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Report

drawn up on behalf of the Committee on Energy and Research

on the communication from the Commission of the European Communities to the Council (Doc. 251/77) on the fast breeder option in the Community context – justification, achievements, problems, and action perspectives

Rapporteur: Mr L. NOE'

1.2.1

PE 50.579/fin.

English Edition

By letter of 26 August 1977, the President of the Council of the European Communities consulted the European Parliament on the Communication from the Commission of the European Communities to the Council on the fast breeder option in the Community context - justification, achievements, problems and action perspectives.

On 12 September 1977 the President of the European Parliament referred this Communication to the Committee on Energy and Research as the committee responsible and to the Committee on Budgets for its opinion.

On 28 September 1977 the committee appointed Mr Noe' rapporteur.

It considered the Communication at its meetings of 13 October, 21 and 30 November, 20 December 1977 and 26 January 1978, adopting the motion for a resolution and explanatory statement unanimously at the last of these meetings.

Present: Mr Normanton, acting chairman and vice-chairman; Mr Veronesi, vice-chairman; Mr Noe', rapporteur; Lord Bessborough; Mr Dalyell, draftsman of an opinion; Mr Ellis, Mr Fioret, Mr Jensen, Mr Pintat and Mr Ripamonti.

The opinion of the Committee on Budgets is annexed to this report.

C O N T E N T S

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

embodying the opinion of the European Parliament on the communication from the Commission of the European Communities to the Council on the fast breeder option in the Community context - justification, achievement, problems and action perspectives

The European Parliament,

- having regard to the communication from the Commission of the European Communities to the Council (COM(77) 361 final),

- having been consulted by the Council (Doc. 251/77),

- having regard to the report of the Committee on Energy and Research, and the opinion of the Committee on Budgets (Doc. 519/77),

- recalling its previous resolutions in which it stressed that the Community would have to turn to nuclear energy to meet its energy requirements in coming decades,

1. Recognizes that, on the basis of known world oil reserves, of the rate of discovery of new oilfields in recent years and the rate of growth of consumption of oil products, the oil supply and price situation will become critical before the end of this century and that therefore the Community should reduce its imports to 500 million t.o.e. per year by 1985;

2. Notes that a similar situation will arise for natural gas;

3. Considers that, while energy-saving measures are an important part of Community energy policy, they must not lead to an increase in overall energy costs which would damage economic performance, and that therefore their impact is only likely to reduce the rate of growth in energy demand;

4. Points out that the Community's special position of dependence on fuel supplies justifies the adoption of measures different from those adopted by certain other industrialized countries;

5. Points out that alternative energy sources at present under study will only, at best, meet a small percentage of energy demand at the end of the century;

6. Recognizes that while coal constitutes the Community's greatest available energy resource, its production and consumption cannot be extended sufficiently to fill the resultant energy gap alone without serious social, economic and environmental consequences and recognizes that the availability of coal imports on economically acceptable terms cannot be predicted;

7. Believes that the growth of consumption of electrical energy in the Community, even by the most conservative estimate of expansion of demand, will lead to a doubling of present consumption by the mid-1990's;

8. Considers, therefore, that nuclear energy must be further developed if the Community is to avoid an energy shortage from the mid-1980's onwards;

9. Points out that known reserves of uranium which can be extracted at an acceptable cost amount to an estimated 3.5 million tons and will therefore be able to provide fuel for current thermal reactors and those due to come on stream under current programmes for only a few decades;

10. Recognizes that plutonium, reprocessed from used uranium fuel elements, can provide an additional source of fissile nuclear fuel;

11. Notes that plutomium may be mixed with uranium and used as fuel in existing thermal reactors;

12. Recognizes, however, that fast breeder reactors may offer the possibility of using reprocessed plutonium far more efficiently and that their future introduction will reduce uranium consumption by a factor of 60 for the same energy produced, thus extending the lifetime of nuclear fission resources almost indefinitely;

13. Considers that the experience already gained from the operation of experimental and prototype fast reactors in the Community since 1961 to be very encouraging for the future development of these reactors;

14. Asks that the studies and experiments on the industrialization of sodium-cooled fast breeder reactors, including the fuel cycle, be pursued as one of the programmes for the installing and operation of thermal reactors which are essential to provide sufficient quantities of plutonium to get a fast reactor programme under way;

15. Recognizes that consistent attention has always been paid to the safety of fast breeder reactors and calls on the Commission to intensify its current efforts towards harmonization, at Community and international level, of design, construction and safety standards of this type of reactor;

16. Requests that the introduction in the Community of irradiated fuel reprocessing plants must be limited to as few as possible with, however, sufficient reprocessing capacity to assure that all used fuel elements from thermal reactors can be reprocessed without undue delay and that adequate quantities of plutonium are provided for use in the demonstration fast breeder reactors;

17. Insists that adequate checks be carried out at Community and at international level for the control of plutonium and that all civilian reprocessed plutonium is so treated during reprocessing as to reduce its suitability for the fabrication of nuclear explosives;

18. Requests, moreover, that the Commission continue its studies of nuclear parts at Community level to avoid unnecessary transport problems;

19. Notes the industrial cooperation agreements for the development of fast breeder reactors in Europe and calls upon the Commission to make every effort to ensure that this cooperation extends to the whole Community and includes the manufacture of the principal components;

20. Asks that studies on the 'burning' of trans-uranium products obtained from the reprocessing of irradiated fuel in order to shorten considerably their radioactive life, be pursued and intensified and take into account the possibility of using fast reactors for this purpose;

21. Requests the Commission to encourage the study of any measures which might improve the technical, economic and industrial solutions for ensuring that fissile materials and in particular plutonium are used only for peaceful ends, in accordance with the EURATOM Treaty;

22. Approves the Commission's commitment to support the development of sodium-cooled fast breeder reactors, but asks that study and research be carried out also on other fast breeder cycles, in particular those which are completely free of any risk of nuclear weapons proliferation;

23. Considers that only when the first commercial demonstration fast breeder reactors have been operating for an adequate time can a decision be made for the further development of this type of reactor;

24. Asks the Commission and the governments of the Member States to introduce a vigorous programme to inform public opinion about the 'nuclear problem' and requests that a specific report be submitted on the problems relating to Community financing of the energy policy.

B

EXPLANATORY STATEMENT

I. Introduction

1. The Commission of the European Communities has submitted to the Council a communication (COM(77) 361 final) on the fast breeder option in the Community context - justification, achievements, problems and action perspectives.

2. This document is one of a set of three (Orientations in the matter of reprocessing, radioactive waste disposal and fast breeder reactors) on the Community's future nuclear strategy. It starts with the premise that, in view of their heavy dependence (about 58% in 1976) on imported primary energy (particularly in the form of hydrocarbons), the Member States of the European Community are in a rather difficult situation. The Community must therefore, in addition to energy saving and rational utilization programmes, have recourse to nuclear energy as a means of reducing this dependence and diversifying its sources of supply in accordance with the objectives of the Community's energy policy as laid down by the Council.

3. The Council will have to decide before 1978 on the Community's internal nuclear strategy on the basis of these three communications.

However, consideration also has to be given to the line the Nine will have to take in international negotiations following the economic summit in London and President Carter's pronouncements on the nuclear fuel cycle.

4. The follow-up to this Communication will be of particular interest to the Community and the Member States because of the important role which nuclear energy will play in reducing their dependence on imports of oil.

5. Assuming therefore a continuous and progressive deterioration in the Community hydrocarbon supply situation after the year 2000, and taking into account the Community's strong dependence on outside sources for its uranium supplies and the uncertainty about the quantities of uranium that are likely to be available to the Community, efforts must be directed towards fast breeder reactors.

6. Fast reactors would make it possible for the Community's assured stocks of uranium to meet power station demand for a very long time (centuries). Indeed the quantity of fissile material produced by fast reactors is greater than the quantity of fissile material used. It has been calculated that fast reactors can extract at least 60 times more energy from uranium than existing thermal reactors. By using this type of reactor, 5,000 tons of uranium could produce as much energy as the oil in the North Sea (these reserves being approximately 3,000 million tons).

7. On these bases the Commission invites the Council to agree :

- that the Community and its Member States must preserve the option of making fast breeder reactors available to utilities on a commercial basis during the early 90s

- that the demonstration of the fast breeder technologies by industry should continue without interruption and that at the same time increased effort should be applied towards achieving fully adequate performance of this reactor system in terms of safety, radiological protection and impact on the environment

- that the Community should support the implementation of the above objectives.

II. The energy situation in the Community

8. To understand the importance of bringing fast breeder reactors into commercial use in the Community by the 1990's, it is necessary first to examine the Community's energy situation.

9. The Community has a quite marked dependence on imported primary energy, mainly in the form of hydrocarbon; in 1976 the proportion of primary energy imported into the Community was 58%.

10. This situation is likely to get worse in future. According to informed sources (see the Exxon report of March 1977) the availability and price of oil will become critical in about 15 years time.

11. For some years now the potential of new deposits found in the world (expressed in barrels per day) is lower than the consumption noted over the same period. This means that we have been eating into world oil reserves for some years now.

12. It would thus be disastrous to continue towards the exhuastion of oil deposits over a period depending on the rate of increase in consumption and the rate at which new deposits can be found.

13. It is clear that at the end of the century we shall be faced by a critical situation with regard to oil supplies in the world and even more so in the Community. Similarly, it is likely that natural gas deposits will eventually be exhausted.

14. Messrs. Hafele and Sassin of the IIASA in Vienna have made a forecast for energy consumption beyond the turn of the century (2030), the main findings of which confirmed the trend mentioned above:

consumption : 35 TW (1 TW equals 10^{12} watts) as against the present consumption of 7 TW and comprising

5 TW oil, gas and coal ⎫
7 TW coal for the production of methanol ⎭ 12 TW fossil fuels
9 TW electrical energy from nuclear power stations
10 TW methanol produced using heat developed by nuclear reactors
5 TW methanol produced using solar energy

15. Although merely an indication, this forecast does show the decisive contribution which nuclear energy will have to make at a relatively early date.

16. Therefore, attention must be given to world uranium supplies to see how the forecast future nuclear consumption can be squared with the availability of fuel.

17. Uranium is at present the most important primary material of the nuclear industry.

Uranium is an element which is used almost exclusively in the nuclear field; because of this, the world market has been subject to the changes in demand caused by the changes in pace of nuclear development itself.

18. The proven world reserves of uranium and estimated additional resources, with an extraction price lower than $30/lb amount to some 3.5 million tons, of which only 3.5% is found within the Community.

19. Assuming that the diplomatic negotiations at present under way can be conducted skillfully enough to guarantee a supply of 1.2 out of 3.5 million tons of uranium to the Community, which is an optimistic figure in view of the present stand taken by countries having uranium deposits, this quantity would only be adequate to feed the light water reactors due to come into service in the Community for a number of decades.

20. Moreover, given the Community's strong dependence on uranium imports, the 'price' which the Community will have to pay will certainly be higher than the 'extraction cost' and will depend not only on commercial but on political considerations. The example of oil is particularly apt here.

21. 1.2 million tons of uranium would be sufficient to supply an installed power of 200 GW for thirty years if the irradiated fuel were not reprocessed and 260 GW if the uranium and plutonium recovered from reprocessing were reutilized in the light water reactors; in energy terms these two power figures correspond to 10,000 million tons oil equivalent and 13 thousand million t.o.e. respectively. The same figures apply to other types of reactor like the Magnox and the AGR.
plant.

22. The installed power of light water reactors in the Community in 1976 was 20 GW; the figure forecast for 1985 is 80-90 GW and in 2000 in may reach 200-300 GW.

23. These figures show that light water reactors may gradually replace conventional oil-fired power stations between now and 2000 but they will not for long meet the requirements of the next century.

24. Hence the following generation will unfortunately have to cope almost simultaneously with the exhaustion of oil and natural gas and, later, uranium.

25. On the other hand, the above mentioned figure of 3.5 million tons for the total reserves of natural uranium corresponds in energy terms to two thirds of the known reserves of oil. These figures do not however allow for the results of current mining research to determine the potentially more costly usable deposits among the 160,000 million tons of uranium which are distributed in the top 2,000 metres of the earth's crust.

26. The discovery of new deposits at world level does not guarantee that the Community will no longer be dependent on uranium imports. The exploitation of higher cost deposits will not protect the Community from the progressive increase in energy costs (in real terms).

III. The fast reactor fuel cycle

27. Compared with water reactors the fuel cycle for fast reactors is in many ways much simpler. There are no stages involving isotopic enrichment of uranium, conversion or reconversion.

The whole cycle consists of:

(a) the manufacture of elements based on plutonium and uranium (natural or depleted);
(b) the burn-up period;
(c) the recovery of plutonium and disposal of waste.

28. A large quantity of plutonium is necessary to start off the plant both as regards the initial quantities present (3.1 t./GWe) and the requirements for at least two years (1.5 x 2 = 3 t./GWe), the time needed until plutonium recovered from the irradiated fuel becomes available.

29. To set up a fast reactor it is necessary to recover the plutonium produced by approximately 25 LWRs in one year, or from approximately 20 years operation of a similar FBR (doubling time).

30. Once under way, the fast reactor needs a quantity of natural or depleted uranium of only 1.5 t./year compared with the 100 t./year of natural uranium necessary for an LWR which completely recycles the fuel recovered.

IV. The plutonium problem

31. We believe that the closing of the fuel cycle, that is to say the reprocessing of irradiated fuel, the recycling of fuel and the treatment of radioactive wastes, consisting of fission products and fuel which has not been recovered, should go ahead.

32. We feel that this should be supported because the 'open cycle' which provides for the direct disposal of irradiated fuel has the following drawbacks:

- the limited energy resources involved in the open cycle, which allows only for the use of thermal reactors, which for the most part do not recover fuel;
- the risks involved in the disposal of the spent fuel elements, in the absence of suitable procedures for isolating and fixing radioactive waste.

33. The high toxicity of this substance, the risks of uncontrolled proliferation and the theoretical possibility that groups of terrorists could use it to build rudimentary nuclear devices are certainly matters which deserve close attention; however, we should not forget that plutonium is produced by thermal reactors and that a fast reactor can, depending on how the core is planned and how it is run:

(a) produce more plutonium than it consumes, thus increasing the number of fast reactors in the system;
(b) produce less plutonium than it consumes, thus burning up plutonium;
(c) produce a different fissile substance, U 233, which is an excellent substance for HTR reactors which, producing high temperature heat, can extend the uses of nuclear energy beyond the production of electrical energy.

34. We can, even now, identify a strategy which will permit the recycling of fissile material in such a way as to greatly reduce the possibility of terrorist use of plutonium.

35. This can be done by concentrating on one site the plants for reprocessing nuclear fuel and for manufacturing plutonium fuel elements. In this way plutonium on its own is present only within this site (a nuclear park if it has several reactors), while only the irradiated or fresh fuel, diluted with uranium, is transported outside.

36. In conclusion, a massive industrial research and development effort on the fuel cycle after irradiation appears essential.

V. The role of fast breeder reactors

37. This scarcity of uranium resources in comparison with the quantities needed to supply water reactors derives essentially from the fact that water reactors use only a tiny fraction (less than 1%) of the potential energy in natural uranium; fast reactors, however, are, theoretically, able to use almost all this potential energy.

38. On the other hand, all reactors using U238 as a fertile material i.e. all reactors using natural, enriched or depleted uranium, produce plutonium, part of which is fissioned in situ and the rest discharged with the irradiated fuel. Every reactor produces plutonium in direct proportion to the electrical energy produced. This proportional relationship is a characteristic feature of this type of reactor.

39. Fast reactors are not partioularly great plutonium producers but they do use uranium very efficiently.

The following table[1] sets out some very interesting figures:

Type of reactor	Plutonium Production (xx) (g/MW per year)	Uranium consumption (x) (kg/MW year)	Utilization of uranium (MW year/kg)
Graphite-gas (Magnox)	595	300	0.0033
HWR (Candu)	502	168	0.0059
LWR	260	173	0.0058
FBR	214	2 (xxx)	0.5
AGR	187	165	0.006
HTR (low enrichment)	115	136	0.0073

(x) kg natural uranium

(xx) Fissile plutonium. With allowance for reprocessing losses

(xxx) Depleted uranium

40. <u>The great advantage of fast reactors is that their uranium requirements are much smaller than those of other types of reactor</u>.
However the eventual introduction of this type of reactor as an essential element of electricity production in the Community will require adequate supplies of plutonium produced by thermal reactors.

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1 From a report drawn up by the OEDC Nuclear Energy Agency and the International Atomic Energy Agency (1976)

41. It should also be pointed out that, contrary to popular belief, the presence of fast breeder reactors in an electricity production network involves slightly lower quantities of plutonium than those involved when only light water reactors are used, for the same amount of energy produced, of course.

42. The link between fast reactors and the 'plutonium economy' is not attributable to the presence of greater quantities of plutonium but to the fact that in order to use this kind of reactor the uranium and plutonium must be separated from the fission products in the irradiated fuels.

43. Therefore, fast reactors can come into commercial use in 1990 and be operated on a much wider scale from the turn of the century only if the present programmes for light water and gas reactors and associated reprocessing plants are implemented in time to make sufficient quantities of plutonium available to supply the new reactors.

44. We must therefore look to a combined system made up of the type of reactor at present in service together with the fast reactors; our objective must be to perfect this system as a whole.
The overall uranium utilization efficiency of a system composed of thermal and fast reactors will depend upon the relative proportion of thermal and fast reactors present at any time and will increase with the proportion of fast reactors to total nuclear installed power.

45. The maximum utilization efficiency in a system containing light water cooled thermal reactors and sodium cooled fast reactors is approached when the proportion of fast reactors lies in the range 50-70%.

(a) State of development of fast breeder reactors

46. The concept of the fast reactor originated with Enrico Fermi, who prepared the first design in 1944.

The first experimental nuclear plant to produce electricity was the FBRI which began operation in the United States in 1951.

47. The initiative was taken first by the Americans; then in the early 50's the Russians also began working in this area and in 1954 the British experimental DFR was opened.

48. France, which was later to make the most progress, began to take an interest in this type of reactor 20 years ago in 1957. Research activities and the construction of prototypes became more rapid in all countries in the 1960's.

49. In the last 20 years almost all the Member States of the Community have been involved in the development of fast breeder reactors cooled by liquid metal (sodium).

50. The expense of developing these programmes has been considerable (approximately two and a half thousand million units of account); the results have been exceptionally good and are very promising.

51. At present the financial effort in developing experimental, prototype and demonstration reactors amounts to some 30% of the total expenditure on energy research and development.

52. The following table taken from the Commission's communication sets out the current situation:

Country	Experimental reactors	Test Reactors	Prototypes (200-300MW)	Demonstration plants (~ 1200MW)
United Kingdom	DFR (1963)		PFR (1974)	CFR (project not yet adopted)
France	Rapsodie		Phénix (1974)	Super-Phénix (x) (1982)
Federal Republic of Germany	KNK II (xxxx) (1977)		SNR 300 (xx) (1982)	SNR 2 (xxx) (project not yet adopted)
Italy		PEC (1981)		

(x) In collaboration with Italy, the Federal Republic of Germany, Belgium and the Netherlands

(xx) In collaboration with Belgium and the Netherlands. UK is involved through a nominal participation of the Central Electricity Generating Board (CEGB) at the utility level

(xxx) In collaboration with France, Italy, Belgium and the Netherlands

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53. Several experimental reactors and prototype reactors have been successfully constructed and operated. One large station (Super-Phénix, 1,200 MW) is under construction in France and a further two of equal power are in an advanced state of design in Germany and Great Britain, whilst a reactor designed to test fuel elements (the PEC) is being constructed in Italy.

54. These advances have not been equalled anywhere else in the world; the Community's nuclear industry will therefore be able to play a very important role in this field, providing that the programmes at present laid down are continued without interruption. Important cooperation agreements have been made, the first one being an initiative taken by European electricity producers at the UNIPEDE congress in Zermatt in August 1969.

55. This cooperation embraces not only the producers of electrical energy, who participate in these projects because of the importance which as users they attribute to fast reactors, but also the main nuclear industries and the Member States' nuclear research centres.

56. A Fast Reactor Coordinating Committee was set up in the Community by Council decision of April 1970.

Unfortunately this fruitful cooperation began before Great Britain's accession to the Community. As a result, the United Kingdom's efforts are insufficiently well coordinated with the other members. We consider it extremely desirable that efforts should be made towards closer coordination.

57. **Elsewhere** the most advanced plants are in Russia where a 350,000kw prototype, which is also used to desalinate the salt water of the Caspian Sea, is in operation, and the BN 600 of 600,000 kw is under construction. In the United States the FFTF reactor for testing fuel elements, and hence which supplies only thermal power, is already completed and is about to be put in operation.

VI. The safety problems of fast reactors

58. The safety of a reactor, which essentially is a heat exchanger in which heat is transferred from the fuel cans to the coolant, depends on the power density (MWatts per m^3 of core)[1] and of the thermo-hydraulic characteristics of the core itself.

The nature of the coolant, in this case liquid sodium, may complicate the problems.

[1] The core comprises all the components which produce and channel the heat of fission from its place of origin.

59. We shall now consider some specific aspects of fast reactors:

(a) Sodium cooling

This type of cooling has been preferred from the outset because of two favourable characteristics i.e. low vapour pressure at the operating temperature (between 400^{o} and 600^{o}) and good thermo-hydraulic characteristics (viscosity, thermal capacity and conductivity). This first feature means that the fast reactor needs only a low operating pressure (2-3 atmospheres).

60. These factors also make it possible to use a normal thermo-dynamic cycle (similar to that of conventional thermal stations) with consequent advantages in the cost of the turbo-alternator set, which is more compact than for a water reactor, and in the thermo-dynamic efficiency, which makes it possible to minimize thermal discharge into the environment.

Efficiency is between 33% and 40% higher, which is quite considerable.

61. Sodium however is difficult to handle, since it reacts violently with water and air; its use therefore requires particular care.

62. One definite requirement is to avoid leakage from the sodium circuits. This is ensured by design, quality control procedures and adequate instrumentation.

63. The most active of these circuits are located in enert atmospheres (argon or helium) so that any sodium losses which do occur will not have serious effects; the almost complete absence of oxygen would limit and localize the effects.

64. Particular attention must be given to the steam generator; the generation of steam involves a massive exchange of heat between sodium on the one hand and water, plus steam, plus superheated steam, on the other.

65. The steam generator consists of large heat exchange surfaces made up of a large number of tubes designed and constructed with materials such that their durability is guaranteed throughout the life of the power station.

66. The accident which occurred in 1974 in the Russion reactor BN 350 was apparently due to the heat exchanger. Designers usually adopt small diameter tubes in order to limit the amount of water and sodium which could come into contact with one other.

(b) Core geometry, power density and thermo-hydraulic characteristics of the coolant

67. These three factors will be considered together because the phenomena which can arise in practice are closely linked.
Although the probability of a serious and complicated accident endangering the core is considered to be extremely small, designers, the authorities responsible for safety and the users do consider the consequences of such an accident for the plant, the staff and the population and environment, in order to prepare suitable arrangements to contain the damage and have time to take adequate countermeasures.

68. In particular it is necessary to prevent the release of harmful substances including fission products and plutonium. One of the most serious accidents envisaged is that of core meltdown because of insufficient cooling or worse, because of a sudden rise in reactivity following a rapid ejection of one or more of the control rods.

69. In this case the chain reaction would continue until the core was destroyed, but this would not lead to a serious escape of fission products from the primary containment, since this is in fact designed to cope with this hypothetical accident.
The largely molten core would then rest at the bottom of the reactor with very little cooling.

70. The heat-transfer fluid and the incorporation of the whole primary cooling system in the core eliminate the risk of a sudden loss of coolant.

Nonetheless one can imagine a reduction in cooling because of a deceleration in the rate of flow.

The metal components and the sodium have a considerable capacity to absorb heat.

71. On shutdown, the residual power can be evacuated from the reactor core by simple natural convection because the design is of the 'pool reactor' type.

Furthermore it is extremely unlikely that all four circulating pumps would stop simultaneously since there is a standby power supply from four independent generator sets.

72. However the provision of additional control rods and their timely insertion into the core can stop the initial transient at the outset.

73. For example, the 66 MW Enrico Fermi reactor had a localized accident in an assembly in 1966. This accident did not have any radio-logical effects but merely put the reactor out of service.

The absence of any harmful effects was due to the correct functioning of the normal automatic protection systems.

74. Fully conscious of the problems of fast reactor safety, the Member States are already spending approximately 50 million u.a. annually on research. The present expenditure by the Community is approximately 10 million u.a. for programmes being carried out at the Joint Research Centres at Ispra (Italy) and Karlsruhe (Germany).

VII. CONCLUSIONS

75. The document presented by the Commission of the European Communities which we are considering starts with a brief statement of the Community's dependence on imports of hydrocarbons.

It does not base its remarks on precise energy forecasts, but provides the basic elements which will determine possible future developments; it puts forward valid arguments in support of continuing current research and development on fast reactors.

76. As regards the Community's dependence on uranium imports, it gives an estimate of currently available resources at a given price.

On the relatively optimistic assumption that the Community can have access to a third of world uranium resources, it reaches the conclusion that the Community's nuclear programme will be effectively limited.

77. It can be deduced that, apart from the alteration in the available options which would be brought about by a sharp increase in the price of uranium, such as more rapid development of fast breeder reactors, it is clear that excessive changes in the cost of natural uranium would alter one of the most important economic and social assumptions on which the introduction of nuclear energy is based.

78. Your rapporteur believes that in view of the above considerations any reduction in the rate of development of the demonstration phase of fast breeder reactors would completely compromise the option of having these reactors available on an industrial basis within fifteen years and would greatly prejudice our future energy options by brutally interrupting the technology which has been under way for twenty years.

79. The development of the fast breeder reactor in the Community is unequalled in the world. Over the last twenty years more than $2,500 million has been spent and current expenditure represents approximately 30% of the whole energy research and development budget.

80. Many experimental and prototype fast breeder reactors have been built and operated successfully. A large power station of 1,200 MW is under construction (Super-Phénix, France), and two more are at the advanced design stage (in the United Kingdom and the Federal Republic of Germany). There is a growing tendency among Member States to cooperate on the building of fast breeder reactors.

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81. More than twenty years would be needed to implement a programme to put fast breeder reactors on the market. A more extensive programme will probably be required in the first quarter of the next century to support the Community programme and at the same time reduce annual uranium requirements.

82. In this sector, however, it must be recognized that cooperation, which is well advanced in reactor design, is sadly lacking and we call upon the Commission, before proposing research and development measures proper, to examine how delays in solving problems connected with recycling fast reactor fuels could lead to equivalent delays in the development of the reactors themselves.

83. Our committee therefore believes that as regards the acceptability of the technology from a safety point of view, there are problems arising from the fact that the technical solutions differ from those adopted for thermal reactors at present in operation.

However, as regards the recycling of fuels in fast reactors efforts so far appear somewhat inadequate, in particular as regards moves towards cooperation at European level.

84. As regards the technical obstacles arising from the different standards in force, we must not repeat the errors committed with lightwater reactors where industrial standardization was lacking from the outset.

Since fast reactors are of specifically European technology - Europe is certainly in the forefront in this field - it would be useful to provide right away for that standardization which would open up markets within the Community.

85. The Commission proposes to give absolute priority to the financing of demonstration projects on fast reactors, including the fuel cycle, using methods such as Euratom loans or possible Community aid in the form of loans.

Your rapporteur agrees with the Commission in recognizing the complexity of the problems involved in the development of new technology such as this and the consequences of any delays for those who are in the forefront in this sector.

86. Lastly, in the Communication to the Council, the Commission analyses in detail existing or planned programmes in the Community. We believe, however, that the Community should make greater efforts in programmes related to the safety of fast reactors.

87. These efforts would improve existing cooperation at national level, intensify and increase the efficiency of national efforts and pave the way for the introduction of fast breeder reactors through a coherent Community approach.

We believe that the Commission should in 1978 present proposals aimed at intensifying joint research and development activities on fast reactors. Moreover, it should put forward proposals for the implementation of guidelines on design, manufacture and inspection standards.

88. In conclusion, the Committee on Energy and Research supports the proposals made by the Commission to the Council. Nevertheless, it calls upon the Commission to continue its activities in the field of safety and to make more specific proposals next year, after consulting the European Parliament.

OPINION OF THE COMMITTEE ON BUDGETS

Draftsman: Mr T. DALYELL

At its meeting of 2 November 1977, the Committee on Budgets appointed Mr Tam DALYELL draftsman for the opinion.

At its meeting of 24-25 November 1977 the committee discussed and unanimously approved the draft opinion.

Present: Mr Lange, chairman, Mr Dalyell, draftsman of the opinion, Mr Alber, Lord Bessborough, Lord Bruce of Donington, Mr Dankert, Mr L'Estrange, Mr Notenboom, Mr Ripamonti, Mr Shaw and Mr Spinelli.

The case for Community involvement in the development of fast breeders

1. The Commission, in its interesting paper, concludes that the Community and its Member States should preserve the option of making fast breeder reactors available to utilities on a commercial basis during the early 1990s.

2. Their arguments are based on the likelihood of a world-wide energy deficiency and the fact that fast breeders could extract as much as 60 times more energy from the limited uranium supplies available than conventional nuclear reactors.

3. Both in this paper and in accompanying documents, the Commission recognises the controversial nature of the fast breeder option and the concerns about safety. Nonetheless, it concludes that despite the risks, which it believes can be minimised if commercial interests are subject to strict public and supranational control, the Community should persevere in the development of commercially viable fast breeders as the only certain way of ensuring a sufficient supply of world energy in the next century to cope with the needs of the developed and developing nations.

4. As can be seen from the Commission's document, the rate of development is different in the different Member States. France is the only state as yet to commit itself to the post-prototype phase, with the United Kingdom and the Federal Republic of Germany currently examining projects. All these projects are characterised by an element of supranational cooperation, but as the Commission points out, the financial effort required is immense, not merely because the initial investment is so considerable, but also because of risk. The projects in hand alone can be expected to cost, together with the associated reprocessing and recycling demonstration, some 5 to 6 billions of units of account. [1]

5. As the Commission also points out, the Member States which lead the field are precisely those who will be exposed to the highest burden in relation to their own available resources.

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[1] Page 17 of the Commission's communication

6. Because of the sums involved, the length of time required to complete projects, the need to avoid delays and the novelty and risks implied, the Commission concludes that it is necessary:

> "for the Community to contribute to the financing of fast reactor demonstration projects, including their fuel cycle, by means of financial instruments which exist or could be created." [1]

7. In any rational view of the tasks which should be assigned to the Community, and therefore financed by the Community budget, large scale investments of this kind would seem to have priority, if the political problems can be overcome.

Means of proceeding

8. Because the Commission has taken the stance urging the preservation of this option, it has launched three papers :

- Fast breeders COM(77) 361 final
- Reprocessing COM(77) 331 final
- Waste disposal COM(77) 397 final.

9. It is clear that these papers cannot be considered entirely in isolation. Furthermore, it is apparent that the Commission communication is a very general document containing much on which to reflect. The interest of the Committee on Budgets will be aroused by this proposal but it will not be possible for the Committee to come to a definitive view until a very detailed communication from the Commission can be provided to describe the financial instruments that it has in mind and the extent of the cost involved. Until this time, only an interim reaction can be provided by the Committee on Budgets.

10. The Committee will have to resist the temptation of embarking upon a major political debate on the pros and cons of fast breeder reactors. To do this would be to encroach upon the preserve of the Committee on Energy and Research. The Committee on Budgets must limit itself to the financial aspects of the Commission's proposal.

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[1] Page 18 of the Commission's communication

11. However, it is the responsibility of the Committee on Budgets to examine the basic feasibility of the Commission's proposal and to this end your draftsman wrote to several leading authorities in the energy field asking for their reactions to the Commission's communication. Included in this survey were the potential users such as the Central Electricity Generating Board and the Electricity Council, to cite examples from one of the Member States.

12. The general view of these bodies was support for the conclusions listed on page 18 of the document. Again, the support can only be expressed in general terms since the conclusions themselves are not specific. It will be necessary to carry out a further and wider consultation once the financial instruments and the degree of Community involvement have been proposed.

Preoccupations of the Committee on Budgets

13. In order that the Commission may be informed of the kind of information that the Committee on Budgets will require and the conditions that might be set, your draftsman would propose that an inventory along the following lines be set out:

(i) the decisions on the levels of Community financial support should be made during the budgetary procedure;

(ii) that whatever structure of financial support may be envisaged, where aid is provided to commercial enterprises and where the commercial enterprises benefit from the success of the operation, that aid should be repayable to the Community budget;

(iii) that where recourse to special loans is envisaged in order to finance investment in fast breeders, those loans should be fully budgetised according to a procedure to be laid down following consultation between Council and Parliament;

(iv) that the Commission should maintain responsibility for the management of all Community funds involved and that the setting up of a network of management committees drawn from the Member States in anything other than a consultative capacity would not be acceptable;

(v) as regards the financial statement attached to any proposals, the following information should appear:
- amounts required (minimal and maximal hypotheses),
- the explanation for these figures with methods of calculation,
- the breakdown according to financial years, and
- means of covering the extra expenditure.

14. It is worth bearing in mind that a small Community contribution is already provided in this field through the work of the Joint Research Centre investigating safety aspects of the problem. Furthermore, the Community does provide some liaison support.

15. It is further clear that the present proposal is to be seen in the context of an overall renewed emphasis on energy as a Community priority with various instruments of Community support for existing and new sources of energy.

16. Given the finite nature of own resources and taking into account that those limits may be reached simply as a result of a natural development of the Community budget, even were it not to take on tasks other than those already carried out, it is possible that the Community will be confronted with a crisis in its financing if all the proposals being put forward in the energy sector are carried out with a sufficient Community financial contribution. Your draftsman considers, however, that the development of fast breeder reactors, along with thermonuclear fusion, should be considered as a priority.

17. Your draftsman suggests that in order to complete the information of the budgetary authority, the Commission should provide a special report on the problems of financing Community energy investment within the limits of own resources. This could be attached to the particular proposals on support for fast breeders.

Conclusions

18. The Committee on Budgets takes note of the Commission's communication which is extremely important in its implications for the Community budget in future years. It considers that this type of activity,because of the scale, costs and supranational nature of the project, is most appropriate as the subject of Community finance.

19. It has set out a series of conditions and requests for further information which will have to be met at the stage of the presentation of detailed proposals.

20. Furthermore, it requests the submission of a special report on the problems of financing Community energy policy.

21. The Committee on Budgets underlines that this is an interim view on the basis of a general statement from the Commission. It does not prejudice in any way the attitude that the Committee will take, either when it comes to examine the specific proposals from the Commission or during the appropriate budget procedure.