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R E P O R T

of the Committee on Energy, Research and Technology

on energy and the environment

Rapporteur: Mr Paul LANNOYE

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A Series: Reports - B Series: Motions for Resolutions, Oral Questions - C Series: Documents received from other Institutions (e.g. Consultations)

*	= *Consultation procedure requiring a single reading*	**II	= *Cooperation procedure (second reading) which requires the votes of a majority of the current Members of Parliament for rejection or amendment*
**I	= *Cooperation procedure (first reading)*	***	= *Parliamentary assent which requires the votes of a majority of the current Members of Parliament*

C O N T E N T S

By letter of 4 January 1990 the Committee on Energy, Research and Technology requested authorization to draw up a repot on energy and the environment.

At the sitting of 2 April 1990 the President of the European Parliament announced that the committee had been authorized to report on this subject.

At its meeting of 21 March 1990 the Committee on Energy, Research and Technology appointed Mr Lannoye rapporteur.

At its meetings of 20/21 March,18/19 April, 25-27 April, 30/31 May, 19/20 June, 17-19 September, 25/26 September, 16/17 October, 6-8 November 1990, 28/29 January, 4-6 February, 21/22 March and 2/3 May 1991 the committee considered the draft report.

At the last meeting it adopted the motion for a resolution by 9 votes to 0, with 4 abstentions.

The following were present for the vote: Mr La Pergola, chairman; Mr Anger, vice-chairman; Mr Lannoye, rapporteur; Mr Amendola (for Mrs Breyer), Mr Bettini, Mr Chiabrando, Mr Desama, Mr Hervé, Mr Linkohr, Mr Porrazzini, Mrs Quisthoudt-Rowohl, Mr Regge, Mr Robles Piquer and Mr Seligman.

The report was tabled on 7 May 1991.

The deadline for tabling amendments will appear on the draft agenda for the part-session at which the report is to be considered.

A

MOTION FOR A RESOLUTION

on energy and the environment

The European Parliament,

- having regard to Rule 121 of the Rules of Procedure,

- having regard to Articles 100a and 130r to 130t of the EEC Treaty,

- having regard to Chapter III of the Euratom Treaty,

- having regard to Council resolution 86/C 241/01 concerning new Community energy policy objectives for 1995[1],

- having regard to Council recommendation 88/611/EEC of 8 November 1988 to promote cooperation between public utilities and auto-producers of electricity[2],

- having regard to the Council conclusions of 21 May and 29 October 1990 on energy and the environment,

- having regard to its resolution of 26 May 1989 on the internal energy market[3],

- having regard to the communication from the Commission to the Council on energy and the environment[4],

- having regard to the report of the Committee on Energy, Research and Technology (A3-0125/91),

A. whereas energy is the principal factor in the problem of the environment,

B. whereas energy is also a determining factor in social progress,

C. recalling the 1987 recommendation of the United Nations Commission on the Environment and Development (Brundtland report), which called on the industrialized countries to adopt a sustainable development objective,

D. whereas this recommendation has been explicitly endorsed at a series of meetings of European Heads of State and by the European Council of 21 May 1990,

E. having regard to the potentially serious consequences of the intensification of the greenhouse effect, largely due to the use of fossil fuels, and to the urgent need to find solutions,

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1 OJ C 241 of 25.9.1986
2 OJ No. L 335 of 7.12.1988
3 OJ No. C 158 of 26.6.1989
4 COM(89) 369 final

F. whereas the world is facing a serious problem which is being tackled differently, from the point of view of anti-pollution technology and economic capacity, by most of the industrialized countries, including the EEC Member States, and the developing countries,

G. having regard to the contribution made by the burning of fossil fuels to atmospheric pollution, to the damage to woodlands caused by acid rain, to the destruction of the forests which are often the only source of energy production in many developing countries, and to urban pollution, linked to oil used in transport,

H. having regard to the intrinsic dangers of nuclear energy and the technologically unresolved problem of the disposal of nuclear waste,

I. having regard to the limited third party liability of nuclear power station operators,

J. aware of the need to stabilize emissions of CO_2 and other greenhouse gases at 1990 levels in the short term and to reduce them appreciably in the long term,

K. fully aware that an immediate abandonment of nuclear energy would in no way help reduce CO_2 emissions, and that the mass replacement of conventional power stations by nuclear power stations is neither economically sensible nor desirable,

L. whereas, furthermore, a policy of replacing fossil fuels by nuclear energy in response to the major challenge posed by the problem of the greenhouse effect is inadequate,

M. whereas an appreciable reduction in emissions of CO_2 and other greenhouse gases could already be achieved worldwide if more modern combustion technologies were to be introduced,

N. whereas the various kinds of ecological imbalances now arising are interrelated, (greenhouse effect, death of lakes and woodlands, depletion of the stratospheric ozone layer),

O. whereas renewable energies would already have greater market opportunities today if energy prices were to reflect all social and ecological costs and also have a positive effect on employment since they involve low capital investment,

P. considering that decentralization of energy production may be, in certain cases, a useful element in energy conservation,

Q. whereas the visual and noise impact of certain renewable energies may only prove acceptable where they are applied on a small scale; and whereas there are land-use implications for large-scale use,

R. whereas the decentralization of energy production is an essential factor in any strategy on energy management,

S. whereas any containment of energy demand through rational energy use and conservation is desirable in limiting disturbance to the environment of all human activities,

T. whereas some Community countries which as yet consume relatively little energy will need to increase consumption as they develop, and therefore will need to formulate strategies and objectives which, without affecting the process of development, enable them to improve the energy efficiency of their economic activities,

U. whereas over 50% of SO_2 emissions come from the use of solid fuel, particularly in electricity generation,

V. whereas almost 80% of NO_x emissions emanate from the use of oil in the transport sector,

W. whereas almost 50% of CO_2 emissions come from the use of oil and just over 30% from the use of solid fuels,

X. where it is important in strategic terms for the Community to reduce its dependence on imported oil,

Y. whereas the Community has failed to maintain its improvement in energy intensity and whereas the application of the results of the demonstration programmes in the rational use of energy and in the energy sector generally, have been disappointing,

1. Affirms the overriding importance of energy policy in the development of society and calls on the Commission for proposals to develop Community energy policy in relation to future supplies with regard to security and price;

2. Declares that the development of Community energy policy must be related to the energy aspirations of underdeveloped and developing countries;

3. Considers it urgently necessary to increase the area of woodlands worldwide to serve as an agent to reabsorb greenhouse gases, to achieve which the EC must develop programmes for the protection of woodlands, for reafforestation and forestation in Europe, in particular the arid zones of the Mediterranean, and in other parts of the world;

4. Insists that the greenhouse effect can only be corrected by world wide agreement on the measures to be taken and consequently Community policy must be determined in conjunction with all major energy-consuming states;

5. Declares that, in the light of the above, **the priority** of energy policy must be **rational energy use**, so as to reduce energy demand and also to limit losses incurred during conversion and transportation to an absolute minimum;

6. Calls for the use of renewable energy technologies to be promoted both at the level of distribution and of demonstration projects and research and development;

7. Calls for the comprehensive advance financing of the introduction on to the market of renewable energies;

8. Calls for active programmes and structural changes in each Member State and in all areas designed to improve energy efficiency;

9. Calls for the best available technology to be applied, in accordance with the guiding principles set out above, with a view to minimizing the environmental impact of the use of fossil, fissile and renewable energies;

10. Considers that, because of strict Community and national anti-pollution regulations and the development and application of technology for the clean burning of coal, the contribution of EEC power stations to the total volume of emissions is relatively small, and so even more progress would be made if the EEC facilitated access to these technologies through financial aid and technological cooperation with the countries of Eastern Europe and the developing countries;

11. Calls for the implementation of these guiding principles to involve:

    (a) maximum integration of social and economic costs into the production, transport and distribution costs, with repercussions on prices,

    (b) harmonization of environmental and safety standards at a high level,

    (c) aid for all investment taking into account, as a priority, the criterion of reducing energy demand, aid being proportional to the efficiency and speed of implementation,

    (d) energy research and development geared as a priority to renewable and clean technologies, especially for coal;

12. Calls on the Commission to bring forward a report on the comparative risks relating to the production and use of all energy systems;

13. Calls on the Commision to bring forward proposals to apply the results of the energy demonstration programmes with a view to improving the intensity of energy use;

14. Proposes, for this purpose, the harmonization of taxes on energy at the highest rate currently levied in the Community and the introduction of a Community eco-tax on fossil energies, the amount being proportional to carbon and sulphur content and being increased over a period of ten years so as to permit maximum integration of environmental costs into prices; the rate of increase should be adapted to trends in market prices to avoid increasing the tax burden in difficult phases;

15. Proposes that part of the revenue from such a tax be redistributed to the Member States according to a scale based on population figures, so that socially disadvantaged groups can be compensated for the rise in energy prices, to finance a reduction in VAT rates on goods and equipment which save energy and use new and renewable energy sources, a second part being paid into a fund to aid the restructuring of the energy sector in third countries, with particular reference to the ACP States and countries of Eastern Europe, a third part being used to increase the resources allocated by the Community to energy management programmes and research and development in respect of new and renewable energy sources;

16. Calls urgently on the Commission to draw up a proposal affirming and translating into European law the principle, enshrined in Article 130r, of total and unlimited third party liability for any injury caused to persons, property and the environment by operators in the nuclear sector both in connection with the management of fissile materials and radioactive waste and with the risk of accidents;

17. Calls on the Commission to draw up a directive aimed at introducing tariffs which will act as a disincentive to excessive energy consumption;

18. Calls on the Commission for the Council recommendation of 8 November 1988 on promoting cooperation between public utilities and auto-producers of electricity to be transformed into a directive, which should be drawn up with a view not only to removing legal obstacles but also to laying down fair contractual conditions for exchanges of electricity;

19. Recommends the Commission to propose a regulation laying down the obligation to label and provide clear information on all energy-using appliances and/or equipment, promoting the gradual introduction of metals with high magnetic permeability in electrical appliances;

20. Calls on the Commission to draw up a framework directive aimed at ensuring that all equipment that utilizes or transforms energy complies with a minimum level of energy efficiency;

21. Calls for a regulation to be adopted banning the use of heavy fuel oil in combustion plants not fitted out with desulphurization technology within the meaning of Directive 88/609/EEC[5];

22. Calls for the speedy harmonization at the highest level of standards relating to the various kinds of power station in operation: standards on emissions, the safety of installations and the protection of workers;

23. Requests that, in accordance with Article 31 of the Euratom Treaty, the basic standards relating to protection against ionizing radiations be reviewed in the light of the latest scientific data and the scientific conclusions and recommendations of specialist international bodies such as the International Commission on Radiation Protection (ICRP) and UNSCEAR and a response found to the recommendation made by various scientific bodies that these standards should be reduced by at least a factor of ten;

24. Calls for an end to all reprocessing of irradiated nuclear fuels and production of mixed uranium-plutonium fuel on the basis of the principle laid down by the ICRP, which states that 'for any activity involving exposure to radiation it should be shown that the advantages it offers are much greater than the risks and the costs arising', general verification to be carried out by 31 December 1992;

25. Proposes that before making any investment in energy production, the applicant should be obliged, in addition to the EIA verification, to make a comparative study of the various possibilities for meeting demand,

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[5] OJ No. L 336, 7.12.1988

the final decision being dependent on the criterion of lowest overall cost, including ecological costs (least-cost planning);

26. Calls for the criterion of reducing energy demand to be taken into account in the selection of investments by the European Investment Bank, the structural funds and the various specific regional aid programmes; these could be given a prominent role in the management of policies on energy saving and the use of alternative sources, also through the creation of appropriate regional energy agencies;

27. Invites the International Energy Agency to undertake a technical and economic study of different energy-generating systems in commercial operation throughout the world with the aim of providing electricity undertakings with impartial performance reports;

28. Calls for a substantial increase in the proportion of the R & D budget allocated to renewable energies, in accordance with the positions taken by the European Parliament;

29. Instructs its President to forward this resolution to the Council and Commission and to the governments and parliaments of the Member States.

B

EXPLANATORY STATEMENT

I. INTRODUCTION

At all times, human activity has caused changes and even major disruptions to the environment, but accelerated technological development in the last few decades and the resultant world economic growth has given a global dimension to this problem. It is increasingly evident that the determining factor in this problem of the environment is energy. It is not only the use of non-renewable energies which has contributed substantially to the pollution, it is also the low cost of fossil fuels and uranium which has made possible many forms of production which have serious impact on the environment and has shaped most of the activities of our industrialized societies.

Should the market value of this energy suddenly increase, its costs soar and the whole of society is shaken. The two oil shocks in 1973 and 1979 weighed heavily on the world economy. Today, the political instability in the Middle East again demonstrates our great dependence on oil products, but there is another threat: it lies in the nature and the extent of the ecological disruptions which are now becoming evident and intensifying in the absence of any effective counter-measures.

The report by the United Nations Commission for the Environment[6] published in 1987 emphasises the urgent need for the industrialized countries to adopt an ecologically and socially sustainable development objective, which implies a new relationship with energy. If this sustainable development is to 'endeavour to meet present needs without compromising the capacity to satisfy those of future generations'[7], it is clear that present trends cannot be maintained and that renewable resources must sooner or later constitute the priority response which will shape energy demand for the whole of the planet.

II. THE VARIOUS ENERGY SYSTEMS AND THE MAJOR ECOLOGICAL IMBALANCES ASSOCIATED WITH THE ENERGY PROBLEM

All energy systems have an impact on the environment, whether they involve the use of non-renewable or renewable resources. Despite important limitations, the data available allow the following conclusions to be drawn:

1. The objective of minimizing primary energy losses broadly coincides with that of minimizing ecological impact;

2. Centralization of production and utilization has detrimental effects on the environment;

3. The use of fossil fuels represents the major source of atmospheric pollution. From all points of view, natural gas causes the least damage;

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6 World Commission on the Environment and Development: 'Our common future', Oxford University Press 1987

7 idem, p. 47

4. Nuclear power involves three types of specific problems:

   - risks of large-scale contamination;
   - potential use of fissile materials for military purposes (plutonium);
   - need for management of toxic waste with a lifetime of a thousand years.

5. Renewable energies have a generally minimal impact compared with non-renewable energies, at least provided that production and utilization are decentralized.

II.1. Acid rain

The death of woodlands is now recognized as an economic and ecological disaster. The deep seated causes of the problem are known: they are the principal atmospheric pollutants such as SO_2 and nitrogen oxides (NO_x) which lead to acidification of the biotopes (lakes and forests) and to destructive imbalances. These pollutants are emitted by installations which use fossil fuels both in transport (especially NO_x) and the domestic sector, as well as in industry and electricity generation.

II.2. The intrinsic risks of nuclear power

Since April 1986 the illusion of the infallibility of nuclear technology has finally faded. It is also known that a reactor accident may contaminate Europe as a whole. According to the official report of the Commission of the Soviet Ministry of Planning:

- more than 4 million people in the USSR are living on contaminated land. For 800 000 of them the level of contamination is at least 5 curies caesium per km^2;
- the financial assessment of the damage is between 180 and 250 million roubles between now and the year 2000, without counting the losses connected with radiation-induced sickness.

For the USSR, therefore, the aftermath of Chernobyl is a socially unacceptable ecological and economic disaster. In running LWR reactors the risk is no less real, as has been confirmed by most recent studies; according to P. Tanguy, general inspector for nuclear safety at EDF, the probability of a core meltdown within 20 years on French territory would be a few percent. Europe of the Twelve, with its high population density, its 140 reactors, its reprocessing plants and its research reactors, is particularly vulnerable in this respect. This risk, which is specific to nuclear power, goes hand in hand with that involved in the use, transport and recycling of fissile materials. Nuclear reactors produce electricity not only but also plutonium, which can be used for military purposes; despite the existence of the non-proliferation treaty, the boundary between the civil and military domains is blurred[8] and adds to the ecological risk of the plutonium system a geopolitical risk which it would be irresponsible to minimize.

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[8] See in particular in this connection A.B. and L.H. LOVINS: 'Energy/war; breaking the nuclear link'; FOE; San Francisco, 1980.

Finally, the problem of the safe disposal of radioactive waste has still not been resolved and the geological disposal projects have met with the almost unanimous opposition of the local and regional communities directly concerned. The reprocessing of irradiated fuel, the principal justification for which is that it allows the recovery of plutonium for recycling in breeder reactors, is a key process of the nuclear system. The breeder system is now proving to be uneconomic[9] and unreliable. Through a chain reaction, it is reprocessing itself which is now being called into question, especially as, contrary to widespread opinion, it does not simplify the problem of waste: in fact it creates additional waste (low and medium activity) and increases the volume transported.

II.3. The greenhouse effect

The controversy which began twenty years ago[10] on the risks of climatic heating due to the increase in the CO_2 content of the atmosphere has slowly abated following the refinement of the climatological models and the increased number of observations. According to the most reliable models, if present trends continue, by the year 2020 there would be a temperature increase of between 1.3°C and 2.5°C compared with the pre-industrial age. Precipitation and evaporation have increased by 3%. By the year 2070, the figures would be respectively: 2.4°C to 5.1°C and 7%. The most likely consequences of these changes would be:

- a rise in sea level (of the order of 20 cms by 2020);
- major changes in meteorological conditions which would differ according to the regions of the globe and would be characterized by greater frequency of extreme conditions;
- the rapid and forced migration of living species towards the higher latitudes and altitudes and an extension of the vulnerable ecosystems.

If mankind were able to change the present tendencies quickly, the heating of the atmosphere could be both delayed and reduced. However, even a stabilization of the concentration of greenhouse gases in the atmosphere at the present levels would leave us faced with a total change of 0.1°C per decade. This aim of stabilization requires a radical reduction in the emissions due to human activity of the majority of the gases involved (60-80% of CO_2 emissions; 15 - 20% of methane emissions; 70 - 80% of N_2O, ...if the natural sources of emissions and absorption remain unchanged).

There are a number of uncertainties affecting in particular the role played by clouds, the oceans' CO_2 absorption capacity, changes in biological activity which do not call into question the general trends. Two facts should be underlined:

- the complexity of the problem and the extent of the scientific work to be carried out to remove the uncertainties are such that short-term results cannot be expected. On the grounds of prudence[11] one cannot therefore

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9 D. FINON: 'The failure of the breeders: autopsy of a major programme'; University Press of Grenoble, 1989.

10 B. WARD and R. DUBOS: 'We only have one earth'; Norton and Co. USA, 1972.

11 J. C. HOURCADE: Statement at the public hearing 'Environment and fiscal incentives', 21 and 22 June 1990.

await these results before taking action on the causes, for fear of being unable to change the course of events;

- reductions in emissions will have a greater effect the sooner they are carried out; this is particularly true for the long-lived gases such as CO_2, freons and N_2O.

Apart from the predominant role of CO_2, which calls into question immediately the use of fossil fuels, with, in order of decreasing responsibility, coal, oil and natural gas (methane), most of the other greenhouse gases are emitted at least in part, directly or indirectly as a result of the use of these same fossil fuels.

III. PRIORITIES FOR AN ENERGY POLICY COMPATIBLE WITH THE ENVIRONMENT

The potential consequences of future climatic changes are such that control of the greenhouse effect would seem to have to be a priority consideration in the energy options of the future.

III.1. The inappropriateness of purely technical 'solutions'

It is technically feasible to trap the carbon contained in fossil fuels either before or during combustion, but it is difficult to see how to extend the process to all energy uses. Furthermore, the enormous quantities of carbon which would have to be disposed of (by dumping in the oceans) involve such investment levels that they would result in a doubling of the production cost in the case of coal[12]. Without necessarily abandoning the study of this possibility, it is clear that it does not seem promising either in terms of cost or time.

Similarly, the replacement of fossil fuel by nuclear energy may appear a priori as a solution to the problem of the greenhouse effect: it is true that the nuclear system involves no direct emission of CO_2, nor does it produce emissions of SO_2 and NO_x. There is therefore a great temptation to recommend a further wave of nuclear investment. Three crucial factors which rule out such an option:

(a) Nuclear power can only satisfy a small part of energy demand

Nuclear power's contribution is at present only 4% of energy production throughout the world. In the EEC it is 12% i.e. 36% of the contribution by electricity. Since nuclear power can only operate on base load, its maximum contribution in electricity demand cannot exceed 70%, and even less in the case of increased penetration of electricity for heating. Altogether then, the 'all nuclear' option thus alleviates the impact of the use of energy on CO_2 emissions by about 20% where the electricity penetration is unchanged. This percentage could only increase at the cost of major structural changes in demand.

(b) Nuclear power shapes energy demand in a manner incompatible with rational energy use

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[12] L. BROWN et al: 'State of the world'; Worldwatch Inst., 1990.

Nuclear power is characterized by high capital costs, long construction times and inevitable base-load operation. This financial and technological rigidity involves:

- a need for reliability and deadlines in demand forecasting, leading to over-equipment and hence an almost inevitable stimulation of demand;
- this demand being geared towards non-rational uses of electricity[13]
- diversion of capital which could be more effectively used for a rational energy use policy.

(c) Nuclear power is too expensive and too slow to implement to provide a timely response to the increase in the greenhouse effect

The need for rapid results in the policy of reducing CO_2 emissions means that the most effective solutions need to be chosen now. Nuclear power is one of the least appropriate options[14] both because of the time it takes to implement and the capital investment required.

III.2. A global strategy

The causes of the increase in the greenhouse effect call for a global response, involving a reexamination of the way in which energy is used in all economic activities, but also profound changes in agricultural techniques, waste management, sylviculture and industrial production. Embarking right away on the path of sustainable development[15] is the most effective strategy if environmental constraints are to determine energy options.

(1) Rational energy use as an absolute priority

Examination of the energy balances of the industrialized countries clearly shows that energy efficiency is generally low. Reducing losses involves the use of more efficient technologies, and less energy-consuming systems and materials, but also structural changes in consumption and production/distribution. These means are already available.

Above and beyond improvements in the techniques of energy utilization, the adoption of production/distribution systems which are more efficient is essential:

- cogeneration in industry and services makes it possible almost to double the primary energy utilization efficiency, it involves decentralization of production which runs counter to present trends;
- in synergy with cogeneration, heat distribution systems in built-up areas allow effective exploitation of the heat produced but also maximum recovery of heat losses.

Finally, the third route to rational energy use is that of optimum matching between the energy carrier used and the final use; the use of electricity for low-temperature or medium-temperature thermal needs should, as a general rule, be banned: not only does it involve a poor energy balance, it also results in a particularly unfavourable electricity supply structure, both from the

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[13] Ministry for Industry and Regional Planning; Directorate-General for Energy and Raw Materials: 'Electric heating in France'; Paris, 1988.

[14] L. BROWN et al: op. cit. (ref. 11)

[15] Bergen Conference; final resolution; 16 May 1990

economic and the ecological viewpoints[16]. Conversion of existing installations to natural gas, or wood (in a rural environment) is a genuine priority. The various studies published on this subject agree on the following conclusions:

1. avoiding further energy consumption by investment in rational energy use is generally less costly than satisfying it by adding to the supply;

2. the cost of reducing emissions of atmospheric pollutants and lower waste production is always less for rational energy use investment than investment aimed at reducing pollution in conventional installations or alternative production (renewables) or which is claimed to be (nuclear);

3. certain improvements in energy efficiency are less costly than the corresponding operation of the production unit, which means a negative cost for pollution reduction.

Rational energy use is thus the obligatory priority approach to an environmentally compatible energy policy.

(2) Ensuring the rise of renewable energies

Accepting that most of the renewable energy potential is bound up with the flow of solar energy reaching the continents, present world energy consumption represents only a very small proportion of that potential (1/2500). The theoretical renewable supply represents according to some experts more than three times the present world consumption. On the basis of those which are already marketable, it can be predicted that it is perfectly realistic to build a world energy system based essentially on renewable energies[17]. The most promising systems in the medium term seem to be solar photovoltaic, passive solar and conversion of the biomass. The total absence of conventional infrastructure in the third world already makes decentralized techniques (photovoltaic) competitive for a major proportion of future demand.

Annex I shows the present situation of the various decentralized techniques for renewable energies in relation to their capacity to contribute to the energy supply. It is clear that if the R & D effort is to be intensified, many systems are directly available for widespread use or are at the pre-implementation stage. The commercial breakthrough of these systems is dependent both on the removal of the legal, institutional and political obstacles blocking the current situation in favour of centralized systems and energy stocks, and on the present reluctance to undertake demonstration projects.

(3) Acting on the structures

Given that most energy consumption structures have been established on the basis of a low market cost for non-renewable energies, it is logical to assume

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16 M. BEHAR: 'Heating of buildings and the greenhouse effect'; French Agency for Energy Control; Paris, 1990

17 See in particular the work of B. DESSUS (CNRS) of the Solar and Hydrogen Energy Research Centre in Stuttgart and DG XII

that they may be unsuited to new energy options based on rational energy use and renewable energies. Examination of the transport, agriculture, residential sectors and numerous industrial systems in the industrialized countries and, as a spin-off, throughout the world, confirms this hypothesis. Nor are energy supply structures neutral in this respect. Developments in the energy production apparatus over the last few decades have tended towards centralization, particularly as regards electricity. This trend represents a decisive structural obstacle to the implementation of a genuine rational energy use policy. Commercial logic calls for a stimulation of demand which is incompatible with rational energy use. A production system based on multiple decentralized units does not a priori present this type of syndrome.

III.3. Managing the transition

Alongside a global strategy for structural change we need a policy for reducing pollution. This is a difficult task; reducing pollution, without at the same time creating further inflexibility which would hinder in the longer term the fundamental changes required, calls for a specific evaluation covering the capital costs, the operating costs, the life of the equipment, the time required for its installation, as well as a global ecological balance.

Large combustion installations must necessarily be equipped with desulphurization technology and possibly denitrification[18]. In the years to come, the preferential use of natural gas at the expense of petroleum products and solid fuels is also an important element in any pollution-reduction policy. Finally, the promotion of clean technologies for mining and combustion of coal is indispensable in the medium term, coal being the only non-renewable resource for which reserves are counted in centuries.

IV. IMPLICATIONS OF THESE OPTIONS FOR THE EUROPEAN COMMUNITY

The European Community is a major and potentially decisive operator in a world strategy for change towards sustainable development.

The Community objectives for 1995 provided for a 20% increase in energy efficiency compared with 1987, which will manifestly not be achieved[19] having regard to the low market energy prices and in the absence of any major short-term initiative.

IV. 1. The outlook as envisaged by the Commission

The four scenarios put forward recently by DG XVII[20] for the year 2010, based on the assumption of a high growth in GNP and an improvement in energy efficiency, reckon on growth in the nuclear power network and increased utilization of renewable resources, although this would only represent in the optimum case (scenario 4) 3.5% of the total demand (compared with 2% in 1987). In the case least in line with recent developments (scenario 4), CO_2 emissions would be reduced by 20%, SO_2 emissions by 70%; NO_x emissions practically by

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18 For the different pollution-reducing techniques see in particular: 'Energy and the environment: policy overview'; OECD/IEA; 1989

19 Communication from the Commission: COM(88) 174 final; May 1988.

20 Energy for a new century - op. cit. (ref. 18).

half. Finally the quantities of radioactive waste produced annually would increase by more than 40%!

While the prospects seem acceptable as regards SO_2 and NO_x they are very unsatisfactory for emissions of carbon and clearly unacceptable for the pollution related to nuclear power. Reducing CO_2 emissions by 20% in 20 years, while the contribution of third countries will inevitably be increasing, obviously will not enable Europe to contribute effectively to the objective of stabilizing the greenhouse effect. The various scenarios remain extremely cautious as regards structural changes and demonstrate no willingness to adopt renewable energies.

IV.2. The potential for reducing demand

The global potential for reducing demand is very high once one acknowledges the need to review existing structures and certain mechanisms which admittedly favour growth in GNP but cause waste and pollution.

- The promotion of electricity for heating, while it has enabled certain Member States to disguise the extent of their over-equipment in electricity generating facilities also leads to permanent structural waste. A programme for reconversion of all-electric heating installations to use gas or wood in a rural environment would allow a substantial reduction in the demand for primary energy.

- Again in the residential and tertiary sectors, the use of passive solar technology and exploitation of the heat gains would make it possible to reduce the demand for heat in the home by 70% on average in the Community[21].

- There is no serious development of cogeneration in Europe despite the recommendations made[22]. The lifting of tariff and institutional obstacles and the promotion of energy integration would have a considerable impact on the demand for energy.

- The transport sector is the only one in which demand is continuing to increase, despite the substantial reductions in specific consumption in the last few years. Only a radical change to the redevelopment of public transport, the railways and electric traction can achieve any effect in the short term.

The internal market and energy

The completion of the internal market is likely to change the situation considerably, both as regards energy policy and its effects on the environment. The increase in competition is, of itself, a stimulus for reducing production costs and therefore improving energy efficiency. However, in the absence of early upward harmonization of the standards and regulations governing the generation and distribution of energy, the opening of frontiers

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21 'Research and Development Programmes on solar energy, applications to buildings'; EEC, DG XII; Brussels, 1988.

22 J. GREIF: 'Combined production of heat and electricity in the EEC' - In 'Energy in Europe', Brussels, December 1989.

may in the short term cause a deterioration in the environment since it enables the more negligent operators to sell energy produced at lower cost more cheaply. Furthermore, if the ecological and social costs associated with transport are not taken into account, opening of the frontiers favours the centralization of production or at least removes the last obstacles to the strategy of the producers who have opted for centralization (EDF).

V. THE MEANS TO BE EMPLOYED

The strategy of sustainable development in energy policy requires the translation into legal, economic and financial mechanisms of new guiding principles as follows :

1. maximum integration of social and environmental costs into the production, transport and distribution costs, and repercussions on prices;

2. harmonization of environmental standards at a high level;

3. aid for investment allowing a reduction in the demand for non-renewable resources in proportion with the efficiency and speed of implementation;

4. Research and development geared as a priority towards technologies for the decentralized exploitation of renewable resources and clean coal technologies;

5. application of the above principles in international trade.

To ensure rapid but gentle application (social acceptability must be guaranteed), the range of means to be employed in a complementary and integrated fashion is wide:

(1) Information: The European Community should lay down, for the benefit of consumers, the obligation to label and provide information on all energy-consuming appliances and should finance awareness campaigns in this connection.

(2) Standards and regulations: Several initiatives should be taken urgently.

The first should be aimed at abolishing the regulation banning the use of natural gas in power stations and introducing one banning the use of heavy fuel oil when the pollution reduction technologies required in new installations are not applied.

The second should be aimed at harmonizing all standards: those relating to the emission of pollutants, the safety of industrial and domestic installations and those designed to protect the workers and the public, and harmonization should be at the highest possible level. Similarly the obligation for all equipment which utilizes or transforms energy to comply with a minimum level of energy efficiency should be established.

The third type of regulation in connection with energy should apply the principle of total and unlimited third party liability for any injury caused to persons, property and the environment. In the nuclear sector this means not only the harmonization of the laws of the different Member States on coverage of risks of accidents, but also a fundamental revision of the

international treaties in force 'so that the operators, and not the states, have to provide compensation for damages. In other words, they would need to make a drastic increase in their insurance premiums'[23].

Finally, on the basis of the principle stated by the CIPR[24] which says: 'For any activity involving exposure to radiation it should be shown that the advantages it offers are much greater than the risks and the costs arising', the question of reprocessing of irradiated fuel as a component in the nuclear system should be reconsidered. Under the EURATOM Treaty the basic standards, in particular those relating to protection against ionizing radiation, should be revised on the basis of the most recent scientific data[25].

Lastly, there must be a regulation covering exchanges of electricity between generators and distribution networks, designed to eliminate the legal obstacles to exchanges and to lay down fair contractual conditions.

(3) Tariffs: The tariffs for energy carriers distributed by grid system are generally based on the principle that the consumer assumes the marginal cost of the unit of energy he uses. The consequence is a generally degressive tariff rate which, by stimulating demand, objectively encourages waste. A progressive tarif beyond a certain level of consumption is a useful disincentive and a means of guiding behaviour.

(4) Taxation: Taxation, both direct and indirect can be a useful means of dissuasion-incentive and/or a means for balancing the prices for different types of energy. Laying down tax deductions for rational energy use and renewable energy investments according to their efficiency and the speed of their implementation is an important step in this regard. At the same time, the process of harmonization of indirect taxation currently under way at European level should be utilized to incorporate into energy prices the ecological costs associated with its use, which necessarily means upward harmonization (and not averaging, as currently proposed by the Commission) and a scale of rates reflecting that of the levels of pollution (carbon and sulphur content).

(5) Aid for investment and for companies: The EIB, the Structural Funds and the specific regional aid programmes must adopt the criterion of reducing the demand for non-renewable resources in order to define their level of intervention; it is clear in this context that investments in the nuclear sector in no way satisfy this criterion. The disguised aid for investment represented, for example, by the coverage of the chronic indebtedness of Electricité de France by the French Government, or the allocation of state subsidies to the British nuclear sector run counter to the recommended policy.

(6) Research and development: Research and development budgets are a powerful tool for steering medium-term policy. The proportion allocated at present to non-nuclear energies by the 1990-1994 framework programme is derisory since it represents only 19.2% of the total devoted to energy, compared with 24.3% to

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23 Linkohr report on the internal market in energy, April 1989, p. 10; Doc. A 2-158/89.

24 CIPR: Publication No. 46; 1985

25 BEIR: 'Health effects of exposure to low levels of ionizing radiation'; report at the National Research Council of NAS; Washington, 1989.

nuclear safety and 56.3% to nuclear fusion. A reversal of priorities is essential in the short term.

(7) Energy in international exchanges: The European Community has a role to play both with regard to ACP countries and the countries of Eastern Europe, for which ambitious aid programmes have been (PHARE) or are in the process of being decided. The countries of the South, particularly Africa, are distinguished by generalized under-equipment in energy. The level of maturity of various decentralized technologies for the exploitation of renewable resources already ensures that, under current market conditions, they are competitive in providing for rapidly growing needs, particularly in rural areas. This applies in particular to photovoltaic energy, for which the production costs have been divided by 15 since 1973[26]. By basing its aid to the ACP countries on the transfer of this type of technology, the European Community can contribute effectively to controlling the rise in carbon emissions in those countries. The countries of Eastern Europe and the USSR are in a very different situation, since they are confronted, as a priority, with the urgent need to modernize an ineffective production apparatus which generates enormous pollution. Even more than within the EEC, the potential energy savings are therefore considerable. All efforts at cooperation must be concentrated on this; in the production and utilization of electricity there is no lack of assets, so that one can look forward with confidence to a substantial growth in final demand without increasing the supply of primary energy.

CONCLUSIONS

The range of (complementary) means available to launch a new energy policy is, as can be seen, very wide. Thus they can take full effect in guiding the market and correcting its inadequacies.

The completion of the large internal market, because of the harmonization it requires, is also an opportunity for the European Community to play a leading role in the necessary transition to sustainable development.

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[26] B. DESSUS: 'The promises of renewable energies'; La recherche, No. 214; October 1989

Table: principal 'renewable energy' systems

Classification of the principal renewable energy systems by current state of development

1 - Research	2 - Demonstration	3 - Pre-implementation	4 - Implementation
Bio-fuels	Bio-fuels	Wood chippings	Slow log-burning stove
Energy crops (new species)	Energy crops (new species)		
	Short rotation coppices and hedges		
Discontinuous methanization of manures, solid and domestic waste	Discontinuous methanization of manures, solid and domestic waste	Continuous methanization of liquid effluent	
		Heating network. Cogeneration and high-capacity wood-burning stations	
		Use of waste for energy purposes	Use of waste for energy purposes
Geothermal	Geothermal, small hydroelectric plants	Geothermal, small hydroelectric plants	
Electricity storage (new batteries)			
Inter-seasonal heat storage			
Latent heat storage	Latent heat storage	Communal and individual solar-heated water (housing, health, tourism, industry)	Communal and individual solar-heated water (housing, health, tourism, industry)
Superefficient housing		'Passive' solar heating (bioclimatic) solar greenhouses (agriculture and domestic)	'Passive' solar heating (bioclimatic) solar greenhouses (agriculture and domestic)
Solar and electric vehicles	Solar cooling and air-conditioning	Direct solar underfloor heating	
New semiconductor materials for photocells	Concentrating collectors	Evacuated tube collectors	
	Photocells	Photocells	Photocells (lighting, kits)
Superconductors	Solar drying (fruits, vegetables, seeds, plants, wood)	Solar drying (fodder)	
Solar power stations	Solar power stations		
Solar furnaces	Solar furnaces		
	Solar distillers and sterilizers		
Solar cookers			

Wind (for each type of wind energy there is a corresponding stage of development: - wind energy farm: research; - lighting or pumping kit: implementation)