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ENERGY CRISIS ESCAPE PLAN?

Europe, America, the Third World - the energy crisis has left few countries unscathed.

A common energy policy has been drawn up for the European Community which could enable the Community, as a body, to secure its energy supplies, guarantee its future economic growth and put its balance of payments back in order.

Euroforum looks at the causes and consequences of the crisis and the measures that must be taken.

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THE LIGHT IN YOUR LIFE

If all sources of energy were to dry up to-morrow, not only would catastrophe befall but we would realise, for probably the first time, the full extent to which we rely on energy in almost every aspect of our daily existence.

The havoc caused by the oil crisis and the petrol shortages which followed in its wake, brought home to many of us our degree of dependence on energy and, in this particular case, energy being supplied by foreign powers. On the lighter side, a great many people were delighted at the demise of the motor car through lack of petrol. Some countries banned cars from the roads on Sundays to conserve fuel, and the peace and tranquility rediscovered through the use of more traditional forms of transport such as bicycles and horses brought home the point that our reliance on energy had become excessive and almost decadent.

The 260 million inhabitants of the European Community have one of the highest standards of living in the world but they owe this more to the energy they have had at their disposal than their own muscle power. It is not by chance that Europe's major industrial zones have been centred around coalfields or close to the ports where the oil arrives. The virtues of energy are not only limited to the standard of living. Systematic use of energy has also improved working conditions in our factories and offices.

For the Community to continue growing, however, it needs an energy supply which is stable, regular, in suitable quantities and reasonably priced.

Energy glossary

Calorie : the amount of heat required to raise the temperature of 1 gramme of water by 1° C.
1 kilocalorie or 1 kcal = 1,000 calories.

Toe : tonne of oil equivalent; this unit enables different types of energy to be compared and added together by taking their calorific value as the point of reference.

1 toe = 1×10^7 kcal or 10 million kilocalories.

1 million toe = 1×10^{13} kilocalories.

Tce : tonne of coal equivalent : this reference unit is based on the same principle as the toe but the calorific value of coal is calculated differently :

1 tce = 7×10^6 kcal or 7 million kilocalories
or 0.7 toe.

1 mill. tce = 7×10^{12} kilocalories.

Kilowatt (or kW) is the unit of energy equivalent to 1,000 watts and is principally used with electricity to denote the power of a generating installation. The electric kilowatt is written as kWe. The multiples are the Megawatt or MWe which is equivalent to one thousand kilowatts (10^3 kWe), the Gigawatt or GWe is one million kilowatts (10^6 kWe).

Kilowatt/hour or kW/h : the energy produced in one hour by a machine rated at one kilowatt. The most common multiples are the Gigawatt/hour (or GW/h) which is one million kilowatt/hours (10^6 kW/h) and the Terawatt/hour (or TW/h) which is one billion kilowatt/hours (10^9 kW/h).

Primary energy : all forms of energy directly produced by nature. The most common types are coal oil and natural gas. They also include wind power, solar energy and nuclear energy.

Secondary energy : all types of energy resulting from a transformation process. This is the case with electricity produced by coal fired power stations. In total energy consumption, the proportion of secondary energy is increasing greatly.

ENERGY DEPENDENCE AND ITS EFFECTS

For many years Europe had all the energy it needed and at reasonable prices. And confident of the future, more and more was consumed until imported sources of energy increased to 60% of total consumption. Whilst the imported energy - basically oil - was cheap, this was fine, but when OPEC introduced fourfold price increases, it brought home, albeit too late, how vulnerable the Community really was, and how dependent on its suppliers.

The third world countries had indeed decided that it was time for them to regain control over their principal resources. Iran, Lybia, Saudi Arabia, Algeria realised that by closing off the oil valves they could not only conserve their own rapidly depleting stocks, but could also exercise power on the world scene and become rich at the same time. The outcome was what became known as the energy crisis. The immediate pretext was political, but the basic problem had been worsening for many years.

25 YEAR INCREASE

Since the 1950s, consumption of primary energy has increased more than 100% in industrialised countries. As a result of twenty five years of rising consumption, each of the nine Community countries now uses about one billion tonnes of oil equivalent (toe) every year.

At the end of the Second World War, the countries which were to form the European Community were able to meet four-fifths of the energy requirements through coal and lignite. Oil only accounted for one tenth of consumption.

In 1976, oil represented 58% of total energy consumption. Natural gas accounted for 16% and the two together permitted consumption to rise rapidly. Now solid fuels only account for one-fifth of total needs.

Price changes

In the period following the Second World War, the price of energy in the Community was largely determined by the price of coal which was the main source of energy. Coal was also protected by import levies on other energy sources, particularly oil, and by other policies designed to keep other

energy sources expensive.

By the early 1960s coal had lost its importance on the energy market, particularly in the Community. From 1960 to 1970, the world oil market was buoyant and the oil surplus kept prices favourable and stable, even to the point of making them cheaper in real terms. At such relatively low prices, oil was able to capture a large part of the increase in demand for energy.

During this period, the Community profited from the lively competition on the oil market and consequently on the whole energy market. Our economy hinges on a large number of process industries which are large energy consumers. The relative drop in oil prices also tended to accelerate the decline of the coal industry and slow down the development of nuclear energy.

Impact on the Community

Cheap imported oil significantly affected the economic situation within the European Community. The non coal producing countries of the Community (Italy, Denmark, Ireland and Luxembourg) had at their disposal an abundant cheap energy source to further their economic development and enable them to catch up on the traditional coal producing countries (UK, Germany, France, Belgium, the Netherlands). The availability of oil put all the Community countries on the same footing as all began importing oil to meet at least some of their energy requirements. The least dependent countries imported at least 50% of their energy.

Oil even had an impact on the regional distribution of industry since the oil which was essentially brought in by tanker mostly benefitted the maritime regions of Europe. Refineries were set up close to the ports, closely followed by all the petrochemical linked industries intent on reducing transport costs.

In addition, the decline of coal posed new problems in traditional coal producing regions where many of the heavy coal consuming industries like steel making were situated.

Who consumes what?

1975 figures in million toe

<u>Sector</u>	<u>Domestic and tertiary</u>	<u>Industry</u>	<u>Transport</u>	<u>Total</u>
Solid fuel	27	46	1	74
Liquid oil derivatives	124	172	117	413
Gas	54	80	-	134
Electricity and other	103	138	5	246
Total	308	436	123	867

The crisis

From 1970 onwards a variety of factors caused an about-turn in this trend, and it became the sellers not the buyers who had the upper hand on the oil market. This coincided with a shortage of tankers, delays in bringing certain oil fields into operation and rising energy demand in Europe, the USA and Japan.

The oil exporting countries under the OPEC banner developed a concerted policy to increase their oil revenues, to bring them longer term guarantees over prices, and, fundamentally, to put their oil resources back under their own control.

With economic motives mixed with political ambition, the oil crisis was detonated in October/November 1973. It was a rude awakening for the European Community and for the whole western world. The golden age of energy had come to an end.

Though affected in different degrees, none of the Community countries escaped the most serious economic recession since the end of the war which followed the energy crisis. The fourfold increase in energy prices triggered off worse inflation which rose to around 12% for the Community as a whole with extremes of 20% in the UK and Ireland, and only 4-6% in Germany. The measures taken to counteract the inflation also had a braking effect on economic expansion, which made the increased oil import bill more difficult to stomach, and produced monetary instability.

In addition, currencies were affected by the international movement of the new wealth of the OPEC countries, through the short term transfers of petrodollars - oil revenue being reinvested by OPEC countries. The quantity of petrodollars available each year has grown to between 30 and 40 billion dollars since 1975.

The effects on the Community has been a sudden brake in investments and a deterioration in the competitive capacity of a number of industrial sectors. Between 1974 and 1975 Community industrial production dropped by 8%. The upturn since then has been fragile and uncertain. The social consequences of the crisis have however been enormous - six million unemployed in the Community in autumn of 1977.

WHY A COMMON ENERGY POLICY?

Beginning modestly with memoranda and guidelines, the proposals from the European institutions for a common energy policy have multiplied since 1962. They did not meet with much response among Member States until the fateful winter of 1973-74. The oil embargo and the increase in oil prices sent panic waves through the economies of Europe. Each country reacted as it saw fit, without coordination or solidarity, and also put at risk the future of European construction itself.

All the reasons justifying a common energy policy were suddenly thrown into high relief as countries floundered to cobble together strategies and policies to get them through the crisis. The facts however, had been staring everyone in the face :

++ energy is at the root of all economic activity in our countries but the Community depends on outside countries for 50% of its needs, which risks both supply and balance of payments. A common policy would enable us, in the first place, to defend our interests with one voice and more effect, the voice of the European Community.

++ We need to reduce our dependence on third countries (and reduce the oil bill) and we need to manage all our resources which are dwindling rapidly by rationalising our use of energy and by making economies where we can.

In a "common market" these energy savings should be decided upon jointly to increase their effectiveness and to avoid possible distortions in trade and competition.

++ We have to use our own energy resources to the full. Insufficient as they are, they can often be complementary to resources possessed by other Community countries. Solidarity among European countries is required in the exploitation of our energy resources and also in times of supply crisis.

++ Finally the development of new sources of energy calls for considerable investment at levels which are often above the means of individual countries (in research and development, for example). Here also, cooperation can enable projects to be financed more effectively at the Community level without any risk of wasted effort or duplication.

The countries of the European Community are confronted by a common problem. No country can pretend to be able to resolve it alone. The common energy policy which the European Community is trying to promote is a long process. No one should believe that it can be pulled out of thin air following a favourable decision by the Community's Council of Ministers.

The European Community has not reacted to the energy crisis in isolation. A conference of industrialised countries (representing all nine member States of the European Community, Japan, Canada, Norway and the USA) led to the creation of the International Energy Agency, attached to the OECD (Organisation for Economic Cooperation and Development). Though the European Community as a body is not a member, the European Commission participates in the work of the Agency and plays a double role, on the one hand coordinating the positions of the Member States, and on the other coordinating the work of the Agency and that of the Community.

Objectives for 1985

In 1974 the Community set new targets to try and change the energy "mix" by 1985 :

solid fuel	17% instead of 10%
oil	47% instead of 64%
natural gas	20% instead of 15%
hydraulic and geothermal energy	3% instead of 2%
nuclear energy	13% instead of 9%
rate of dependence	50% instead of 60%

ENERGY IN FIGURES1. What we consume

(in mill toe)	<u>Coal</u>	<u>Lignite</u>	<u>Oil</u>	<u>Gas</u>	<u>Primary Electricity</u>	<u>Total</u>
1st half 1976	89.1	14.2	246.9	79.5	23.7	453.4
2nd half 1976	90.0	14.5	251.0	77.9	24.8	458.2
1st half 1977	90.5	13.1	244.8	83.6	32.9	464.9
Variation between 1st half '76 and 1st half '77	+1.5%	-8%	-1%	+5%	+39%	+2.5%

2. Production

(in mill toe)	<u>Coal</u>	<u>Lignite</u>	<u>Oil</u>	<u>Natural gas</u>	<u>Nuclear</u>	<u>Hydraulic and others</u>	<u>Total</u>
1st half 1976	79.6	13.7	.8	71.3	10.9	11.6	195.9
2nd half 1976	76.5	14.4	13.3	72.2	11.0	13.2	200.7
1st half 1977	75.8	12.6	21.9	72.7	13.7	18.1	214.8
Variation between 1st half '76 and 1st half '77	-4.8%	-8.0%	+148.9%	+2.0%	+25.7%	+56.0%	+9.6%

3. Imports

(in mill toe)	<u>Solid fuel</u>	<u>Oil</u>	<u>Natural gas</u>	<u>Primary electricity</u>	<u>Total</u>
1st half 1976	13.5	247.9	8.3	1.2	270.9
2nd half 1976	14.6	269.2	7.7	0.5	292.0
1st half 1977	15.8	233.8	10.6	0.9	261.1
Variation between 1st half '76 and 1st half '77	+17.0%	-5.7%	+27.7%	-25%	-3.6%

ACTION ON ALL FRONTS

To give its future a solid base the European Community has to avoid wasting energy and at the same time guarantee its future supply. These are the two principal lines of action undertaken already.

15% reduction

rationalising the use of energy should enable energy demand to be met by cutting out waste. The action programme proposed by the European Commission and adopted by the Council of Ministers in December 1974 aims at reducing demand for primary energy in 1985 by 15% compared with projected consumption level if no action was taken.

The Community's margin for manoeuvre is rather slender since it cannot touch usefully used energy nor risk retarding economic growth or social progress. The savings in question, however, are of the order of 240 million tonnes of oil equivalent valued at about 24 billion dollars.

To succeed, the Community's programme has to mobilise both the imagination and the ...energy of all Europeans. In the home, we should habitually switch off lights that burn in unused rooms. In factories and offices, overheating of various rooms should be avoided and machines switched off when not in use. The transport industry also has to look carefully at its fuel consumption and in many industrial processes, energy losses can be avoided.

The Council of Ministers has already adopted a number of proposals put forward by the European Commission dealing with various aspects of energy saving, such as the thermal insulation of buildings, the promotion of public transport, the operation of household appliances, the driving habits of car and lorry drivers, etc.

There is still room for a bit more creative imagination however, and the Commission has proposed to give financial aid to "demonstration" shows for energy saving projects. The weak point in any new invention is usually the attempts to prove to others that the invention is commercially and economically viable. This is the moment when financial aid can be most useful.

In addition, the European Commission has been pooling together the experiences of national attempts to rationalise the use of energy so as to spread the benefits as wide as possible.

Rebirth of coal

For a long time coal was the main and almost only source of energy in Community countries. Consequently, heavy industry developed in the areas close to the coalfields in the last century. During the fifties, the position of coal slipped and governments were planning to let coal decline as long as it did not upset the economic equilibrium or employment etc. in the regions concerned.

Since 1973 however, we have had to revise all our old conceptions. Coal is once more useful and even competitive. Instead of closing, the mines will have to produce 250 million tonnes per year up until 1985. This will require substantial progress in an industry which has seen little improvement in extraction techniques over the previous fifteen years.

All is not roses for the coal industry however. In 1975 demand for coal was weak and despite the rise in energy prices, the financial situation of the coal industry worsened with costs increasing faster than income. It is now more necessary than ever to give financial aid to the Community's coal industry. At the beginning of 1976 the European Commission introduced a new Community-wide system for giving aid to the coal industry. In addition, the aid system has been weighted in favour of coking coal and coke to guarantee the European steel industry a relatively independent energy supply.

Coal is largely used for producing electricity. At the end of 1976 the Commission proposed measures to encourage the construction of a large supplementary capacity in modern coal fired power stations, by way of subsidies.

By producing more lignite and importing coal, solid fuels will be able to hold a larger share of the energy market in 1985 than originally predicted (17% instead of 10%) and thereby reduce oil imports.

Oil and gas

Under the Community's soil and under the sea-bed lie oil and gas which, fortunately, will raise Community energy production to 180 million tonnes of oil and 175 million tep of natural gas by 1985.

To sustain this effort, the Community has been granting financial aid to research and development projects relating to new oil exploration techniques for areas like the North Sea where conditions are particularly difficult. Some one hundred projects have received aid amounting to a total of more than 100 million units of account (1 u.a. = 1.1 US dollars approx.)

The Community also envisages increasing purchases of natural gas from third countries. As with coal imports, these purchases will diversify the origin and type of energy being imported even though it will not help our balance of payments too much.

With respect to oil, the Community is to continue good relations with the oil producing countries, taking their own respective interests fully into account.

Other problems have arisen within the Community itself however. In 1976 Community oil refineries processed only 500 million tonnes of oil whereas they have a capacity of almost 850 million tonnes. The Commission takes the view that refinery installations corresponding to 140 million tonnes per year have to simply be taken out of service. This amounts to about 16.5% of total capacity. The best approach would consequently be to halt all new construction work and shut down temporarily, or even permanently the marginal and less efficient installations.

Other problems which have arisen in the Community concern the transparency of prices on the oil market. Two regulations adopted by the Community now require all imports of oil-based products as well as all exports of hydrocarbons (crude oil, oil derivatives and natural gas) to be communicated to the European Commission. The information received will be summarised in periodic reports to the Council of Ministers. Public authorities will thereby have comprehensive information on the movement of hydrocarbons between the Community and third countries. Another Community directive deals with an information and consultation procedure covering the prices of crude oil and oil derivatives. This information is compiled by the Commission and transmitted to Member States to prevent abusive variations in prices and help coordinate national policies.

The promise of research

Putting so much of our faith in oil, we have not put the effort we should have into the search for alternative sources of energy. We have to catch up, and researchers are now at work in all countries looking at wind and wave power, solar energy and hot rocks, with a view to making the conversion techniques and machines more profitable.

For maximum results, substantial financial aid is necessary and such work should occupy a proper position within a common energy policy. The Joint Research Centre (JCR) works in this spirit. The Centre has four establishments situated respectively at Ispra (Italy), Geel (Belgium), Petten (Netherlands) and Karlsruhe (Germany).

Originally the JCR was seen as a way for the Community to pursue its own research and development policy in the field of nuclear energy. Since 1973 the JCR has been extending its activities to other fields and particularly to new sources of energy (hydrogen production, solar energy, etc.). From 1977 to 1980, more than 600 million dollars will be devoted by the JCR to energy. 200 million will be used on its own projects and 400 million distributed for work undertaken under contract in other Community laboratories. The JCR spends more than 58% of its budget in the energy sector.

The aim of energy research is not only to develop new energy sources (nuclear fusion, solar energy, geothermal energy, etc.) and increase the extraction efficiency of traditional sources (coal, lignite, hydrocarbons). Research also has to avoid the errors of the past and study the various effects and implications and the types of energy currently being used and those to come in the future, and also determine the conditions that these energy sources have to fulfil. How much energy will really be needed? Who should the energy go to and what will be its long term effects on the environment?

One of the most promising areas of research is geothermal energy (underground steam sources, hot water sources and hot rocks) as well as the gasification and liquefaction of coal, of which the Community has relatively abundant supplies. The price of oil produced by coal liquefaction is still around 0.14 to 0.16 dollars per litre whilst the cost of refining ordinary crude oil is around 0.11 dollars per litre. It would consequently seem prudent to begin by producing heavy oil, since the price is around 0.12 dollars per litre. A pilot project subsidised by the Community will put this idea to the test.

Solar energy still captures the imagination of the general public despite the uncertainties of our own climate. Researchers in the Community and elsewhere have been working in five main areas: how to produce electricity from solar energy, how to desalinate sea water, how to heat homes, accelerate the growth of plants and weld metals. The techniques are well behind in meeting man's current requirements. In the best circumstances, solar energy could only meet 3% of our needs by the year 2000, unless there's a technological miracle.

From 1973 to 1976 the JCR's solar programme has involved 14 researchers and cost more than 3 million dollars. From 1977 to 1980, 35 researchers will be employed and total funds will amount to 15 million dollars. In addition, 5 million dollars will be spent over five years to finance research undertaken in national laboratories.

Research into hydrogen is also being undertaken. It could be, in fact, an excellent energy storage unit, on account of the ease with which it can be transported and stored, its flexibility in use, and non-polluting combustion characteristics. The JCR is currently working on ways of producing hydrogen from water, using thermochemical systems. In this field, the JCR is leading the world. It works in cooperation with the OECD's International Energy Agency.

And nuclear energy?

Faced with the Community's considerable dependence on third countries for its energy supplies, the European Commission has taken the view that nuclear energy is indispensable as an energy source.

The use of nuclear energy is probably only a transitory phase but should provide the Community with its own supply of energy whilst other techniques are developed such as nuclear fusion.

The importance of the atom in Europe's energy supply was recognised in the "Three Wise Men" report drawn up in 1957, which recommended the development of this new source as an "objective for Euratom" and therefore a major objective for Europe's energy policy.

Accepting the usefulness of nuclear energy clearly does not mean accepting it blindly. The European Commission has drawn up an overall nuclear strategy in which safety takes first place.

Public debate

The European Commission has decided to organise public hearings on the problems posed by the development of nuclear energy, to guide its own work in the field of nuclear power. Two sessions have already been fixed to take place in Brussels on 29 and 30 November 1977, and 1 December 1977. Issues to be covered concern : energy needs to the

end of the century and the role of nuclear power; the problems raised concerning safety, health and the protection of the environment.

The general public and the press will be taking part in these debates (invitations are available from the services of the European Commission and are subject only to the limits of available space), and each participant will be able to put questions to a group of experts, some of whom are for and some against the development of nuclear energy.

The debates will be chaired by European Commissioner responsible for energy, Dr. Guido Brunner.

Nuclear objectives

If we cannot increase the quantity of energy produced in the Community, we will have to increase our imports and thereby our dependence on oil producing countries. This would put an unbearable financial burden on our balance of payments. The development of nuclear energy in our energy "mix" should help reduce dependence on imported oil in the following proportions (in percentage of total consumption) :

	<u>1976</u>	<u>1980</u>	<u>1985</u>
Germany	1.9	6.1	9.2 to 11.0
Belgium	4.7	4.9	10.4
Denmark	-	-	-
France	1.9	8.1	17.4 to 19.8
Ireland	-	-	-
Italy	0.6	1.2	4.0
Luxembourg	-	-	20.0
Netherlands	1.2	0.9	0.8
UK	3.2	4.9	5.1
EEC	<u>2.0</u>	<u>4.8</u>	<u>8.9/9.4</u>

Safety first

Under the terms of the Euratom Treaty, the European Commission is responsible for setting protection standards dealing with nuclear radiation, and it tackles this role with particular vigilance. The basic standards in force in the Community to protect the health of workers and the general population from the effects of ionising radiation are regularly reinforced by new proposals from the European Commission. It is then up to Member States to ensure that the workers and the general public are not subject to radiation exposure above the prescribed limits.

Community standards are applicable to all peaceful applications of nuclear energy, i.e. production, reprocessing, movement, storage, transport, disposal etc. of radioactive substances. Authorisation is always required to use radioactive substances for medical purposes, for example, for the manufacture and import of toys with a higher than permitted level of radioactivity, or even to control the use of certain radioactive substances in foodstuffs, cosmetics or maintenance materials.

The Community's basic norms also prescribe the maximum admissible doses of radiation for workers in the nuclear industry and for the general public. Extremely detailed regulations control the manner in which this is verified.

The total amount of radiation resulting from the peaceful use of nuclear energy amounts to only about 1% of the radiation received by the general public due to natural sources and radioactive medical treatments. This high standard of protection must also be kept up in the future, however, and the European Commission is regularly drawing up new methods of surveillance and reinforcing the monitoring techniques to protect workers in the nuclear industry.

What about waste?

The strictest controls and standards need to be applied to these three areas : fuel reprocessing, fast breeder reactors and waste disposal, to ensure full protection is given to Europe's population and environment.

The disposal of nuclear waste, however, raises certain problems with regard to their radioactivity and toxicity. Long life highly radioactive waste has to be stored in safety for thousands of years. At present, nuclear wastes are produced in relatively small quantities and, up until now, storage has not presented any serious difficulties. The forecast development of the nuclear programme offers a new dimension to the problem. Nuclear waste will have to be processed and sealed in such a way that it can stand up to the most rigorous conditions in permanent storage.

Various processes for reprocessing highly active waste already exist. Sealing in glass is one of the processes with the most promising industrial application. As regards permanent storage, a number of solutions are being studied (disposal of waste in suitable geological formations) and some pilot projects have already been undertaken (experimental storage in salt formations for example).

Up until now, Community action has been essentially concentrated on research and studies to complement the work being undertaken in Member States. Waste disposal does not only give rise to technical and scientific problems; other legal, administrative and financial questions are involved, and a variety of measures are called for to ensure adequate protection of the Community's population. These considerations extend beyond national interests and call for Community action.

The action plan which the Commission has just submitted to the Council of Ministers, covers the period 1978-1990. It proposes to fully analyse the situation facing the Community, to facilitate setting up a network of Community storage sites, to harmonise and standardise practices and policies concerning waste management, and also to periodically inform the general public on the Community's position. At the same time, the Community's research and development effort should be vigorously pursued.

The Commission takes the view that the commercial aspects are of secondary importance. The management of radioactive waste constitutes a public service.

Supply

Uranium resources are limited. World reserves are only put at 3.5 million tonnes out of which the Community only has about 3.5%.

The Community cannot therefore be permitted the luxury of not using the irradiated fuel which can be reprocessed and recycled particularly in advanced reactor models such as fast breeders.

a) reprocessing of irradiated fuel

The Commission has come to the conclusion that with the existing controls and those being developed, reprocessing can be compatible with public safety, the protection of the environment and the exclusively peaceful use of nuclear materials.

Reprocessing of irradiated fuel is itself an extremely complex chemical operation. The fuel is a mixture of reusable substances (unburnt uranium, and plutonium created by atom bombardment in the reactor) and radioactive wastes. Reprocessing enables the uranium and plutonium to be reused. Plutonium can be burnt with uranium in light water reactors but is also the basic fuel for fast breeder reactors.

Though not highly radioactive, extreme care has to be taken in handling plutonium since it is such an extremely toxic substance. It can also be used in the production of nuclear explosives and consequently requires the strictest security measures.

By the year 2,000, the European Community will be one of the largest consumers of nuclear fuel, accounting for about one third of world demand. Currently, 80% of the uranium we use is imported. A reprocessing policy would therefore offer the Community benefits in both the medium and long term. The European Commission has therefore submitted proposals to the Council of Ministers containing the basic elements for a coherent reprocessing strategy which would involve bringing together the operators of reprocessing plants and power stations within joint undertakings.

The type of joint undertaking already catered for in the Euratom Treaty could be a useful instrument for implementing this strategy. It would enable industrial initiative to be developed but would still make them subject to strict Community control. They would also be limited in number and kept within a limited geographical area. Concentrating the reprocessing plants in regional centres would also simplify the problems of theft and sabotage.

Urgent decisions, however, have to be taken now. There are as yet no fully operative reprocessing plants and the stocks of used fuel are building up. In the Community, reprocessing capacity will stay below requirements until 1886-89 at least. Waste fuel that has been accumulated since 1975 will not be completely reprocessed until 1988 at the earliest.

b) Fast breeder reactors

Over the last twenty years more than 2 billion dollars have been invested by Community countries in fast breeder reactors, and 30% of current research and development expenditure in the energy sector is also allocated to their development.

The particular interest in fast breeder reactors arises from the basic shortage of uranium resources. A fast breeder reactor is able to extract 60 times more energy from uranium as classical thermal reactors. With the use of fast breeders, 5,000 tonnes of uranium could produce as much energy as the total oil in the North Seas (whose exploitable reserves amount to about 3 billion tonnes). It would take twenty years at least, however, to install sufficient fast breeders to be able to improve sufficiently total output from uranium.

At present, several experimental reactors and prototypes have been built and put into service - Dounray Fast Reactor (UK 1963), Rapsodie (France 1967), PFR (UK 2974), Phoenix (France 1974), KNK 11 (Germany, Belgium, Netherlands 1977).

The Commission proposes that Member States keep open the possibility of introducing fast breeder reactors on a commercial basis by the beginning of the 1990s. It also recommends that greater effort be put into the parallel work on safety, protection against radiation, protection of the environment, not to mention security.

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Oil, coal, natural gas, nuclear energy, wind, sun, warm water, hot rocks..... there are numerous forms of energy which are indispensable to our economic and social development, and the Community is active in all these sectors. Perhaps it is not doing enough yet, but increasingly it is the Community as such that is taking the initiative, since the interests of the Nine are so closely intertwined.

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