European Communities

EUROPEAN PARLIAMENT

Working Documents

1980 - 1981

7 JANUARY 1981 DOCUMENT 1-696/80

Report

drawn up on behalf of the Committee on Energy and Research

on the possibilities and limits of decentralized energy production (soft technologies)

Rapporteur: Mrs H. WALZ

English Edition

PE 54.924/fin

At its meeting of 6 July 1978 the enlarged Bureau authorized the Committee on Energy and Research to draw up an own-initiative report on the possibilities and limits of decentralized energy production (soft technologies).

On 18 September 1978 the committee appointed its chairman, Mrs WALZ, rapporteur.

It consider the draft report at its meetings of 20 March 1979, 28 May and 25 November 1980 and adopted it by 23 votes to 1 with 1 abstention on 3 December 1980.

Present: Mr IPPOLITO, acting chairman; Mr GALLAGHER and Mr NORMANTON, vice-chairmen; Mrs WALZ, rapporteur; Mr ADAM, Mr BEAZLEY, Mr CROUX, Mr FUCHS, Mr GALLAND, Mr GRIFFITHS (deputizing for Mr LINDE), Mr HERMAN (deputizing for Mr VANDEWIELE) Mr LINKOHR, Mrs LIZIN, Mr MORELAND, Mr HÜLLER-HERMANN, Mr PERCHERON, Mr PETERSEN, Mr PRICE, Mr PURVIS, Mr RINSCHE, Mr SÄLZER, Mr SCHMID, Mr SELIGMAN, Mr TURCAT and Mr VERONESI.

Also present but not participating in the vote: Mr HOFFMANN and Sir Peter VANNECIL.

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A

The Committee on Energy and Research hereby submits to the European Parliament the following motion for a resolution, together with explanatory statement:

MOTION FOR A RESOLUTION

on the possibilities and limits of decentralized energy production (soft technologies)

The European Parliament

- having regard to the report of its Committee on Energy and Research (Doc. 1-696/80).
- having regard to its previous resolutions relating to energy policy, in particular,
  - on energy objectives of the Community for 1990 and convergence of national policies[1]
  - on the granting of financial support for projects to exploit alternative energy sources in the solar energy sector[2]
  - on I. the granting of financial aids to demonstration projects in the field of energy-saving and II. financial support for projects to exploit alternative energy sources[3]
  - on the need for a Community policy on the use of solar energy[4]
  - on a decision to review the energy research and development programme adopted by the Council Decision of 22 August 1975[5]

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[1] OJ No. C 59, 10.3.1980, p.41

[2] OJ No. C 39, 12.2.1979, p.38

[3] OJ No. C 299, 12.12.1977, p.50

[4] OJ No C 163, 11.7.1977,p.66

[5] OJ No C 293,13.12.1976,p.17

1. Draws attention to the inexorable depletion of the world's fossil fuel resources, which makes it necessary to search for new energy sources.

2. Considers that, given the Community's heavy dependence on imported fossil fuels and uranium, far greater attention should be paid to the development of indigenous and renewable energy sources;

3. Views projections of future energy demand, even where these have already been scaled down, as involving a commitment to take full advantage of every economically feasable opportunity for additional energy production and use;

4. Regards the sharp increases which have already taken place and the still higher increases which can be expected in the price of conventional fuels as an opportunity to exploit sources and forms of energy which have hitherto appeared uneconomic if these yield a net energy gain;

5. Takes the view, therefore, that the time has come to push strongly ahead with further research and investment programmes to test and develop new sources of energy, particularly the generation of heat and electricity from solar energy, wind energy, biomass and geothermal energy in order to add to the existing range of still vital sources of energy such as coal and nuclear power, including fast-breeder and high-temperature reactors, by offering economically viable alternatives which reduce the dependence of the European Communities on third countries;

6. Takes the view that significant progress can be made by introducing smaller scale, decentralized production based largely on non-fossil and non-nuclear energy forms in order to reduce the Community's dependence on imported energy and to stimulate development and employment in areas away from large overcrowded conurbations;

7. Believes that, while there is considerable scope for decentralized energy production in the highly-developed industrialized nations within the framework of existing electricity grid and other energy distribution systems, such production can be of even greater importance in sparsely populated regions of developing countries;

8. Calls on the Commission to draw up as part of a comprehensive energy policy, a programme to develop and exploit all forms of decentralized and renewable energy production both in the Community and in developing countries and more specifically, to investigate the extent to which these can serve to disassociate economic growth from energy consumption;

9. Expects the Commission to include in its study the social consequences, particularly the effect on employment;

10. Instructs its President to forward this resolution and the report of its committee to the Council and the Commission of the European Community.

B

EXPLANATORY STATEMENT

I. Introduction

1. For some time now a new aspect of energy policy, known as 'soft technology' or 'soft energy', has been under discussion. The debate has grown appreciably since the publication of 'Soft Energy Paths. Towards a Durable Peace' (1977), by Amory B. Lovins. As the European Parliament must consider the full range of energy problems (however sceptical one may be of Lovins' theories) in order to discuss the ideal shape of a global energy policy for the future, the issue of 'soft' energy cannot be ignored, especially as a growing section of the population see it as a viable proposition. The purpose of the following report, therefore, is to provide an initial explanation of what is meant by the term and how and why it has become a public issue, and to attempt an assessment for use when taking any decision on future energy policy.

II. Arguments of the 'soft technology' supporters

2. 'Soft' energy may be contrasted with 'hard' energy which basically is the term used for the present energy policy and its further development. That policy is primarily based on the rapid expansion of large scale technologies. It entails gigantic expansion in the following sectors: an increase in coal production for electricity generation and the production of synthetic fuels, the exploitation of oil and gas reserves in hitherto inaccessible areas such as the Arctic and marine coastal zones and, lastly, the expansion of nuclear energy. It also includes areas not directly related to the energy sector, such as the development of micro-processors, which could lead to unemployment, and the extensive computerization of all socially relevant processes (reduction of human beings to mere statistics). This 'hard energy path' - so the argument goes - has led to an impasse. It is characterized by the continued emphasis on historically-rooted energy structures with highly centralized and expandable - but at the same time vulnerable - production and distribution systems. The supply of energy, mainly in the form of electricity generated by coal-fired and nuclear power stations, is constantly being increased and leads to the rapid growth of antisocial large-scale technologies, greater concentrations of economic activity, population and power and growing signs of bureaucratization. This - according to Lovins - alienates people from one another and at the same time leads to a degrading state of dependence. The standard of living is maintained at the expense of future generations: a continuing process of intellectual, cultural and spiritual impoverishment is the inevitable

consequence. It was nuclear energy specifically, and fast breeder technology in particular, that was the first wrong turning on to this fatal path towards a dehumanized future, and the 'plutonium economy' associated with it is seen moreover, as an ever-growing threat to peace.

3. 'Soft' energy - an element of 'soft technology' - is distinguished from conventional energy production less by the energy sources it proposes to use than by the way in which it intends to use them. Its main concern is for better energy conservation and the rapid development of renewable energy sources. Large-scale technological projects, such as the exploitation of the Arctic or coastal zones or nuclear energy, but also large-scale solar energy power stations and coal gasification and liquefaction, are to be avoided. Instead energy consumption is to be stabilized in the long term roughly at the present level by substantial technological and economic improvements in the use of energy. The energy sources used today, such as oil and gas, are to be replaced in the next 40 to 50 years, predominantly by the decentralized exploitation of renewable sources of energy employing relatively simple technological processes such as:

- solar heating and cooling systems
- processes to convert agricultural and urban waste into liquid and gaseous fluids,
- wind energy converters and
- combinations of the above

The advantages cited for these types of 'soft' energy are speed of construction, the ease with which their operation can be understood because of their simple design, minimal capital input and avoidance to a large extent of transport and distribution losses.

4. But, by the same token, even these 'exotic' sources of energy as they are sometimes known, such as solar, wind and geothermal energy, and differences in water temperature are not to be brought into play on a large scale. A solar energy power station operating in space, for instance, and the method of electricity generation based on large pump systems exploiting the difference between temperatures on the surface and in the depths of the ocean, are classified as 'hard' energies by virtue of their scale alone. In general it may be said that the 'soft' energy alternative is largely characterized by the deliberate avoidance of large-scale technologies in favour of decentralized energy generation. Thus the difference between 'hard' and 'soft' energy lies basically in the method and organization of its production and consumption, even though - as the rejection of nuclear energy clearly shows - the purpose is also to achieve a specific selection of energy sources. The industrialized countries must ask themselves the question: are these people Utopians dreaming of an ideal

world, or have the advocates of this theory an important contribution to make towards curbing the growth in energy consumption?

5. The advocates of 'new' forms of energy do not always distinguish clearly between the dichotomies of hard/soft, centralized/decentralized, non-renewable/renewable/and the like. Often such terms are used interchangeably and thus lack clarity. Our task in this report is not to clarify this terminology. The term 'new' forms of energy is used below to refer to soft, decentralized and renewable sources of energy as a whole.

Nonetheless this semantic imprecision highlights certain problems of definition confronting the adherents of soft technology: if they take scale of energy production as the defining criterion then they would have to accept, for example, small nuclear power stations such as those developed and used in satellites and this they are not prepared to do. If the use of 'hard' ie complex technology is excluded then this would rule out, for example, solar energy which requires highly-developed technology such as solar cells. But in fact solar energy is regarded as one of the major forms of 'soft'energy.

The debate with the proponents of 'soft' technologies can, however, not be conducted solely in terms of definitions.

III. Origins of the energy debate

6. The origins of the debate on 'soft' energy are complex. The following are just some of those that are particularly striking and frequently mentioned:

7. For some years the public has repeatedly been bombarded with forecasts predicting a tremendous increase in energy demand in the near future, not only to maintain the standard of living and the number of jobs in the highly industrialized countries but also to allow the countries of the Third World the development which everyone hopes for. Thus the 1980 World Energy Conference estimated that there would be 8,800 million people in the world by the year 2020, or roughly twice as many as today, and that their energy consumption would amount to 1,000 Exajoules (Ej.). (1 Exajoule is equivalent to approximately 34 mtce). This figure must be seen in the context of a world consumption level of 269 Ej in 1972. It seems only natural that in the face of such huge figures, strategies should be developed to keep this energy consumption within bounds.

8. The oil crisis of 1973/74 was not generally recognized - except by the European Parliament - as a political and economic storm warning, a fact which has had disastrous consequences. Since the overthrow of the government in Iran, and even more so since the Soviet Union's invasion of Afghanistan and the war between Iran and Iraq, the West's oil supplies are in extreme danger. The attendant multiple increase in oil prices has led not only to a greater awareness of energy problems on the part of the man in the street, but also, because of the increased costs, to reduced economic growth and hence to higher unemployment. One needs only to look at the EC's oil import bill - US $15,000 million for 580 million tonnes of oil in 1973 compared to US $70,000 million for a smaller quantity (491 million tonnes) in 1979 - to understand the drastic economic repercussions. Imports of natural gas in 1979 were 650% more expensive than in 1973. Another consequence of these extremely steep increases in the prices of traditional energy sources is that hitherto uneconomic energy sources have become economically viable. Should prices - as may reasonably be assumed - continue to rise, the range of viable options would grow automatically. Therefore this must be seen, more than ever, as a challenge to the innovative capacity of our industry in particular and our society in general.

9. According to what is still the prevailing view today, the provision of an annually increasing volume of energy is an essential condition of economic growth. Since the Club of Rome study defined the 'Limits to Growth' in 1972, it has gradually been realized that unlimited growth is impossible in a finite world. The information it contained came as a great shock in many quarters, sparking off the debate on whether growth was necessary, and if it was, what direction it should take. In this debate those who support moderate and carefully controlled growth find themselves opposed by the advocates of zero growth, a policy which would need to be accepted by the whole population of the industrialized nations, since it would mean a marked lowering of their standard of living and social expectations. The latter see the proclamation of 'soft' energies as a way to gain acceptance for the zero growth they advocate. However, this cannot be the objective of the European Community, as it would signify its abdication as an industrial or post-industrial society.

10. The energy sources used at present, and more especially the sheer scale of plans for the future production of such energy, represent a hazard to man's environment which should not be under-estimated, but at the same time damage to the environment must be weighed against job security. Although a policy solely aimed at environmental conservation might also create jobs, the number it would be possible to create would be far outweighed by the jobs lost as a result of abandoning 'hard' energy sources. In the light of the 6 million unemployed in the Community

in 1979 and the forecasts of 7 million in 1980, a modus vivendi has to be found. Transfer of production and jobs to the Third World necessitates a long-term restructuring of certain sectors of the economy, which we cannot afford to put at risk by 'experimenting'. The extent of the danger to our social and economic security represented by a fall in growth rates is illustrated by the following: supposing a deliberate effort were made to stay below the GNP growth targets, as a measure to reduce the demand for oil, this would have various consequences: failure to increase GNP by its full potential would mean not only less goods and services, but also higher unemployment. A model calculation of the socio-economic effects in the case of OECD countries, indicates that every barrel of oil saved through reduced growth would 'cost' 240 dollars!

11. The apparently inescapable need to develop increasingly complex and powerful technologies for the production of energy for mankind has sociological implications. Human society is in danger of having to subordinate its organizational shape to a structure of energy production which was once treated as no more than a means to an end. As a specific example of how this leads to involvement in the energy debate, we may take the 'Plutonium State': opponents of the development of fast breeders fear that the large quantities of plutonium - raw material for nuclear weapons - that will then be available can only be manufactured and transported in conditions of such strict security that the nature of the State would be completely transformed in our countries, despite the fact that burning plutonium in fast breeder reactors is the best way to dispose of it.

IV. The viability of 'soft' energy

(a) Defining the problems

12. In a world of limited energy resources, the development and application of new energy sources is absolutely essential. This may be said whether it is assumed that energy consumption is bound to rise or whether the levels attained in the past are considered sufficient. Since some of the energy sources used in the past, such as oil and natural gas, will be exhausted in the forseeable future unless vast new reserves are discovered, the search for new energy sources is logical enough. Hence the problems of 'soft' energy do not lie in its existence as such, but in the aspects of economic viability (b), its relationship with the way economic structures are organized in the highly industrialized countries(c), and its impact on the shape of our society(d).

(b) The economic threshold

13. The economic threshold applying to the use of any new form of energy must be seen from many different points of view.

If it were assumed that 'hard' energy had become a threat to existing forms of social organization and ultimately to the freedom of mankind, as is claimed, for instance, by F.E. Schumacher in 'Small is Beautiful' (1973) and Klaus Traube in 'Müssen wir umschalten?'(1978), who describe the threat to man from the development of large-scale technologies, economic viability would not be the one and only criterion by which to asses the need to change over to soft energies.

14. But that is not the view taken here. Rather, it is assumed that the use of 'hard' energies is perfectly controllable and does not expose mankind as a whole to risks of catastrophic proportions. The trends to which the abovementioned critics have drawn attention must obviously be taken into account and any developments which put liberty at risk must be strictly controlled. This is the standpoint from which the question of the viability of 'soft' energies is to be posed. First of all, a few general considerations raised[1].

15. The criterion of economic viability is not a fixed value which we could use today to make a definitive judgement on the feasibility of applying specific forms of energy at any time in the future.

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1 On the practical cost of such 'soft' energies as can already be applied and estimated for today, the reader is referred to a study by the research department of the German Bundestag, which examines certain types of 'soft' energy and the practicality of applying them in the Federal Republic of Germany; see also Felice Ippolito, 'Development and future of alternative energy sources in Italy', 1979.

To understand this we need only remember that some of the new energy sources, such as solar energy, wind biomass, tidal power and difference in water temperature, could be 'economic' as early as 20-30 years from now, given the expected increase in energy prices. To illustrate the price - crease potential in the energy sector one need only consider the abovementioned trend in the price of oil imports into the Community between 1973 and 1979. The 80% price increase between December 1978 and December 1979, in particular, highlights not only the tremendous burden this placed on the economy but also the fluidity of the definiton of 'economic'.

When discussing the concept of economic viability it must also be remembered that the costs of the energy sources used at present are usually not calculated in full and seem relatively low only because a large proportion of the supply and investment cost is not contained in the current price. This point is particularly true of the nuclear energy option in its various forms - conventional nuclear power stations, fast breeders and nuclear fusion - which have all been developed and are being promoted by vast capital expenditure. Thus since 1956 West Germany alone has spent almost DM 30,000 million in this field; while only comparatively small sums have so far been spent on investigating 'soft' energy. Even the study of the feasibility of solar energy, to which increasing funds are being devoted at national and Community level, cannot really be compared with expenditure on the nuclear sector. In addition, cost-reducing factors such as mass production may be expected to make the application of 'soft' energy sources cheaper. However, the likelihood, in the current political and economic situation in the industrialized countries, of finding the necessary capital investment, amounting to US $50,000 million per year (or up to 5% of GNP) for the EEC alone, must be considered nil.

16. These considerations of economic viability lead to the tentative conclusion that, in any event, substantial research investment is required in the field of 'soft' energy sources to reduce as far as possible by means of diversification our precarious dependence and to create new jobs. Since the dearest form of energy is the one we do not have, we must exhaust every option even those that appear initially to be uneconomic.

As things stand, however, there is no question of contemplating a changeover to larger-scale production: either the financial drawbacks are too great compared with the conventional energy sources or the energy consumed in producing the new products frequently exceeds the amount of energy they create. In the present state of the art, the manufacture of ethanol from agricultural products, for instance, would require vast

areas under cultivation, in addition to which the net production of energy is likely to be negative. Similarly, the techniques now being discussed of implanting certain transmittable genes in micro-organisms to stimulate them to manufacture substances (such as insulin or trytophan) which have been difficult to produce by other methods, is neither far enough developed nor unreservedly to be welcomed. These techniques belong to a Utopia which is unlikely to materialize. The application of genetic engineering to produce biogas from waste would also raise problems, in that these waste materials - at least in some cases - form part of functioning ecosystems, which are vital in the field of forestry, to name but one.

17. Studies[1] on the basis of 1978 prices and estimates for 1985 which included extremely detailed investigations of the individual sources of energy proposed have revealed that, contrary to earlier assertions, the capital investment needed for plant to produce this energy would be very great indeed. The cost of energy obtained in this way would also be far higher than for 'hard' forms of energy.

(c) Organization of economic structures

18. The effect of the use of 'soft' energy on economic structures varies greatly between the countries of the Third World - at least in those where the population does not already live in large cities - and the highly industrialized nations.

19. In the Third World, particularly in the still scarcely developed countries, there are no dominant economic structures comparable with those in the advanced technology countries. This is made clear simply by looking at population density. A country - chosen at random - like Chad has, statistically, 3.3 inhabitants per sq. km. (In comparison, the Federal Republic of Germany has around 242 inhabitants per sq. km). In such conditions, the use of the production methods which 'soft' energy involves does not come up so much against the obstacle of pre-established systems, and hence of existing demands for a particular type and output of energy. The decentralized establishment of economic units, creating large numbers of jobs and capable of using such raw materials as are directly

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[1] See for example: D. Oesterwind, O. Renn and A. Voss, Sanfte Energieversorgung - eine neue Utopie, in Energiewirtschaftliche Tagesfragen 1980, No. 2; the following energy systems were studied in relation to West Germany:
- Water and wind-powered power stations producing electricity
- solar energy systems with diesel-powered heat pumps providing heat for multiple dwellings, small-scale consumers and industry ($<100^{o}C$)
- monovalent motor/generator units providing heat for multiple dwellings, small-scale consumers and industry ($<100^{o}C$) with integrated electricity production and
- organic waste processors producing liquid and gaseous fuels.

available on the spot, thus becomes possible. This decentralized industrial structure would be the natural counterpart of the kind of decentralized energy supply which 'soft' energy can provide.

20. In the highly developed industrialized countries, and in developing and newly-industrialized countries, such as India and Mexico, in parts of which there may be a very high density of population, the situation is totally different. Since in this case highly differentiated economic structures already exist, 'soft' energy, which requires decentralization, cannot by definition act as a genuine alternative, for this would require equally favourable starting situations for both the 'hard' and 'soft' options. The existing structures in the industrialized countries are, to at least the same extent, determined by the forms of large-scale technological energy production which have existed up to now and which they in turn also determine. Hence if we are not prepared to alter this structure, it also means that, in principle at least, the large-scale technological exploitation of energy sources must remain the prevailing system. There would still be scope for the use of 'soft' energy in the following areas: when building new capacity, we could try not to integrate this into the existing structure, but to operate it decentrally using 'soft' energy. Thus we could, for instance, envisage supplying groups of buildings with heating from solar and geothermal energy. Within the limits of its capacity, 'soft' energy would also be a realistic alternative, for example, for industrial water heating and the production of fuel in the agricultural sector for its own use. The relatively self- contained energy production units which would result might also lessen the vulnerability of the social system in the event of industrial or military conflict.

Wherever energy is processed in the form of electricity, however, a grid system is needed to provide a certain security of supply. But a grid system - the need for which was even accepted by Amory Lovins in his submission to the committee of inquiry of the German Bundestag - necessarily involves a scale and degree of centralization which cannot be reconciled with the criteria laid down by the advocates of 'soft' energy.

21. The latter recommend an increase in the number of small and medium-sized businesses. Even within our existing economic structure there is further scope for 'soft' energies: programmes to promote small economic units are already being recommended today at national and Community level, not only for competition policy reasons but also following management recognition of the problems caused by excessively large companies.

22. Just how much scope there is for the use of alternative energy sources when traditional industrial structures are maintained still has

to be examined in detail. But it may be said that this is an area in which increases in conventional energy production could in fact make a decisive contribution, through conservation and a more rational use of energy, towards severing the link between economic growth and energy consumption.

23. If we were prepared radically to change existing economic structures and to depart from large-scale technology production methods, completely new prospects would be opened up. Such a course of action even if spread over several decades, would mean a revolution in all our present habits and political circumstances, which would force the industrialized nations to abdicate from their present role; this objective is favoured only by an infinitely small section of the population.

(d) Impact on the shape of society

24. The impact of the use of 'soft' energies on the shape of society is the least predictable aspect at present. Several alternatives must be considered, and these are determined by answering the question of whether the 'hard' and 'soft' approaches are mutually exclusive or can be reconciled with one another. Advocates of the 'soft' approach do regard it as irreconcilable with the 'hard' energy option, mainly by reason of the charge of inhumanity which is levelled at the large-scale technology systems. This criticism is usually accompanied by an alternative vision of a trouble-free world in which there are no social or ecological problems, and where - thanks to 'soft' energies - society has attained a state of bliss. If this charge of inhumanity is considered worth taking seriously and provided it is not inferred from this that large-scale technologies must be completely abolished - thus stripping the ideological trappings from the 'soft' technology theory, as it were - there is a wide range of opportunities for combining the two approaches. Which combination is actually chosen should not just be made to depend on questions of economic viability and acceptance of the ridigity of existing structures, but to a large extent on the image of the kind of society we want to have in the future.

25. It is here that serious questions do emerge, which have caused particular concern among many of our young people, and these must be debated in greater depth, particularly with reference to 'soft' energy. Thus, the question arises, for instance, as to whether absolute priority should in future be given to the creation of jobs, however questionable 'absolutes' are in practice. The 'soft' energies, with the restructuring and the small-scale production process they involve, would offer substantial advantages, although no-one can say at this stage how it will be possible to finance such a restructuring operation and, particularly,

how the existing system of social benefits would be maintained.

At the same time, however, we should be abandoning man's dream of release from drudgery, if nonetheless making progress towards the other dream of self-fulfilment through convenial work. The appealing aspect of the soft energies and their associated production methods, according to their supporters, is their humanity, although this argument is sometimes used to conceal other political aims.

If, on the other hand, the objective is to reduce the amount of work required to a minimum, in order to create as much leisure time and personal freedom as possible, this too entails serious problems. This second objective may well be feasible - given a massive expansion of large scale technology production methods - but redistribution of labour among the greatest possible number without constant wage increases and participation of workers in the fruits of their labour would then be needed to maintain industrial peace and ensure a minimum level of social justice.

v. Conclusion

26. The basic questions which have only been touched on here by way of illustration must be settled in a full and democratic debate. Only then can a final judgment be made on how far 'soft' energy should be used. Until that time, however, the option to use such energy should at least be kept open by increased research and demonstration projects. The first results, which may be expected within the course of the next few years, will tell us how far 'soft' technology can fulfil the expectations vested in it. The existing world energy situation compels us to investigate the prospects in this field, too, with the utmost vigour. Even though soft technologies are only likely, on present estimates, to provide 5-8% of total demand in quantitative terms by the year 2000 this would represent a substantial part of the energy production needed by then. An increase on this percentage share would be likely, and even necessary, in the period following the year 2000. The 1980 World Energy Conference estimated that it could rise to 10% or 100 Ej by as early as 2020.