements, basically consisting of the possibility of tax deduction for investments (solar and wind power, very small hydro-power plants, use of gas from the anaerobic fermentation of waste). As part of the consultation system for the setting of electricity and gas tariffs, the Control Committee for Electricity and Gas has recommended establishing specific tariffs for contracts for the purchase of auto-produced RWC electricity.¹²
41. The programme for the multiannual development of renewable energy sources drawn up in 1992 in Denmark extends the existing arrangements and is part of the "Energy 2000" plan. The aim is to double the use made of renewable energy sources by the year 2000. The programme covers three main areas: biomass, wind power and solar power. However, certain types of aid can also be granted to other renewable energy sources. The programme was allocated DKR 105 million (approximately ECU 13 million) in 1991.

The aid granted can take the form of:

- "standard" aid for the building of plants regarded as being comparatively mature technically; it cannot exceed 30% of the value of biomass projects and solar projects; the aid for wind-power projects was discontinued in 1989;
- aid for R&D projects (100% of the project cost) and demonstration projects (50% of the project cost);
- basic aid for the exploitation of test plants and the establishment of information centres, etc.

¹² Renewables, waste, CHP.

Regarding electricity tariffs, two agreements concluded make it possible, until 1994, to pay 85% of the consumer price for the electricity produced by wind mills if the auto-producer sells the entire production to distribution companies and 70% if it consumes part of its production itself and only sells the surplus to the grid. DKR 0.23 per KWh is deducted from electricity taxes for the benefit of auto-producers for the electricity produced from renewable energy sources and sold to the grid. The amount reimbursed under this heading by the State amounted to some DKR 130 million in 1990 (ECU 16 million).

42. In Germany the Federal Government and the Länder Governments have continued to place the emphasis on increasing the role of renewable energy sources in energy supplies. The instruments used are as follows: maintenance of tax relief for depreciation in the new Länder, low-interest loans for SMEs, the self-employed and municipalities, and an increase in budgetary allocations for R&D, in particular in the field of photovoltaic energy and wind power. Certain Länder have stepped up considerably their action to promote the development of renewable energy sources. The new Electricity Law, which entered into force on 1 January 1991, guarantees a fairly favourable remuneration for renewable energy sources. In the case of electricity from wind and solar power, distribution companies are required to pay auto-producers a price at least 90% of the average KWh price charged to all final consumers. For electricity produced from hydro-power, biogas and agricultural and forest waste, this price varies between 65 and 75% of the average KWh price, depending on the size of the plant.
43. Law 1559/85 on alternative forms of energy and the production of electricity, which entered into force in Greece in 1985, has been followed up by several ministerial decisions and other legislative measures implementing these provisions. Two major decisions in 1988 laid down contractual clauses and principles for remunerating RWC auto-production, which was already permitted by Law 1559/85. The Greek Government has also taken a decision on the conditions governing the installation of wind mills. Law 1475/84 on exploiting the geothermal potential has been successively adapted and will shortly be further amended. The financial incentives granted in Greece to renewable energy sources are based on Law 1892/92 (new version of Law 1262/82), which lays down the types of enterprises qualifying for subsidies. Support may take the form of capital-account aid ranging from 40 to 55% of the investment depending on the region and exemption from the tax on investment and on annual profits. Created by Presidential Decree No 375/87, the Centre for Renewable Energy Sources (KAPE) plays an important role in promoting the use of renewables, and especially in the development and transfer of technologies and the development of industrial activities in Greece.

44. In the 1989 renewable energies plan updating the 1986 plan the Government of Spain set itself for the year 2000 the objective of producing renewable energies equivalent to 8.3 million toe (not including hydroelectric power stations above 5 MW), or 3.4% of the total energy consumption, a 57% increase over the present level. Several technical, economic, legal and administrative measures were taken over the period 1986 to 1990. Demonstration projects have enabled progress to be made with the development of wind energy. The IDAE (Institute for Energy Diversification and Conservation) has also extended the application of the technique of third-party financing to projects using renewable energies (biomass, small-hydro). As a result of the granting of interest subsidies, a series of projects in the field of wind power and the treatment of solid municipal waste have reached the break-even point. The legislative framework established in 1980 and 1982 guarantees favourable treatment for purchases of electricity from auto-producers through the application of tariffs based on percentages ranging between 85 and 95% of the prices paid by consumers.
45. In France the AEME's budgets for renewable energies increased by 13.9% in 1989, 15.6% in 1990 and 17.6% in 1991. AEME aid is granted for research, demonstration and the dissemination of technologies. A Decree of 18 July 1987 authorizes the mixing with petrol of motor fuels of agricultural origin, and a Decree of 1988 lays down a reduced rate of the TIPP (internal tax on petroleum products) for such biofuels. One of the four points of the adaptation plan for agriculture established by the French Government provides for the total exemption of green fuels from the TIPP in pilot installations under 31 December 1996. A package of measures for 1991 and 1992 also seeks to facilitate demonstration and technical validation operations by the Institut français du pétrole with regard to the use of methyl esters of vegetable oils. The Order of 30 July 1991 authorize companies to charge the special depreciation over one year for boilers using biogas.
46. The Electricity Supply Board (ESB) in Ireland has since 1990 been pursuing a very positive policy with regard to electricity auto-producers using renewable energies, in particular wind power, solar power and hydro-power. The standard contract and the new tariffs agreed in June 1991 are very favourable for auto-producers and represent a marked increase over the previous year. The first wind park in Ireland, financed to the extent of over 50% by the VALOREN programme (ERDF), will be operational in August 1992. Its installed capacity will be 6.45 MW and it will cost around 7 million Irish pounds (ECU 9.1 million).

47. Following on from the first Law L 308/82, Italy adopted Laws L 445/87 and L 47/89 providing for additional funding to that provided for in the Law of 1982. Law L 10/91 of 9 January 1991 completely revamped and updated the existing provisions on the development of renewable energy sources. Together with Law L 9/91, it constitutes a decision of great scope and follows the guidelines given in the national energy plan. The funds available for the programme as a whole (hydroelectric power stations, demonstration, energy-saving, co-generation, other renewable sources) for support for studies and projects amounts to LIT 384.3 billion (ECU 250 million) in 1992 and LIT 1 072.8 billion (ECU 700 million) in 1993. The average rate of capital-account aid can be estimated at 30% for projects using renewable energies, but the investment contribution may amount to 50% for demonstration projects and 80% for the installation of photovoltaic equipment in buildings.

A regulation adopted by Presidential Decree should streamline the procedure and eliminate obstacles to the use of watercourses for the production of electricity. The Decision of 14 November 1990 laid down very favourable tariffs for purchases by ENEL (Italian Public Power Corporation) from new wind, photovoltaic and geothermal plants. Law L 9/91 also established a legal framework for installations for the production of electricity using renewable energy sources.

48. In 1990 Luxembourg stepped up its arrangements for granting aid to private individuals and businesses to promote energy-efficiency projects and encourage the use of renewable energy sources. In 1991 an Energy Agency was set up as a limited company, with the participation of the State and the electricity companies; its tasks include promoting the use of renewable energy sources and decentralized electricity production.

Luxembourg's electricity requirements are mainly covered by imports and by hydroelectric power stations.

49. The programme of support for renewable energies in the Netherlands focuses mainly on developing wind power. The capacity of wind mills should amount to around 100 MW in 1992, but the objective set by the Government is 1 000 MW in the year 2000. Under the action plan for the environment, the electricity companies have decided to build 250 MW between 1991 and 1995. R&D programmes will focus on a reduction of at least 30% in the cost price of turbines and improved reliability.

A study carried out by the national and regional authorities has shown that there is sufficient space for the installation of the capacities foreseen until the year 2000. The industrial prospects are promising, and the Government is examining the legislative and regulatory aspects, in particular as regards the safety of wind turbines.

A State subsidy scheme will be devised to stimulate the application of solar, thermal and photovoltaic energy systems which are handicapped by their comparatively high prices. Where solar thermal energy is concerned, Novem (Dutch Agency for Energy and the Environment) is examining the possibilities as regards standardization in this sector. Novem has also been given the task of carrying out a study to take stock of the potential for the production of energy from biomass (energy crops).

The 1989 Electricity Law established a legislative framework for relations between distribution companies and electricity auto-producers. This Law guarantees auto-producers a remuneration which encourages the use of alternative energies, and in particular wind power.

50. By implementing the national SIURE programme, set up in 1988, and the Community's VALOREN programme, Portugal has given considerable impetus to the contribution of renewable energies to the country's energy balance. A few hundred projects have started in the field of small-hydro (less than 10 MW), thermal and photovoltaic solar energy, geothermal energy, wind energy, use of forest waste and biogas production. Decree-Law 189/88 regulated the independent production of electricity in small installations, simplifying the licensing procedures. This has made possible the decentralized exploitation of hydro-power resources, biomass and biogas in several regions of Portugal and the establishment of 60 production units totalling around 270 MW. In the framework of R,D&D actions and programmes, a project to set up a biomass centre was launched at the end of 1988. In addition to its active involvement in the Community programmes, Portugal has granted financial support since 1984 to the innovation efforts of the universities, businesses and national research centres. Between 1988 and 1991 this support totalled ECU 1.1 million for projects valued at ECU 10 million in the field of thermal and photovoltaic solar energy, biomass and biogas.

51. The Department of Energy in the United Kingdom has been pursuing since 1974 a major programme of R, D&D in the field of renewable energy sources. This programme, which at present is allocated over 180 million pounds (approximately ECU 260 million) makes it possible to grant financial support of around 24 million pounds (ECU 34 million) during the financial year 1991 to 1992. The institutional framework has undergone major reform to bring down the obstacles to the development of renewable energy. In the small-hydro sector in particular a decision has been taken to do away with the water-extraction charges for small hydroelectric power stations up to 5 MW. With the Non-Fossil Fuel Obligation (under the 1989 Electricity Act) the production of electricity from renewable sources has received very favourable treatment, whereby distribution companies have to purchase at a price higher than the market price. The first two "orders" of 1990 (168.3 MW) and 1991 (457.3 MW) in respect of the NFFO were a big success and a large number of contracts have already been concluded between auto-producers and the regional electricity companies.

With the probable extension of the NFFO beyond 1998, the objective of installing a further capacity of 1 000 MW for the production of electricity from renewable energy sources by the year 2000, as provided for in the 1990 Environment White Paper, is within the reach of the British Government and could even be exceeded.

V. THE RATIONALE BEHIND A COMMUNITY INITIATIVE

52. Examination of the action taken by the Member States suggests that the measures introduced in the field of renewable energy sources should have positive effects in the short term and improve the unsatisfactory situation reported by the Commission in 1988. However, to enable renewables to play a genuinely significant role in the Community's energy balances, and thus make a significant contribution towards reducing CO₂ emissions, it is essential to consolidate this positive trend in the longer term by means of Community action to coordinate national efforts, approximating the national policies and ensuring their convergence towards common objectives.
53. Experience with the setting of quantified energy policy objectives for 1985, 1990 and 1995 shows that the framework constituted by such Community objectives provides major guidelines for the coordination and harmonization of national energy policies. However, quantified objectives have never been set for renewable energy sources. Since precise objectives have been laid down elsewhere for controlling CO₂ emissions, quantified objectives should also be set for the contribution from renewable energy sources.

Well-defined objectives will also give a clear indication to consumers, producers and investors in the Member States, and to third countries, that the Community and its Member States are determined to make a significant contribution to protecting the environment, and in particular reducing CO₂ emissions, by exploiting renewable energy sources. To give practical expression to the concept of Community solidarity, the Member States must make a joint effort, subject to their energy characteristics and their possibilities and special constraints. The existence of common objectives will make it possible to verify, at regular intervals, the convergence of Member States' policies towards the Community objectives, and the extent to which the objectives are attained.

54. Community competence should come into play first of all in matters concerning the harmonization of technical specifications and standards and the removal of barriers to the free movement of products and equipment and appliances using renewable energy sources. Difficulties have emerged on several occasions in connection with the free movement of equipment such as aerogenerators. In the absence of safety and environmental protection standards, the development of the market in equipment for other renewable energy sources will inevitably result in other barriers to free movement.
55. Given the objective of facilitating the development of renewable energy sources, the Member States are invited to simplify existing administrative procedures. They should also create flexible conditions to further the development of renewables.
56. Biomass, which is very abundant in the Community, and has a wide range of potential applications, is the only renewable energy source which will be able to make a substantial contribution to the replacement of conventional fuels and play a significant role in the overall energy balance in the short and medium term.

Given the close links with the reform of the common agricultural policy, priority will be given to the commercial penetration of biofuels and fuels of agricultural origin.

B. ALTENER - COMMUNITY ACTION PROGRAMME
FOR THE PERIOD 1993 TO 1997

I. COMMUNITY OBJECTIVES FOR 2005

1. On three separate occasions the Community has set energy policy objectives, in Council resolutions, for 1985, 1990 and 1995. In the texts in question the objectives for renewable energy sources were never quantified. Without prejudice to new energy strategy guidelines with different time-frames that the Community may adopt in future, the recommendation of the Toronto Conference for a reduction in CO₂ for 2005 and the Council's decision to stabilize carbon dioxide emissions in the Community in the year 2000 at their 1990 levels call for the establishment of specific quantified objectives for renewable energy sources in the Community for the first time.
2. Given these commitments entered into by the Community, 2005 seems to be the most appropriate time-horizon. By then, it should be possible to reconcile the need for a minimum time-span to prepare an ambitious policy and the need to assess the progress made in the not too distant future. Objectives for 2005 will be set for the total production of renewable energy sources, new production capacities (including independent producers) for generating electricity from renewable sources, the production of electricity obtained using these installations and the contribution of biofuels, alcohols, vegetable oils and their derivatives towards meeting overall motor-fuel requirements. The values given in Scenario 1 (Conventional Wisdom) of the study "Energy for a New Century - The European Perspective" will be taken as reference figures in 2005 for total energy demand, electricity demand and motor-fuel consumption (petrol and gas oil).¹³

¹³ These values are as follows:

- total energy consumption (excluding non-commercial energies)	1330 Mtoe
- total electricity demand	2315 TWh
- consumption of petrol	121 Mtoe
- consumption of automotive gas oil	93 Mtoe

A 180 million tonnes reduction in carbon dioxide emissions can be achieved in 2005 by:

A. increasing renewable energy sources' contribution to the coverage of total energy demand from nearly 4% in 1991 to 8% in 2005.

To achieve this objective, the production of renewable energy sources should rise from nearly 43 Mtoe in 1991 to approximately 109 Mtoe in 2005.

B. trebling the production of electricity from renewable energy sources (excluding large hydroelectric power stations).

To achieve this objective, the capacity and electricity production of all power stations (excluding hydroelectric power stations above 10 MW) using renewable energy sources should rise from 8 GW and 25 TWh in 1991 to 27 GW and 80 TWh in 2005.

C. securing for biofuels a market share of 5% of total fuel consumption by motor vehicles.

The production in 2005 of 11 Mtoe of biofuels on an agricultural area of approximately 7 million hectares will be necessary in order to achieve this objective.

NB:

In the energy balances on which the formulation of objective A above is based the electricity produced from the various alternative sources is accounted for in accordance with the conventions of the Statistical Office of the European Communities. According to these conventions, the conversion from TWh into Mtoe is carried out using different factors depending on whether primary electricity (from hydro-power, wind power or photovoltaic energy) or electricity produced from geothermal resources or waste and biomass is involved.

According to the "substitution" convention (1 TWh = 0.22 Mtoe) used by other statistical offices and international organizations, in 1991 the contribution from renewable energy sources amounts to 5.4% in 1991 and the objective for 2005 becomes 9.6%.

The tables annexed summarize for the two statistical systems the energy balances and the contributions from renewable energies for 1991 and the 2005 objective.

II. COMMUNITY ACTIONS (ALTENER PROGRAMME)

3. The purpose of the ALTENER programme is to develop the penetration of renewable energy sources in the Community, and increase trade in products, equipment and services within and outside the Community.

It will contribute towards better utilization of local energy resources, efficient allocation of public funds, protection of the environment by limiting emissions of greenhouse gases and other pollutants, and will play its part in completing the internal market and reducing the Community's dependence on imported energy.

The ALTENER programme will comprise actions in the following areas:

- (1) promoting the market for renewable energy sources and their integration into the internal energy market;
 - (2) financial and economic measures;
 - (3) training, information and outreach activities;
 - (4) cooperation with third countries.
- (1) PROMOTING THE MARKET FOR RENEWABLE ENERGY SOURCES AND INTEGRATING THEM INTO THE INTERNAL ENERGY MARKET

4. The variety, or non-existence, of legislative provisions relating to renewable energy sources, is an obstacle to their development.

The harmonization of legislation and the formulation of common technical standards at European Community level is part of the process of completing the internal energy market, and will also put the Community industry in a better position to face up to competition on the international market.

Incentive measures concerning the production of renewable energy sources and investments in their exploitation and attractive conditions for the purchase of electricity produced from renewable energy sources will provide a powerful impetus for their development.

(a) Small hydro

5. The report on the application of Council recommendation 88/611/EEC to promote cooperation between public utilities and auto-producers of electricity¹⁴ indicates a favourable trend in the development of small-hydro power. Nevertheless, a number of obstacles remain, particularly concerning authorization to build and operate hydroelectric power stations.

The obstacles could be overcome by establishing a general framework within which each Member State can determine:

- the qualifications to be satisfied by a plant in order to obtain a building and operating licence;
 - the content of the file to be submitted with the licence application;
 - the time limit for processing files submitted as part of the licensing procedure, which should not exceed one year;
 - the period of validity of the operating licence, which should be sufficiently long to allow a return on the investments.
6. Moreover, the need to develop hydro-power must be reconciled with the need to protect the environment. Small hydro alters a watercourse's flow only very slightly and does not consume any water. Applied correctly it has very little direct impact on the environment and when used instead of fossil fuels it helps reduce emissions of greenhouse gases and other pollutants.

7. In the sphere of standardization, certain countries have drawn up standards for the testing and characteristics of small turbines; these are being examined by CENELEC for the purposes of approval at European level. The Commission will make a survey of the standards in force in the Community Member States and, where necessary, will give a mandate to the standardization bodies to draw up European standards.

8. The data available for an assessment of small-hydro resources and potential are incomplete and are not comparable in all Member States. The Commission will continue its work on the establishment of an atlas of such resources.

(b) Wind power

9. In the context of Directive 83/189/EEC laying down a procedure for the provision of information in the field of technical standards and regulations, certain Member States have asked the Commission to take steps to harmonize technical specifications and draw up uniform safety standards for the Community as a whole.

The Commission has asked the Danish Energy Agency to prepare the ground for harmonizing technical and environmental specifications relating to aerogenerators. The work in question consists in finding out what rules and regulations are now in force in each country, evaluating the similarities and differences and taking stock of the wishes and requirements of the various countries in relation to future European regulations, which should lay down the minimum requirements regarding safety, performance and environmental impact.

On completion of the work involved, the Commission will submit a proposal for a Directive on the safety, performance and environmental impact of aerogenerators. Where necessary, mandates will also be given to the standards bodies to draw up European standards.

Thermal solar energy

10. The existence of common standards could help European solar collector businesses both in the context of the single European market and in the context of world trade. Moreover, consumers would also derive benefit from this if they were to be offered certified products, possibly with a seal of quality.

The ISO (International Organization for Standardization) is working on the texts of standards which should be published shortly. Certain Member States are considering referring these documents to the CEN (European Committee for Standardization) so that they can be taken into account.

Work is also being carried out by the Joint Research Centre's Ispra establishment on the performance of solar collectors, and life-span tests have been conducted. At the CETB (Centre d'Essais Techniques du Bâtiment) in France a "technical opinion" procedure has been devised for all solar water-heaters appearing on the market.

Greece has started standardization work on the basis of the activities at Ispra and the ISO standardization proposals.

11. The certification of solar equipment and materials is vitally important to the development of the market and to guarantee quality standards for consumers. It must be based on a joint approach by the manufacturers, consumers and public bodies, resulting in:
- the formulation of testing procedures (performance, strength, safety, etc.) and the performance of the tests in question by approved laboratories;
 - the publication of an appraisal document, product by product;
 - the laying down of a manufacturing control procedure to verify the constancy of the quality of products marketed;
 - the formulation of specific informative labelling setting out the essential features of the product.

In compliance with the usual procedures regarding standardization, the Commission will take the necessary steps to ensure that methods of certifying solar equipment and materials, as set out above, can be finalized and agreed at European level. It will propose quality standards for solar collectors and hot-water production systems.

12. Community-backed programmes for the wider use of solar energy for the production of domestic hot water have been launched throughout the South of Europe by a European business grouping. These businesses offer a contract of quality to users: a "guarantee of solar results". Via this contract, the businesses involved (solar collector manufacturers - designers - installers) jointly guarantee that the installation will provide a certain quantity of solar power each year. If the results guaranteed are not achieved, they will compensate the user.

In France an idea has been developed and tested whereby the contract for the guarantee of solar results (GSR) is incorporated into the rules in force relating to the construction of buildings (public procurement code). The Commission, with the help of the European Federation of Thermal Solar Equipment Manufacturers, will make a contribution towards adapting and integrating this idea into each Member State's building regulations.

Photovoltaic solar energy

13. In the photovoltaic energy field, the JRC's Ispra establishment has carried out experiments and certification and approval work, following commercial developments very closely. The photovoltaic modules produced in the Community are generally accompanied by a test certificate issued by an approved testing institute or by the JRC's Ispra establishment which in November 1987, in cooperation with a panel of experts, drew up guidelines for the acquisition of data relating to photovoltaic installations.

No cases of technical or other barriers to trade in photovoltaic equipment have come to the attention of the Commission so far.

Biofuels

14. The considerable reduction that the Commission is proposing¹⁵ in taxes on biofuels compared with petroleum fuels will make biofuels competitive and encourage the development of the market in such fuels.

In the Community, units for the production of methanol and ethanol from agricultural and forest products have seen the light of day. The mixing of these products and their ether derivatives (MTBE and ETBE) in petrol is authorized in small quantities pursuant to Directive 85/536/EEC of 5 December 1985.¹⁶

The Commission will propose revising this Directive so as to increase the quantities of these products permitted to be mixed with petrol.

¹⁵ COM(92)36 final, 28.2.1992.

¹⁶ OJ L 334, 12.12.1985, p. 20-22.

15. In addition, oilseeds, in particular rape and sunflower, have proved to be of value for the manufacture of motor fuels; their oil can be used in the unaltered state in modified diesel engines or in the form of methyl esters in standard diesel engines. Tests have been conducted on such fuels, and the findings demonstrate the feasibility of using them commercially. The Commission will prepare a proposal on the use of vegetable oils and esters of vegetable oils in diesel engines.

It is essential that there should be precise and recognized technical specifications for these products, which are to be distributed both within and outside the Community. To this end, the Commission will submit a proposal for a Directive on the technical specifications of biofuels for diesel engines. At the same time, it will give the standards bodies mandates to draw up European standards for these fuels.

Geothermal energy

16. Four studies carried out for the Commission have enabled geothermal data collected during oil-prospecting to be collated for Spain, Greece, Italy and Portugal. The Commission will extend these studies to include other Community countries and will conduct a legal examination of the possibilities for circulating the data in question. This effort to improve knowledge of the existence of geothermal reservoirs and their access conditions should help to increase the use made of them considerably.

(2) FINANCIAL AND ECONOMIC MEASURES

(c) Tax measures (for the record)

17. The Commission has submitted to the Council a communication on a Community strategy to limit carbon dioxide emissions and to improve energy efficiency.⁹ Tax measures are foreseen in this proposal. They concern the reinforcement of certain existing arrangements (inclusion of external costs, in particular environmental costs) and the introduction of a tax on conventional energy sources to reduce CO₂ emissions and energy consumption. This "ecotax", which would not apply to renewable energy sources (except large hydroelectric power stations), will if adopted make it possible to reduce the production cost differential which may still exist between conventional and renewable energy sources, making the latter more competitive.
18. The Commission recently proposed a Directive¹⁷ on the reduced taxation of biofuels which calls for excise duties on biofuels (ethanol, methanol, vegetable oils, esterified oils) not to exceed 10% of the excise duties on the fossil fuel which they replace.

(b) Promoting the third-party financing of investments

19. In the SAVE programme the Commission proposed measures to promote third-party financing for energy-efficiency projects.

With the ALTENER programme the Commission is proposing to extend these measures to encourage the third-party financing of projects exploiting renewable energy sources: establishment of a European network of institutions interested in promoting third-party financing, renewable energy demonstrations, removal of obstacles to the use of the third-party financing mechanism in the public sector.

(c) Integrated resource planning (formerly least-cost planning)

20. In the SAVE programme the Commission stressed the importance of least-cost planning in the choice of energy investments and energy supply and demand-side projects. The Commission is encouraging the development of this planning technique through a series of pilot schemes.

¹⁷ COM(92) 36 final, 28.2.1992.

To extend the range of possible options and pay equal attention to all the energy resources offered on the market, the possibilities of renewable energy sources should also be taken into account in this type of planning.

(d) Coverage of financial risks - geological uncertainties

21. While the operating costs relating to renewable energy sources are generally low, the investment costs involved in harnessing and using them are more often than not high. The financial risks for the investor are therefore considerable. These risks are further increased if the renewable resources in question are uncertain. With geothermal energy, the mining risks attributable to geological uncertainties (risk that insufficient resources will be found) are considerable.

Guarantee funds, financed by the public authorities, to cover such risks are sometimes set up by those operating in the sector. These funds also make it possible to provide bank guarantees to obtain investment loans.

Quite exceptionally and in the case of major operations to exploit renewable energy sources, the Community may contribute towards the financing of guarantee funds to cover particularly high financial risks.

(e) Local plans for the development of renewable energy sources

22. Renewables are local energy sources which can only be harnessed and exploited on a decentralized basis.

In compliance with the procedures regarding the management of the structural Funds, regions, provinces and cities will be urged to adopt renewable energy development plans. Where appropriate, the Community may provide aid for planning studies and studies into the establishment of renewable energy development programmes.

(f) Feasibility and pre-feasibility studies

29. When constructing a new building, dwelling, school, hospital, swimming pool, etc., the feasibility of making use of renewable energy sources is rarely considered. To give renewables every possible chance, the Member States should take steps to ensure that in all such cases an examination is carried out of the possible contribution of renewable energy sources to the lighting and heating of buildings and the production of domestic hot water, just like conventional energy sources. To this end, simplified "pre-feasibility" studies should be carried out to enable the contracting authority to assess the technical feasibility and economics of using a particular renewable energy source. On the basis of the findings of this study, the possibility of using renewable energy sources would either be abandoned or examined in greater detail in a full feasibility study or a project would be drawn up. Similar studies could be carried out for renewable energy production, conversion or utilization equipment.

(g) Developing the market for biofuels and biomass

24. The establishment of a new Community agricultural policy will result in the gradual abandonment of part of the land that can be cultivated. This will have a major impact on employment in the sector. In the past the reduction in manpower in agriculture has been offset by extensive mechanization heavily dependent on petroleum products which represent the main energy source in this sector (nearly two-thirds of energy consumption being met by oil, 11 million tonnes in 1990).

Community agriculture can deal with its own oil dependence but also help to supply alternatives to petroleum-based fuels. The various systems which can be developed will make it possible to preserve the landscape, in keeping with the requirements of environmental protection. It has been estimated that the land released, or not needed for food crops, could allow a theoretical production of 15-30 million toe/year, depending on the type of energy crop.

25. A broad range of energy systems can be introduced in agriculture. Biomass, which is already well represented and supplies 14% of world energy demand, could make a bigger contribution and take a bigger share of the Community's energy consumption balance: a doubling or even trebling of the use made of biomass in 2005 looks possible.

Of the many possible support measures, the Commission will concentrate its attention to actions relating to the development of biodiesel, short-rotation coppices, and biogas installations, three particularly promising options in the specific context of the European Community and the revision of the common agricultural policy.

Production of vegetable oil ester (biodiesel)

26. The use of derivatives of vegetable oils (methyl and ethyl esters) as motor fuel is now a well-established technique. These products can be used in place of gas oil or mixed with gas oil in diesel-engined vehicles without having to modify the engine. Rapeseed oil ester is at present manufactured in a few small pilot plants. Bigger plants are under construction: 20 000 t/year in Compiègne in France, 8 000 t/year in Kiel in Germany, and 20 000 t/year in Leghorn (Livorno) in Italy.
27. The European Community produces enough oilseeds to supply the biofuel industry. Self-sufficiency will be increased with the reform of the CAP, since fallow land could be used for non-food purposes.
28. Biodiesel produced from vegetable oils from European agriculture can be marketed at prices comparable to that of gas oil if it is subject to minimal or zero tax rates. This applies with world market prices of 20 dollars a barrel for oil and 0.4 dollars a kilo for rapeseed oil.

The economic benefits of producing biofuels are numerous:

- development of a new energy source with an economic impact on agriculture and on processing industries;
- maintenance of employment in rural areas and creation of new jobs in processing industries: approximately 6 500 new jobs with a production of 500 000 tonnes of ester per annum;
- generation of a tax gain as a result of this new economic activity;
- reduction of the dependence on external energy supplies;

29. As biodiesel does not contain any sulphur, it does not give off any sulphur gas when burned. The quantity of pollutants emitted is generally much lower than with the combustion of gas oil. This is true in particular of aromatic hydrocarbons, particulates, nitrogen protoxide and carbon monoxide. There is only an increase in oxides of nitrogen if biodiesel is used in an engine adjusted to burn gas oil. This drawback can be overcome by a specific injection adjustment.

The energy balance of the methyl ester of rapeseed oil is extremely positive: the total energy obtained from the biofuel is three times the fossil energy expended to make it. The CO₂ conversion factor (CO₂ emission avoided to CO₂ emitted) is about 3.

30. Future biodiesel production units will have optimum capacities of between 40 000 and 100 000 tonnes/year. The investment cost for the oil esterification part of the units is between 250 and 500 ECU/tonne of annual production.

The Commission will examine the possibility of supporting the industrial launching of this project by providing aid for the construction of 10 or so industrial pilot plants for vegetable oil methyl ester and by encouraging the replacement of fossil fuels by this product in vehicle fleets (transport companies, municipal vehicles, taxis, company fleets).

The contribution will relate to the investment and to pre-investment studies, including market studies.

The following are examples of the sectors from which the investors might come:

- oil mill operators (which already have oil pressing and refining units);
- farmers' associations;
- operators in the petrochemical industry (which already have plants for mixing biodiesel with gas oil and which could use their distribution network for gas oil).

Short-rotation coppices

31. Among the possible crops opening up new markets for agriculture, ligno-cellulose production involving short-rotation coppices (SRC) and new plants (C4) can be contemplated in many countries. It is a source of ligno-cellulosic raw materials which can be exploited both for energy production and by industry. The many studies carried out throughout the world into the potential for the development of renewables generally agree on one thing: they acknowledge that SRC combined with advanced gasification techniques occupy pride of place among the various options capable of making a significant contribution to the problem of securing sustainable and economic energy supplies in the long term.

Industrial and energy schemes covering between a few hundred and a few tens of thousands of hectares are now taking shape, more often than not involving industrial plantations to supply timber for crushing plants for the manufacture of pulp and for board manufacturers; about one-third of the timber produced in these units (tree canopy - brushwood) is waste which can be used to make compost or to produce energy. The wood is used in industrial co-generation installations supplying industrial heat and producing electricity, or is burned in boilers to heat dwellings and other buildings.

Other plantations, grown purely for energy purposes, and involving very short rotation coppices (two years for poplar) are also encountered. However, the particularly promising concept of producing electricity by means of wood gasification, feeding a gas turbine or even a combined-cycle plant, is not yet operational in the Community. Plants of this type are, however, already planned or in operation, e.g. in Sweden and the United States.

32. Especially to the extent that it involves new technologies which still present a high risk to the investor, the introduction of this concept in the Community could be facilitated by Commission support under the Thermie programme. Under the ALTENER programme, and in compliance with the afforestation programme under discussion as part of the reform of the CAP, the Community could initially encourage the carrying out of SRC projects, and by use of the new C4 species by providing financial support for the studies needed to lay their agro-industrial foundation: identification of appropriate sites and varieties of coppices, organization of planting and harvesting organization of timber handling, transportation and possibly storage, energy production in high-performance and low-pollution installations, and evaluation of the economic viability of the project as a whole. These detailed feasibility studies should be carried out for appropriate structures, e.g. economic interest groupings bringing together agricultural and industrial operators; one of the aims of action by the Commission is to encourage the establishment of such structures.

Biogas

33. In certain Member States livestock effluent is a source of serious environmental problems owing to the large quantities arising, and the difficulties involved in treating this waste. Biogas production in large digesters, with power and/or heat production (cogeneration), is of considerable interest on environmental, economic and energy grounds.

The Commission is conducting market and technological studies to determine the most suitable areas for installing large digesters for the centralized treatment of livestock effluent. Waste production density, available storage capacities in farms and the distance between the places of production and the digester are particularly important factors for evaluating projects' economic viability. Other factors, such as nitrate load per hectare of agricultural area, and nitrate concentrations in surface and ground water, must also be taken into consideration. The Commission will support pilot actions aimed at building installations of an optimum size for the treatment of livestock effluent with power and/or heat production.

(3) TRAINING, INFORMATION AND OUTREACH ACTIVITIES

34. The Community will support training, information and outreach activities in the field of renewable energy sources which have been insufficiently and diversely developed within the Community.
35. It will call upon the Member States and the regions to establish or reinforce their infrastructures for the organization of training in the field of renewable energy sources.
36. Particular attention will be paid to the training and information of architects on the use of passive solar energy. Putting passive solar techniques to good use may have a very significant impact on the energy consumption of a building, while entailing little or no extra investment (e.g. good orientation of the building, making use of thermal inertia, judicious arrangement of glazed surfaces, etc.). So far few architects have had an opportunity to follow specific courses in the application of passive solar energy.
37. In certain Member States training and information centres bringing together on one and the same site a series of different installations for the exploitation of renewable energy sources have seen the light of day. These "shop windows" for renewables are intended not only to provide information for the general public and school children, they also act as training centres for professionals wishing to acquire, in a short space of time and with a minimum of travel, practical experience of the very varied techniques for applying these energy sources. The establishment and development of such centres throughout the Community will be encouraged. Production installations making use of the most advanced technologies could be supported under the Thermie programme. The centres could also act as permanent exhibition halls for the Community's various technology programmes.
38. The Commission will also continue with its information and exchange of experience activities, particularly aimed at local authorities.

To this end it will be helped chiefly by the existing network of government bodies responsible at national or regional level for the promotion of renewable energy sources, in order:

- to examine periodically decisions of a legislative or fiscal nature etc. and the other promotion measures adopted by the Member States,

- encourage various initiatives, such as the organization of conferences and the establishment of an information bulletin,
- supplement the statistical data on renewable energy resources and consumption,
- analyse the results of studies ordered by the Commission and the Member States, and
- set up new data bases on renewable energy resources.

(4) COOPERATION WITH THIRD COUNTRIES

39. Greater use of renewable energy sources in the world as a whole would ensure greater security of energy supply and would make a major contribution to protecting the environment. The Community will therefore encourage the exchange of experience and will continue to cooperate:

- * with the developing countries, with a view to the exploitation of renewable energy sources and to slow down the damaging exploitation of forest resources.
- * with the countries of the former Soviet Union and the countries of Central and Eastern Europe, with which cooperation has already begun under the technical assistance programmes and the PHARE programme and with which a specific protocol on renewable energy sources will be drafted under the European Energy Charter.

These countries, which often have considerable renewable energy resources, will be associated with the actions foreseen under the ALTENER programme.

Many types of equipment in several areas (aerogenerators - hydroelectric plants - photovoltaic modules - solar collectors) are already exported throughout the world by European companies. The Commission will encourage trade with third countries and transfers of technologies. Technical standards for renewable energy equipment will be drawn up in consultation with the member countries of the European Economic Area in order to avoid creating new trade barriers where possible.

III. IMPLEMENTING THE PROGRAMME

40. The programme will be implemented by the Commission on the following basis:
- (a) The Commission will coordinate a network for the exchange of information between the various national and regional bodies for promoting renewable energy sources, and with third countries;
 - (b) The Commission will publish in the Official Journal calls for proposals relating to the market development actions and will send the Member States a copy of the proposals received;
 - (c) Each year the Commission will draw up guidelines for support actions in the Member States; each year the latter will submit their programme proposals to the Commission in conformity with the guidelines established;
 - (d) The Commission, assisted by an Advisory Committee consisting of national representatives and chaired by the Commission, will examine the proposals referred to in (c) and (d). The Advisory Committee will deliver an opinion;
 - (e) The Commission, taking the utmost account of the Advisory Committee's opinion, will approve the proposals referred to in points (c) and (d).
 - (f) The proposals referred to in point (c) and approved by the Commission will be implemented by the proposers. They will report to the Commission on the results obtained.
 - (g) The Member States' support actions referred to in point (d) and approved by the Commission will be implemented by bodies responsible in the Member States for the management of support measures under the ALTENER programme. They will submit an annual report on the activities undertaken and the expenditure incurred.
 - (h) The work carried out in the context of ALTENER will be the subject of an annual examination by the Advisory Committee with a view to evaluating the results obtained and establishing priorities for the following year.

* * *

The Council is requested to approve the attached proposal for a Council Decision concerning the promotion of renewable energy sources in the Community.

ENERGY PRODUCTION FROM NEW AND RENEWABLE
ENERGY SOURCES (NRES)

(FOLLOWING EUROSTAT'S STATISTICAL CONVENTIONS)

NRES	PRODUCTION 1991(1)		OBJECTIVE 2005	
	MTOE		MTOE	
<u>- THERMAL USES</u>				
.FUEL-WOOD	20,0		50,0	
.OTHER BIOMASS(BIOGAS, WASTE,ETC.)	2,7		8,0	
BIOMASS-TOTAL	22,7		58,0	
.GEOTHERMAL	0,4		3,0	
.SOLAR	0,2		1,2	
THERMAL USES - TOTAL	23,3		62,2	
<u>- BIOFUELS</u>	0,0		11,0	
<u>ELECTRICITY</u>	GW	TWH	GW	TWH
.SMALL HYDRO-POWER PLANTS(2)	5,0	15,0	10,0	30,0
.GEOTHERMAL	0,5	3,0	1,5	9,0
.BIOMASS AND WASTE	2,0	6,3	7,0	20,0
.WIND	0,5	0,9	8,0	20,0
.PHOTOVOLTAIC	0,0	0,0	0,5	1,0
ELEC. TOTAL (EXCL. LARGE HYDRO)	8,0	25,2	27,0	80,0
(TOTAL NRES EXCL. LARGE HYDRO)	(29,3)		(91,6)	
LARGE HYDRO (>10MW)(2)	74,8	154,5	88,6	198,5
INCLUDING PUMPING STATIONS	(26,0)		(27,9)	
ELECTRICITY - TOTAL	82,8	179,7	105,6	278,5
NRES - TOTAL	42,6		108,7	
TOTAL ENERGY CONSUMPTION(3)	1160,0		1400,0	
PERCENTAGE SHARE OF NRES	3,7		7,8	

(1) BASED ON EUROSTAT DATA AND IN-HOUSE ESTIMATES

(2) FOR A YEAR OF NORMAL PRECIPITATION; ELECT. PRODUCTION IS NET, EXCL. PUMPING

(3) ESTIMATES AFTER TAKING ACCOUNT OF NRES NOT YET INCLUDED IN THE STATISTICS.

1.6.1992

ENERGY PRODUCTION FROM NEW AND RENEWABLE
ENERGY SOURCES(NRES)

(1TWH $\hat{=}$ 0.22MTOE)

NRES	PRODUCTION 1991(1)		OBJECTIVE 2005			
	MTOE		MTOE			
<u>- THERMAL USES</u>						
.FUEL-WOOD	20,0		50,0			
.OTHER BIOMASS(BIOGAS, WASTE,ETC.)	2,7		8,0			
BIOMASS TOTAL	22,7		58,0			
.GEOTHERMAL	0,4		3,0			
.SOLAR	0,2		1,2			
THERMAL USES - TOTAL	23,3		62,2			
<u>- BIOFUELS</u>	0,0		11,0			
<u>- ELECTRICITY</u>	GW	TWH	GW	TWH		
.SMALL HYDRO-POWER PLANTS(2)	5,0	15,0	3,3	10,0	30,0	6,6
.GEOTHERMAL	0,5	3,0	0,7	1,5	9,0	2,0
.BIOMASS AND WASTE	2,0	6,3	1,4	7,0	20,0	4,4
.WIND	0,5	0,9	0,2	8,0	20,0	4,4
.PHOTOVOLTAIC	0,0	0,0	0,0	0,5	1,0	0,2
ELEC. - TOTAL (EXCL. LARGE HYDRO)	8,0	25,2	5,6	27,0	80,0	17,6
(TOTAL NRES EXCL. LARGE HYDRO)			(28,9)			(90,8)
LARGE HYDRO (>10MW)(2)	74,8	154,5	34,0	88,6	198,5	43,7
INCLUDING PUMPING STATIONS	(26,0)			(27,9)		
ELECTRICITY - TOTAL	82,8	179,7	40,6	105,6	278,5	61,3
NRES - TOTAL	62,9		134,5			
TOTAL ENERGY CONSUMPTION(3)	1160,0		1400,0			
PERCENTAGE SHARE OF NRES	5,4		9,6			

(1) BASED ON EUROSTAT DATA AND IN-HOUSE ESTIMATES.

(2) FOR A YEAR OF NORMAL PRECIPITATION; ELECT. PRODUCTION IS NET, EXCL. PUMPING.

(3) ESTIMATES AFTER TAKING ACCOUNT OF NRES NOT YET INCLUDED IN THE STATISTICS.

Whereas, under Article 130r of the Treaty, action by the Community relating to the environment should improve the quality of the environment and ensure a prudent and rational utilization of natural resources, objectives which are furthered by the use of renewable energy sources;

Whereas the development of renewable energy sources can make a significant contribution to the reduction of polluting emissions arising from the consumption of fossil fuels;

Whereas the development of renewable energy sources contributes to the reduction of greenhouse gases and the danger of global warming; whereas, therefore, wide-ranging international cooperation is desirable in order to obtain significant results;

Whereas on 9 June 1988 the Council adopted a recommendation confirming in detail its desire to pursue a policy of developing the exploitation of renewable energy sources in the Community⁵;

Whereas, when reviewing the progress made towards achieving the energy objectives for 1995⁶, the Council stated in its conclusions of 8 November 1988 that it attributes particular importance to new and renewable energy sources for future energy supplies;

Whereas the promotion and wider use of renewable energy sources throughout the Community are likely to strengthen its economic and social cohesion, as called for by Article 130a of the Treaty;

Whereas, to this end, it is necessary to set Community objectives and make provision for resources to further the attainment of such objectives, taking into account the particular conditions in each Member State,

5 OJ No L 160, 9.6.1988, p. 46.

6 OJ No C 241, 25.9.1986, p. 1.

HAS ADOPTED THIS DECISION:

Article 1

Member States shall endeavour to contribute in their energy and environment policies to the limitation of carbon dioxide emissions by achieving the objectives relating to renewable energy sources set out in the table in Annex I.

Article 2

1. The Community shall support a series of actions to promote renewable energy sources within the context of the ALTENER programme (specific actions for greater penetration for renewable energy sources), hereinafter referred to as "the programme".
2. The programme shall last five years.
3. The budget authority shall determine the appropriations available for each financial year, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

Four categories of actions on renewable energy sources shall be financed under the programme, namely:

- (a) studies and technical evaluations for defining technical standards or specifications;
- (b) measures to support the Member States' initiatives for extending or creating infrastructures concerned with renewable energy sources. These initiatives shall include:

- training and information activities with regard to renewable energy sources at a level as close as possible to operators and the final consumers of energy,
 - sectoral actions, as referred to in Annex II;
- (c) measures to foster the creation of an information network aimed at promoting better coordination between national, Community and international activities through the establishment of appropriate means for exchanging information, and at evaluating the impact of the various actions provided for in this Article;
- (d) industrial pilot actions relating to energy from biomass, and in particular the production of biofuels and biogas and the use of short-rotation coppices and C4 plants.

Article 4

1. All costs relating to the actions referred to in Article 3(a) shall be borne by the Community.
2. The level of Community funding for the actions referred to in Article 3(b) and (c) shall be between 30 and 50% of their total cost.

In exceptional cases duly justified to the committee referred to in Article 6(2), Community funding may exceed the 50% limit, while not exceeding 60%.

3. The level of Community funding for the actions referred to in Article 3(d) shall not exceed 30% of their total cost.
4. The balance of the funding of the actions referred to in Article 3(b), (c) and (d) may be made up from either public or private sources or from a combination of the two.

Article 5

1. The Commission shall establish guidelines for the support measures referred to in Article 3(b), (c) and (d) each year, in consultation with the committee referred to in Article 6(2).
2. The proposed initiatives referred to in Article 3(b) and the list of national, regional or local bodies which are to implement these projects shall be submitted annually by the Member States to the Commission, which shall decide on the level and conditions of Community funding according to the procedure referred to in Article 7. The Commission shall sign contracts relating to these support measures with those bodies.

Article 6

1. The Commission shall be responsible for the implementation of the programme.
2. The Commission shall be assisted by an advisory committee, hereinafter referred to as "the Committee", composed of the representatives of the Member States and chaired by the representative of the Commission.

Article 7

As regards the measures referred to in Article 3(b), (c) and (d), the representative of the Commission shall submit to the Committee a draft of the measures to be taken. The Committee shall deliver its opinion on the draft, within a time limit which the Chairman may lay down according to the urgency of the matter, if necessary by taking a vote.

The opinion shall be recorded in the minutes; in addition, each Member State shall have the right to ask to have its position recorded in the minutes.

The Commission shall take the utmost account of the opinion delivered by the Committee. It shall inform the Committee of the manner in which its opinion has been taken into account.

Article 8

1. During the third year of the programme, the Commission shall present a report to the European Parliament and to the Council on the basis of the results achieved. The report shall be accompanied by proposals for any amendments which may be necessary in the light of these results.
2. On the expiry of the programme, the Commission shall assess the results obtained, the application of this Decision and the coherence of national and Community actions. It shall present a report thereon to the European Parliament and to the Council.

Article 9

This Decision shall apply from 1 January 1993 to 31 December 1997.

Article 10

This Decision is addressed to the Member States.

Done at Brussels,

For the Council
The President

Objectives for reducing carbon dioxide emissions
by developing renewable energy sources

A 180 million tonnes reduction in carbon dioxide emissions can be achieved
in 2005 by:

A. increasing renewable energy sources' contribution to the coverage of
total energy demand from nearly 4% in 1991 to 8% in 2005.

To achieve this objective, the production of renewable energy sources should rise from nearly 43 Mtoe in 1991 to approximately 109 Mtoe in 2005.

B. trebling the production of electricity from renewable energy sources
(excluding large hydroelectric power stations).

To achieve this objective, the capacity and electricity production of all power stations (excluding hydroelectric power stations above 10 MW) using renewable energy sources should rise from 8 GW and 25 TWh in 1991 to 27 GW and 80 TWh in 2005.

C. securing for biofuels a market share of 5% of total fuel consumption by
motor vehicles.

The production in 2005 of 11 Mtoe of biofuels on an agricultural area of approximately 7 million hectares will be necessary in order to achieve this objective.

NB:

In the energy balances on which the formulation of objective A above is based the electricity produced from the various alternative sources is accounted for in accordance with the conventions of the Statistical Office of the European Communities.

Annex II

**Illustrative, non-restrictive list of sectoral actions,
as referred to in the second indent of Article 3(b)**

1. Pilot actions aimed at introducing a "guarantee of solar results" in the market for solar collectors and solar water heaters.
2. Pilot actions relating to vehicle fleets aimed at introducing biofuels in place of petroleum products in the transport sector.
3. Pilot studies on integrated resource planning and demand-side management.
4. Pilot projects on third-party financing within the framework of the European network for third-party financing (without direct Community funding).
5. Guarantee of financial risks, in particular those arising from the geological uncertainties surrounding the development of geothermal resources.
6. Establishment of local plans for the development of renewable energy sources.
7. Establishment and development of infrastructures in the Member States for offering investors assistance with the drawing up of pre-feasibility studies.

ALTENER - Budgetary aspects

Budget heading B4-1030

	Calculation basis	Total cost MECU	% support	Commitment MECU
1. <u>Market promotion</u>				
a. Studies and technical evaluations	5 years x 0.5	2.5	100%	2.5
b. Standardization mandates	4 x 0.25	1.0	100%	1.0
2. <u>Financial and economic measures</u>				
a. Third-party financing	p.m.			
b. Integrated resource planning	p.m.			
c. Guarantee of financial risks				3.5
d. Local development plans	15 x 0.4	6.0	50%	3.0
e. Feasibility studies	15 x 1.0	15.0	33%	5.0
f. Biofuels	p.m.			
g. Short-rotation coppices	4 x 5.0	20.0	30%	6.0
h. Biogas	3 x 5.0	15.0	30%	4.5
3. <u>Training and information</u>				
a. Courses, outreach services, publications	5 x 3.0	15.0	33%	5.0
b. Information and training centres	15 x 2.0	15.0	33%	5.0
c. Organization of information exchange	4.5 x 1.0	4.5	100%	4.5
4. <u>Third-country cooperation</u>				
a. Miscellaneous	p.m.			
TOTAL				40.0

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