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TOWARDS A COMMUNITY NUCLEAR FUEL SUPPLY POLICY

(Communication from the Commission to the Council)

Towards a Community nuclear fuel supply policy

(Memorandum from the Commission to the Council)

PRELIMINARY REMARKS

This memorandum comprises two parts :

a) the main purpose of the first part is to describe the principal problems encountered by the Community in obtaining nuclear fuel supplies. The numerical data given in this part reflect the basic trend of development of nuclear power in the general context of supply;

b) in the light of the general situation described in the first part, the second part contains a proposal for a Community supply policy and describes the main features thereof;

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PART ONE

General background and essential features of the nuclear fuel supply situation

INTRODUCTION

1. The new energy policy strategy

The main course of action proposed for the Community by the Commission in its New Energy Policy Strategy /COM(74) 550 final/ is to resort to the use of nuclear power as quickly as possible; this course is dictated by the need to contain the rapid growth in the consumption of oil products. In 1973, the Community was reliant on oil imports for more than 60% of its energy requirements; at the same time the risks of price increases and interruptions in supplies became stronger and balance-of-payments difficulties developed.

One of the measures advocated is to step up nuclear programmes; in the medium and long term, this is the most effective way of limiting the Community's dependence on imports.

2. Nuclear objectives

Close analyses of the potential expansion of electricity production, which is the preferred way of exploiting nuclear energy, gives some idea of the future market for nuclear electricity; such an analysis had been made made in "Medium Term Guidelines for the Electricity Sector" (COM(74) 1970). The target proposed for the new strategy is 200 GWe by the end of 1985; this figure is slightly lower than the market potential. In the longer term, by the year 2.000, the proposed target is to have nuclear electricity generating capacity in operation which is large enough to meet about 50% of total energy requirements; 1.000 GWe may be taken as a rough guide.

As regards the use of nuclear power for purposes other than electricity generation, the new strategy sets the target of a further contribution of at least 10%, to be achieved as soon as possible; it would

be desirable to achieve the equivalent of 20 GWe as early as 1985, but this still poses problems.

These targets are not substantially different from the forecasts, which are in any case subject to constant revision. For the year 1985, for instance, the sum of the national targets of the Community countries is constantly increasing : 130 GWe were announced at the beginning of 1973, 140 GWe at the end of that year and almost 170 GWe at the present time. The latter figure does not take into account possible non-electrical applications whose economic appeal has been substantially enhanced by the rising cost of oil. The effort proposed by the Commission in 1974 amounts to the overall anticipation, by one year, of national forecasts of installed capacity on order and completed in the eleven years to come.

3. Risks and return

The Commission realizes that this acceleration may create difficulties in some economic and social sectors. To do its best to help overcome these problems, the Commission has devised a series of measures /(COM(74) 10 final/, which it will initiate itself but which will only be really effective if combined with measures taken by the Governments and revelant industrial circles. Come what may, such an effort is essential, the risk incurred by the Community is not so much that of only partially closing the gap between the 170 GWe estimate arrived at by the Member States and the 200 GWe proposed by the Commission, as seeing the production targets receding into the future without even that of 170 GWe being achieved by the end of 1985. The measures to be taken in fields other than that of nuclear fuel supplies are described in other Commission Memoranda. At this stage we need only recall the implications of the nuclear programmes

- 200 GWe will represent a level of consumption of 240 million tons of oil in 1985;

- each unit of 1 GWe which has not been equipped in time with a nuclear steam supply system will have to be made good by a conventional unit which, if oil-fuelled will burn 1.2 million tons of oil a year, or 18 million tons between 1985 and 2000.

4. Reference model : principal implications

The choice of a reference model is both arbitrary and necessary.

- it is arbitrary not only because of the unpredictability of requirements in the medium term and beyond, but also because of the present impossibility of predicting with reasonable accuracy the relative shares of the nuclear market which will be accounted for by the different reactor types over the long term.

- it is nonetheless necessary because we must be able to analyse the consequences and implications of a trend which is gaining ground rapidly whatever happens.

Since the fixing of brackets around average values would introduce an element of false certainty and a definite risk of confusion in the tables, it was felt preferable to refer to only one development hypothesis and deliberately to give it the virtue of "round figures". This reference model is therefore neither a forecast nor a target, but simply a guide. The relevant figures are as follows :

Years	1975	1980	1985	1990
Nuclear capacity in operation (GWe)	25	65	200	400
Proven reactors (1)	25	64	194	360
Fast reactors	-	1	5	20
HTR reactors	-	-	1	20

(1) GGR, AGR, HWR and LWR

From the supply point of view, the main implications are as follows :

Materials or services (1)	Annual requirements		
	materials		services
Years	U(10^3 t)	SWU (10^3t)	Repr. (10^3 t)
1975	5,5	1,7	0,1
1980	23	10	1
1985	50,0	25	3

This hypothesis only covers uranium-fuelled reactors. From the point of view of supplies, thorium-fuelled reactors pose similar problems.

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5. Integrated fuelling system : uranium - enrichment - reprocessing.

Since the reactor types chosen by the Member States to cope with the medium-term objectives of their nuclear programmes are all fuelled on enriched uranium, from the supply point of view only one programme is needed to cover the production of uranium, its enrichment and - at a later date - the reprocessing of irradiated fuels, which thus make up an integrated fuelling system. In terms of requirements, there is a direct relation between the quantities of natural uranium and enrichment work and the quantities of plutonium and uranium obtained by reprocessing.

This relation does, however, contain an element of flexibility, depending on :

- the tails assay chosen by the enrichment plants (margin of ± 15 %), and
- the quantities of plutonium chosen for recycling (probable saving of about 10% of uranium and enrichment requirements).

This flexibility can be exploited to allow short-term adjustments of supplies, thereby lessening the risk of a temporary shortage or surplus; such measures are similar to the adjustments achieved by juggling with stocks. The flexibility disappears in the event of structural shortages.

Another feature of the conditions of supply is the structural link between uranium and its enrichment : some countries in possession of large deposits of uranium which more than cover their own requirements are showing an increasing desire to develop an enrichment capability, the output of which they might then export. Thus, for the Community, access to the uranium of Canada, South Africa or Australia could soon take the form of the direct purchase of enriched uranium or participation in the establishment of enrichment facilities in these countries.

The inter relationship between uranium supplies, the provision of enrichment services and the reprocessing of irradiated fuels means that the problems arising at the respective stages cannot be treated separately.

6. Complexity of decision-making

The criss-cross of decision-making in this integrated system of nuclear fuel supplies is now being made more complex than ever by the escalation in the requirements of most industrialized countries, whereas the lead time necessary in order to match supplies to the level of demand can hardly be reduced.

In the next ten years, annual requirements throughout the world may even triple every five years. But in the same period lead times will remain as follows :

- from four to seven years to build an enrichment plant or double the capacity of an existing plant;
- from six to nine years to design, build and bring into service a large reprocessing plant;
- from seven to ten years to discover a uranium deposit and begin production;
- from two to three years to increase production from a deposit already being worked.

The estimated increase in demand is undoubtedly a strong incentive for setting up adequate production facilities, but the scale of the investment entailed by an individual decision on these lines - together with the period which elapses before a profit is made act as a deterrent.

In the face of such rapidly expanding demand, these lead times are not flexible enough to allow supplies to catch up or even lessen the threat of short-term - or structural - shortages.

Since an investor's decisions are naturally dictated by the confidence he has in his access to the market, it must be admitted at this stage that past achievements in the nuclear field have rarely been in time with forecasts and programmes; many individual decisions have been taken hastily, either because the market had not expanded as expected, or because suppliers were unable to secure their expected share of the market. This is just as true for those directly encouraged by the public authorities as for those acting on their own initiative. This discrepancy between reality and forecasts has engendered a sceptical reaction and a wait-and-see attitude - or even reluctance - on the part of investors faced by successive reviews of programme.
Without questioning its legitimacy, we must from now on consider such behaviour to be intolerable since the extensive use of nuclear power has become imperative and will soon become absolutely vital and also because the nuclear contribution to the Community's energy supplies

(via cheaper electricity) will admit no more than a very small degree of flexibility. But, on the other hand, actual demand must also be aligned to a programme of properly assessed requirements. For instance, it is conceivable that for several years in succession electricity producers will buy more fuel than they actually require, and then suddenly, when they feel their stocks are sufficient or even excessive, will suspend their purchases or even put back some of their stocks on the market, thereby causing a grave disturbance in the conditions of supply by the effect of their own behaviour.

Consequently, nuclear power is a subject on which decision - making must hence forth be "intelligent" - if not at world level, then at least at Community level - to ensure a satisfactory degree of stability on the nuclear fuel market, which is by nature essentially unstable because of the juxtaposition of a very fast growth of demand and very long lead times.

NATURAL URANIUM

The important role now attributed to nuclear energy makes it essential to ensure that adequate supplies of uranium are available to the Community. Since the known indiginous resources of uranium ore within the Community are relatively small (though not insignificant) compared with needs, timely arrangements have to be made so that supplies may be obtained from a diversity of sources outside the Community. Security of supply and reasonable prices are the essential points to be covered in such arrangements.

1. History of Production

The first important demand for uranium was for military purposes and as a result of intensive prospecting in the 1940's and 1950's sizeable ore deposits were identified, and brought into production. This production reached a maximum of 34.000 tonnes U per annum in 1959 and then declined by 1965 to a fairly constant annual production of about half this amount.

The uranium production industry which rose to the challenge of this military demand for a new mineral (for which new technologies had to be developed) thus entered a long, depressed period when mines had to be closed, staff laid-off and, moreover, prices obtainable hardly covered costs. The expected non-military demand for uranium was slow to materialize.

This market glut virtually stopped prospecting for uranium by mining companies and also brought about the constitution of stockpiles totalling about 77.000 tonnes mainly by producer country government intervention. This large stockpile overhanging the market together with several over-optimistic forecasts of demand for nuclear power stations made uranium producers reluctant to engage further prospecting effort or investment.

The price of uranium (much of which had been profitable at $ 8 per lb. U_3O_8) declined to around $ 5 per lb. or even less. Consequently it was no surprise that several producers (outside the U.S.A.), discussed how they could protect themselves against such market circumstances. In general, any appeal to users to pay more realistic prices went unheeded.

2. Market Revival

With substantial ordering of nuclear power stations, particularly in the U.S. (where no less than 107 GWe were ordered in the 3 years 1971 - 73), appreciable contracts for uranium supply were concluded; prices became more remunerative and prospecting activity increased. However, the U.S.A. maintained an embargo on imported uranium to protect domestic industry*), so foreign producers were denied access to this major market. Nevertheless, these non-U.S. producers shared in the improved market conditions, and several of them began to operate pricing policies which they had agreed upon mutually.

3. Demand begins to exceed Offer.

The improving demand and the virtual certainty of market growth due to the important nuclear programmes undertaken has - over the past year - lead to a complete reversal of conditions from a "buyer's market" to a "seller's market". Invitations to bid during 1974 have evoked few or even no offers. As there cannot be a real market shortage induced so rapidly, it is presumed that some suppliers at least, are holding-back their offer until there is a bigger certainty of prices obtainable.

Meanwhile, contracts which have been concluded in 1974 have attracted prices exceeding $ 10 per lb. U_3O_8 for delivery in the next year or so, and even exceed $ 20 per lb. in the early 1980's.

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*) A gradual lifting of this embargo is proposed over the period 1978 to 1984.

4. New Policies of Producer States

Simultaneously with the market revival for uranium and with the recollection of the recent energy crisis in mind, the main producer states with uranium reserves, have begun to re-define their policies over foreign ownership and export. This reconsideration in the producer states is inspired by understandable motives of assuring their own needs of nuclear fuels and of promoting the optimum prosperity of their own industry by adding maximum value to their natural resources. Some of the main producer states outside U.S.A., e.g. Canada has recently outlined (though not defined) her policy, South Africa has indicated the broad principles of her's, but Australia has imposed a uranium export embargo pending consideration of her position.

5. Problems of Community Based Producers

Meanwhile, the Community based uranium producers, who have uranium production and/or prospecting activities in many parts of the world (both in developed and developing countries) outside the Community are exposed to considerable uncertainty as to what they will be permitted to produce, own and export and under which fiscal conditions. This is currently a severe disincentive to their activities, and impedes their role in helping to assure uranium needs of the Community.

The target recommended by the Commission to satisfy some 17 % of all energy needs with nuclear energy by 1985 - implies that the raw material should be available in adequate and secure quantities and at reasonable prices. "Reasonable prices" means that all legitimate costs, including provision for exploration costs to replace reserves, should be covered plus an adequate profit incentive to attract investment.

6. Uranium Resources

(a) The 1973 ENEA/IAEA report[1] provides authoritative data base for this topic together with a resource classification. It is important to distinguish between the different categories of resources (as defined in the report). Only one of these is equivalent to reserves in the mining sense, the other resource categories have a much higher degree of uncertainty. It can be misleading to add all the resource categories together except as a broad indication of a potential resource base. Most of this potential resource base has yet to be explored and assessed for economic possibilities. If, however, with this qualification the estimates for resource categories up to $ 15 per lb. are added, a figure of about 3.25 million tonnes U is indicated. Reasonably assured resources up to $ 10 per lb. are estimated at 886.000 tonnes.

(b) More recent figures for uranium reserves are given in Nininger's[2] updating of the ENEA/IAEA figures:

WORLD RESERVES *) (Reasonably assured resources up to $ 10 per lb. U_3O_8).	thousands of tonnes U	%
U.S.A.	260	27
South & S.W. Africa	200	21
Canada	185	19
Australia	160	17
France	37	4
Community Associated States :		
Niger	40	4
Gabon	20	2
Other	45	6
	947	100

*) Exclusive of China, USSR and East European States (for which no data is available).

(1) Uranium Resources Production & Demand - OECD, Paris (1973).

(2) Nininger, R. IAEA, Vienna - Proceedings of Athens Symposium (1974).

7. Uranium Demand

The same ENEA/IAEA report evaluated world needs as a function of different hypotheses of nuclear power growth and of the contribution of different reactor types. The following table summarises the maximum needs foreseen at the moment. Although - because of the world's new energy market situation - it is impossible to give the precise figures, it can be foreseen that the demand will tend to increase after 1980 compared to the figures indicated.

World Needs of Uranium
(in thousands of tonnes)

Year	1973	1975	1980	1985	1990
Annual needs	17	26	66	127	224
Cumulative needs	17	64	297	799	1713

The needs of the Community are about a quarter of the world requirements.

8. Satisfying the Demand

The present world production of uranium is about 15.000 tonnes per year, but this rate of production will need to increase extremely rapidly to follow the projected demand. It should be realised that the demand growth shown above exceeds the corresponding maximum growth rate over any 20 year period in this century for such commodities as petroleum, copper or zinc. Even without any of the problems indicated in paras. 10 and 11 above, this would be an exacting task for the industry concerned.

It should be emphasised that it takes 8 to 10 years from the prospecting stage to find and bring an uranium orebody into production. Thus, such work should be undertaken on an appropriate scale of effort and investment, and for commercial reasons full production from any given orebody can only be sustained provided that a forward reserve of at least 8 years production has been proved*. There are other factors, including environmental considerations, which also tend to restrict the production from mines and associated ore-treatment plants.

9. The poor discovery rate in finding uranium deposits during the last decade is due to the following reasons. First the limited risk finance allocated to uranium exploration due to the depressed price. This investment now has to be made. Secondly, uranium exploration has passed into a stage where the more obvious targets have been tested. Thus deeper, harder to find resources must be located and areas that were less attractive targets due to geographical or political reasons should now be considered.

In order that deeper targets can be identified, research must be fostered into new exploration methods. The control of uranium mineralisation needs to be better understood and the beneficiation of uranium from low-grade ores improved, as proposed in "Energy for Europe: Research & Development" - SEC (74) 2592 final.

In the short term, uranium supply to the Community will be dominated by its dependence on a variety of foreign resources. The Community will look to Canada, South Africa, Australia, Community Associated States and developing countries for its supplies. Market security will necessitate a diversity of these supplies but the Community will be in competition for these worldwide resources. The USA will soon become a net importer and could purchase up to 30% of its needs from foreign sources in the 1980's. Japan's nuclear programme, representing a third of that of the Communities' programme is also competing for its needs from worldwide sources.

It is thus essential that the Community should engage in a dialogue with producer countries to find out the conditions under which uranium supplies may be assured to the Community under balanced conditions of mutual interest.

*) In the case of most current South African reserves, uranium is a bi-product of gold production, and for this reason the output of uranium is likely to be less than 7.000 tonnes per annum, in spite of the large size of the reserves.

With the present higher prices ruling viable uranium exploration targets are probably available within the Community.* Detailed evaluation of these possibilities could provide an indigenous resource base contributing to Community future policy for uranium supply; at least, it could provide a security reserve.

In view of the new policies of certain producer countries (see Section 4), it is likely that Community industry will have to take part in the development of enrichment facilities in these countries and that the Community will have to obtain some of its enriched uranium supplies from them.

10. Industrial Considerations

The structure of the uranium producing industry is diverse: including private metal mining companies, international oil companies to an increasing extent, and a number of specially constituted companies with varying degrees of state control and sponsorship.

Companies of all these types, either based in the Community or for which there are important Community financial interests, are prominent in uranium exploration and production. In 1973 about $\frac{1}{3}$ of the world production of uranium was accounted for by such companies. This, however, does not necessarily reflect the important potential role of such companies. This, however, does not necessarily reflect the important potential role of such companies in the future. For example, most oil companies are relatively new to uranium work, but as a deliberate policy of diversification, they have allocated considerable resources to uranium exploration. In addition mention must be made of the worldwide continuous and intensive efforts since the 1950's of the French CEA and associated French companies. This expertise has resulted in important discoveries of economic reserves, not only in France but elsewhere notably in Niger, Gabon and in Canada. Of more recent foundation are companies based in Germany and Italy set up specifically to find and develop uranium reserves.

Clearly any common Community policy for the supply of natural uranium must include an important role for such companies because of their experience, financial resources and potential to help provide a significant proportion of Community needs. In addition they can bring Community developed technology to bear on this task to the benefit of the producer countries, but this role can only be realized if these companies can be assured of acceptable terms for:

(a) the right of access to territory,
(b) marketing the product,
(c) sure access to a reasonable proportion of the Community market.

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* Apart from the reserves in France of about 40.000 tonnes which currently support a production for domestic needs of 1500 tonnes per annum.

ENRICHED URANIUM

Since most countries have chosen reactor families fuelled on enriched uranium, this material has become vitally important to the Community's nuclear fuel supply. The present situation as regards supplies of enriched uranium to the Community is conditioned by two separate problems:

(a) supplying the power plants which will be requiring their first fuel before 1 July 1982;

(b) supplying the power plants which will be requiring their first fuel after that date.

The above dates correspond to the deadlines laid down by the USAEC for the conclusion of long-term contracts, which mean they have been inevitably imposed on users throughout the world in view of the virtual monopoly held by the USAEC in uranium enrichment until recently.

1. SUPPLYING THE POWER PLANTS WHICH WILL BE REQUIRING THEIR FIRST FUEL BEFORE 1 JULY 1982

Community users have tried to diversify their supply sources for this series of reactors by applying to:

(a) European producers (EURODIF, URENCO);
(b) a Soviet producer (TEKHSNABEXPORT);
(c) an American producer (USAEC).

During late 1973 and early 1974 European producers witnessed the saturation of the production capacities planned in their respective development programmes; some of them were even unable to meet orders received from European users.

The European users which approached TEKHSNABEXPORT found it possible to conclude contracts on reasonable and fairly flexible terms.

With regard to supplies from the USAEC, difficulties arose for the Community because of the new criteria it had set in May 1973 for the conclusion of contracts. These criteria involved fairly strict trading terms and the stipulation that new long-term contracts should henceforth be concluded eight years before the first delivery. The application of these criteria was, however, subject to a transitional period during which:

(a) in the first phase, utilities requiring their first fuel before 1 July 1978 should conclude their contracts with the USAEC before 31 December 1973 (three Communityutilities concluded their contracts before this date);

(b) in the second phase, utilities requiring their first fuel between 1 July 1978 and 30 June 1982 should conclude their contracts with USAEC by 30 June 1974 at the latest. On that date the USAEC was unable to accept all the orders received for the following reasons:

(i) a year ago, the USAEC estimated that, between spring and autum 1974, it would have reached the limit of the contractual commitments which the Congress had laid down for it in the light of available capacity. Depending upon whether plutonium was recycled or not, the limit was set at 382 or 275 GWe respectively;

(ii) since nuclear programmes throughout the world have been stepped up as a result of the energy crisis, the number of applications for long-term contracts on 30 June 1974 exceeded previous estimates.

The USAEC, which until then had firmly committed itself for 273 GWe, was obliged to reconsider the whole situation and divide the difference between the total amount firmly ordered (364 GWe), and the amount already committed by contract (273 GWe) into two categories:

(a) for the first category, up to a ceiling of about 320 GWe, the USAEC has concluded firm long-term supply contracts (all US reactors are included in this category, together with five Community reactors and 28 other reactors elsewhere in the world);

(b) the second category includes 45 non-American reactors with which the USAEC is willing to conclude conditional contracts for a date as yet unspecified but situated somewhere near the end of 1974 (18 Community reactors are included in this category). For contracts to be concluded before this date, the USAEC reserves the right of cancellation if the statutory provisions allowing plutonium recycling in the United States are not approved by 30 June 1975. Furthermore, at least some of these contracts may be cancelled on certain conditions if private enrichment facilities are firmly decided upon.

Apart from the commitments which may materialize from these conditional contracts, the USAEC will undertake no contractual commitments to supply reactors requiring their first fuel after 1 July 1982.

The problems of conditional contracts arises because of the inconsistency between the legal situation imposed by Congress on the USAEC (contracting capacity) and the actual situation which determines the final date by which new capacities must be brought into operation (new capacity requirements).

However, in a statement made on 6 August 1974, the US president assured the holders of conditional contracts that, whatever happened, the United States would meet the commitments laid down in these contracts.

Confronted by this situation the Commission and Euratom Supply Agency took steps to try and alleviate the difficulties facing European users who were invited to subscribe to conditional contracts.

The principal steps taken were as follows:

(a) postponing the final date originally set to 31 October 1974;
(b) obtaining from the USAEC reciprocity clauses regarding possible cancellation of contracts;
(c) exploring the possibilities of taking over firm contracts from American users.

Provided that the problems created by the conditional contracts are resolved it seems that, until 1982, all the requirements of users will be covered, perhaps even with a safety margin. EURODIF and URENCO posses supplementary and reserve quantities in various forms. Thus, on the whole, the supply situation up to 1982 appears relatively satisfactory.

2. SUPPLYING OF POWER PLANTS WHICH WILL REQUIRE THEIR FIRST FUELS AFTER 1 JULY 1982

This is where the fundamental strategic problem of Community supplies arises, because - as stated earlier - it is now certain that the USAEC can no longer undertake contractual commitments to supply fuel to reactors requiring their first deliveries after 1 July 1982.

Any subsequent possibility of access to a private or Government-owned American source will therefore depend on the decisions which private industry might take to build new facilities or, failing such decisions, steps which the American Government would be obliged to take to ensure the continuity of supplies.

The final date by which private industry should take a decision seems to be the end of 1975.

There is thus a period running to the beginning of 1976 in which it will be impossible to obtain firm supply commitments from the United States for first deliveries to be made after 1 July 1982.

The beginning of 1976 is not too late to commission new enrichment facilities without interrupting the flow of domestic or foreign supplies. However, such a long period of contract uncertainty may prejudice the smooth development of nuclear power, and consequently the general energy situation, including that of the Community.

In view of this basic strategic problem it is therefore essential for the Community to be able to rely on an adequate contribution from its own producers and, in particular, to find out in the near future on what terms and in what quantities EURODIF and URENCO would be willing to undertake firm commitments in the next few months to supply enriched uranium from 1 July 1982 onwards.

Thus for the year 1985, the supply situation estimated on the basis of the criteria chosen by COPENUR* is as follows:

- Community requirements		19 million t SWU
- sure supplies:		13 million t SWU
(non-European sources)	(4)	
(European sources)	(9)	
- remaining demand		6 million t SWU

The figure given for remaining demand does not allow for the operating stocks which operators are seriously considering building up and which could begin to have an impact on demand by the end of this decade. Furthermore, the annual increase of requirements in the two or three years following 1985 will be in the region of 4 million t/year of SWU.

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* COPENUR: Standing Committee for Uranium Enrichment.

The two European producers consider that new investment decisions could be taken by mid-1975, provided that European users undertake firm commitments enabling them to plan their operations for several years ahead on a reasonably assured basis and with satisfactory terms of supply. In the longer term, the Community will have to envisage the participation of natural uranium producing countries in the enrichment process.

PLUTONIUM

1. Plutonium is the ideal fuel for breeder reactors and has the great quality of revitalizing depleted uranium; it can therefore make a significant contribution to the Community's long term supplies. This will depend heavily on the rate of development of breeder reactors for electricity generation.

   Until the plutonium produced by thermal reactors - and thus already available - is completely absorbed by fast breeder reactors, there remains the problem of choosing the best method of managing the accumulated quantities.

2. Three types of plutonium storage are possible: inside irradiated fuel elements, in the state in which plutonium is removed from these elements and, after insertion in new fuel elements, by recycling in thermal reactors.

   (a) storage of irradiated fuel elements containing the generated plutonium; even allowing for the construction of the requisite pools for the operation, this solution is the cheapest in initial investment and is justified until a genuine market develops;

   (b) storage of plutonium extracted from irradiated fuel elements, which is more costly but has the advantage of launching the reprocessing industry gradually and the equally appreciable advantage of having the plutonium readily available. This solution poses certain safekeeping problems (storage and transport) because plutonium is both highly toxic and strategically important; but since these problems will eventually have to be solved on a large scale, it would only be a question of anticipation.

(c) Recycling in thermal reactors is undoubtedly the solution which requires the most investment and research, but it also presents undoubted advantages: first of all it is a plutonium storage method which is dovetailed into a system of energy production without loss of energy from the product stored; it prepares the industry for reprocessing and manufacturing plutonium-bearing fuel elements, which will be essential operations in breeder reactors; finally, and above all, it contributes the requisite flexibility for a possible saving of about 10 % in the "uranium enrichment" fuelling system[1]. Provided that the commercial operation of breeder reactors is suitably planned, recycling need not give rise to a plutonium shortage; it is enough for the necessary quantities to be immobilized - or reserved - with a period of notice of five years.

In order to enable the Community to acquire the technological know-how which it will need if it uses this technique the Commission recently forwarded proposals to this effect to the Council, under the Euratom Programme of Indirect Projects.

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[1] Thermal reactors.

REPROCESSING

The main reason for reprocessing irradiated fuels, from the supply point of view, is to extract the fissile materials contained therein, namely slightly enriched uranium[1] and plutonium produced by the irradiation of the uranium. Reprocessing thus constitutes a uranium-recovery operation and a plutonium-producing activity; it is an essential feature of a nuclear fuel supply policy.

In the Community, the prospects for reprocessing uranium oxide fuels are at present as follows:

(a) Facilities[2]

(i) the BNFL plant (Windscale, UK) will resume activity in 1976, when its capacity should be gradually brought up to 400 t/year; in 1981/82 it is planned to raise the capacity of BNFL to 800 t/year at least.

(ii) the CEA plant (La Hague, France) will handle some 100 t/year in 1975 then progress gradually to 800 t/year in 1980.

(iii) the KEWA plant (Germany), which is not yet built, will have a capacity of 1 500 t/year and should become operational by 1983/84.

These three plants have signed an agreement to form a joint subsidiary, United Reprocessors Gmbh (URG).

These capacities will suffice for the requirements of European (including Spanish, Swedish and Swiss) users until 1980. Between 1980 and 1984 a shortage of reprocessing facilities may arise. However, it will not be possible to offset this shortage either by establishing further facilities, since it takes six to nine years to design, build and bring into service a large plant, nor by having recourse to outside facilities because these will be even more tightly stretched than those in Europe.

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[1] The reprocessing of natural uranium fuels poses no supply problems, because its contribution will become marginal.

[2] There is also the Eurex 1 plant with a capacity of 25 t/year which could later be followed by Eurex 2 with a capacity of 300 t/year, but at an unspecified date.

Hence, the excess facilities which, less than a year ago, it was thought would not be resolved until about 1985 no longer feature in the forecasts. There are two main reasons for this:

- reprocessing will be feeling the impact of more ambitious nuclear electricity programmes by 1979/1980;
- plant designs are having to be revised because of the difficulty of solving certain technical problems on an industrial scale.

b) Relation between reprocessing and management of radioactive waste

An inevitable by-product of the reprocessing of irradiated fuels is radioactive waste, particularly high-activity waste.

The technico-economic characteristics of reprocessing are such that, during the next ten years, it will be advisable to build plants on a scale which exceeds the requirements of national markets. This was in fact one of the reasons why the above-mentioned URG was formed; its immediate consequence is the development of a Community reprocessing market.

Until techniques for solidifying radioactive waste have become industrially viable and a method and policy of permanent storage have been chosen, this waste is conditioned in liquid form and there are arguments to justify its storage on the site of the reprocessing plant. However, the concentration of facilities in a small number of integrated plants - which is sound policy not only for economic, industrial and commercial reasons but also because it harnesses development efforts together - can in the short term raise a difficult question of responsibility; to what extent and under what conditions can the authorities of the countries where such plants are sited agree to have waste of foreign origin stored on their territory?

The solution must be found through a Community policy - or if possible an international policy - of waste management, which clearly establishes the sharing of responsibility. The Commission is preparing proposals on this subject which it will forward to the Council under its environmental policy.

Although this is not strictly a 'supply' problem, it may affect the supply situation adversely if a satisfactory solution is not found at an early date.

ECONOMIC ASPECTS

The investment required for supplying the Community with nuclear fuels as described above[1] may be estimated as follows:

(in million u.a.)

	1975	1980	1975/80	1985	1975/85
Natural uranium (mining)	71	150	695	167	1492
Enrichment facilities	48	478	2248	651	4914
Reprocessing facilities		26	28	290	982
	119	654	2971	1108	7388

Resulting turnover will be as follows in 1985:

(in million u.a.)

- Natural uranium
  15 u.a./lb. (50,000 t) 1 650

- Enrichment
  70 u.a./kg (25,000 t) 1 680

- Reprocessing
  80 u.a./kg (2,650 t) 212

i.e., a total turnover of about 3 500 million u.a.[1].

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(1) No account has been taken of U_3O_8/ UF6 conversion, transport, fabrication of fuel elements and management of radio-active waste.

Part II

Essential features of a supply policy

A. Introduction

1. The problems

An analysis of the general situation and features of the supply of nuclear fuels (natural uranium, enriched uranium and plutonium) reveals the scope and complexity of the problems to be solved in a new energy policy strategy in order to assure the Community of satisfactory supply conditions.

The following figures show the scope of these problems over the next ten years :

- the annual demand for nuclear fuels will increase almost tenfold,
- the corresponding capital investment for production of materials and services alone will amount to nearly 7.000 million u.a.,
- the turnover in this sector could, following current trends, be 3,500 million u.a. in 1985 alone.

The complexity of the problems lies in the difficulty of matching supply and demand levels because of :

- the extraordinarily rapid growth of demand which in the medium term can only be estimated with a natural margin of uncertainty;
- the long lead times, impossible to reduce and sometimes even to ascertain, for the provision of essential facilities (construction of power stations and production plant, ore prospecting). The complexity also stems from the Community's dependence on non-member countries for its uranium supplies.

2. The major lines of the proposed policy

(i) The purpose of a supply policy is to find solutions suited to the scope and complexity of the problems. The main objectives are first to improve the Community's security of supply for nuclear fuels by ensuring :

(a) adequate materials and services

(b) reasonable prices and

(c) adequate stability in development;

and secondly to strengthen the infrastructure of the European fuel industry, particularly in order to promote exports of nuclear power plants.

(ii) There are three main implications if these objectives are to be attained:

(a) diversification of sources of supply,

(b) establishment by the European industry of sufficient capacity to enable it to meet Community requirements adequately and to operate on the world market.

(c) development of cooperation with countries producing natural uranium. The nature and extent of the efforts to be made justify Community measures to ensure long-term returns on the investments made by industry.

(iii) To attain the full effect expected of it, the policy must adhere to the elementary principles of :

- non-discrimination, although making due allowance for the degree of involvement of the parties concerned;
- community of interests of the partners in the development of nuclear power; this must come to the fore particularly in the event of supply or marketing difficulties.

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3. Scope

Supplies of nuclear fuels include supplies of ores, source materials and special fissile materials, together with supplies of services such as enrichment and reprocessing.

As far as the production and distribution of these fuels is concerned, the common supply policy applies to all the operators involved.

B. Permanent bases

I. Information

A thorough knowledge of the world nuclear fuel market and the Community's supply situation is essential for the definition, implementation and management of measures under the common policy. Consequently the Community must have at its disposal sufficient clear and reliable data collected and processed at a speed consistent with the mobility of the market and by methods ensuring that trade secrets will not be disclosed.

All this information must flow to the Commission from both undertakings and states, either directly or through the Supply Agency. It must cover in particular :

- the market situation and future outlook including the scheduling in time of the requirements covered, the origin of supplies and the level of stocks;
- thestatus and prospects of nuclear fuel production capacity;
- the status and prospects in ore prospecting.

With regard to the last two points, the Commission intends to request the parties concerned to forward their programmes and estimates to it annually.

2. Nuclear power production targets

In parallel with the flow of information to the Community authorities to enable them to formulate the supply policy, there must be a flow of information to individual operators to provide them with facts and guidance.

This is stipulated in Article 40 of the EAEC Treaty, which reads :

"In order to stimulate action by persons and undertakings and to facilitate coordinated development of their investment in the nuclear field, the Commission shall periodically publish illustrative programmes indicating in particular nuclear energy production targets and all the types of investment required for their attainment". In the early days

of the nuclear industry, the programmes published were documentary and explanatory rather than illustrating firm intentions. To meet the new energy supply situation in the Community, which makes it essential to substitute nuclear for conventional energy at a faster rate, these programmes must henceforth meet new criteria :

- frequent and regular publication,
- period of reference consistent with the lead times inherent in investment decisions,
- credibility of targets.

Without anticipating the results of the studies to be made of the other aspects of nuclear energy in this context, there must be a fuel supply programme that is capable of future adjustment and lays down amongst other things long-term targets regarding the increase in Community requirements and their coverage.

3. Smooth Functioning of the Market

The establishment of optimum nuclear fuel supply stability and the development of an industry capable of covering a substantial proportion of internal demand and of occupying a satisfactory position on the world market can only be achieved by aligning the interests and uniting the efforts of Community producers and users. It should therefore be consolidated by mutual rights and obligations.

To achieve this balance without encroaching on the right of individual initiative, the Community authorities must provide a framework for the operations of the undertakings concerned.

The aim must be :

(a) to give fuel producers the guarantee of a large enough market to ensure the viability of their undertakings, in return for their agreement to reserve a certain proportion of their output for the Community's requirements;

(b) to give users -and this also serves the general interest - the guarantee of a regular flow of supplies for a prolonged period of time, in return for their agreement to obtain a certain proportion of their supplies from the producers who have committed themselves as described under (a) above.

To implement such a contractual policy, a list of approved producers must be drawn up and placed at the disposal of users, and consultations must be held to determine the prior notice which must be given for fuel orders and the schedule of corresponding deliveries, so that the satisfactory expansion of production facilities is ensured.

In the light of regular reports from the Supply Agency on the workings of the market, the Commission will be able to keep the Council informed and, should the situation so require, make appropriate proposals to it; these proposals would be designed to promote the expansion of European production, with due regard to its need to adjust to world market trends.

C. The action programme

1. Access to source materials

The first step taken by the Community should be aimed at securing access to source materials - and especially natural uranium - by establishing suitable conditions for the operations of its mining industry in non-member countries and on its own territory.

In the non-member countries, where more than 90 % of known reserves are located, the Community should explore the possibility of obtaining natural uranium from the countries with which it maintains relations. It should therefore develop appropriate contacts with such countries. In its approach, the Community must bear in mind the policies pursued by some of these countries to obtain the maximum return from their natural resources and envisage the possibility of industrial cooperation between Europe and the country concerned for the enrichment of natural uranium.

The Commission intends to make an immediate approach to countries having natural uranium resources, in order to explore ways of facilitating the attainment of the Community's supply targets.

With the developing countries the Community could examine what scope there is, in their scheme of development priorities, for financial participation in prospecting and production and associated infrastructure development.

At the same time the Community should encourage the identification and utilization of its own resources and foster efforts by European companies to strenghthen their industrial base.
In this connection, it must be possible to prepare the development of certain reserves - "earthbound stocks" capable of supplementing, if necessary, the security stocks mentioned below.

It must therefore be possible for the Community to participate financially in the cost of prospecting campaigns.

2. Production

In helping to set up a production industry which satisfies an adequate proportion of its requirements, the Community cannot confine itself to the organization of the market and measures to secure access to source materials, but must also provide technological and industrial incentives.

In its communication to the Council entitled "Energy for Europe : Research and Development" (SEC (74) 2592 final), the Commission has already indicated the areas in which concerted efforts could be made or intensified in connection with nuclear supplies :

- reprocessing methods, mainly for advanced fuels,
- extraction of uranium from low-grade ores and as a by-product of the phosphate industry.

It now suggests the addition of :

- advanced methods of ore prospecting and dressing, including the analysis of mineralization phenomena,
- advanced enrichment methods.

The Commission plans to consult the circles interested in the development of these technologies and then to report to the Council on the possibilities of providing Community incentives. In its Resolution of 4 June 1974 concerning the supply of enriched uranium to the Community, the Council recommended "that the exchanges of views between producers continue with a view to concerted, harmonious development of the existing projects as long as the situation requires".

The Commission considers that similar consultations must cover the whole nuclear fuel production sector. In addition, because of the low elasticity of the "production-utilization" system, consultation between producers and users - started in the Consultative Committee of the Supply Agency and the Standing Committee on Uranium Enrichment - should be stepped up. The Commission intends to make the necessary steps and will keep the Council informed of developments in the situation.

Finally, in the Commission's view the Community should be able to offer support by granting joint undertaking status(*) to undertakings engaged in prospecting or production and also to undertakings having research and development activities. Projects encouraged in this way would benefit from the advantages resulting from their Community nature.

Despite the possibilities for developing a Community enrichment capacity, the Community will continue to rely on non-member countries for at least some of its nuclear fuel supplies. It is therefore essential that Community industry should see ways of participating as much as possible in the development of enrichment in the countries where natural uranium reserves are located.

3. Stocks

Any decision to build up stocks to a volume consistent with the economic and life characteristics of nuclear fuels must be taken at Community level, as in the case of other energy producing materials.

The main purpose of keeping stocks is to increase security of supply. There are other reasons, such as regular supply conditions and the fact that by enabling production to be spread out evenly, stocks facilitate the commissioning of Community facilities.

The Commission will consult the interested circles and if the results bear out the benefit of such action at Community level, it will submit suitable proposals to the Council.

4. Supply difficulties

The Community must also plan a number of measures to be taken in the event of supply difficulties. In particular it must prepare - as it has done for other energy producing materials - a scheme for the allocation of resources in times of crisis, laying down the limits and arrangements for general or selective interdependence and the machinery to set the allocation scheme in motion. In the same context, a reinsurance scheme in the event of failure should be established between producers.

The Commission intends to consult the Member States on the principles of the scheme and then submit to the Council a communication outlining the measures to be taken in the event of difficulties.

(*) Chapter V, EAEC

D. The role of the Supply Agency

If the measures in the programme outlined above are to be effective, the Community must have a suitable instrument capable of acting in the public interest with the speed and flexibility called for by market conditions. This instrument already exists : it is the Supply Agency. It has legal personality and financial autonomy but is under the supervision of the Commission which issues directives to it and has a right of veto over its decisions. The Community need only continue to use this instrument, after redefining its sphere of action and the principles guiding its work.

The Agency whose chief role is to facilitate the flow of supplies to all Community users, is active in the following fields :

- the conclusion of contracts,
- implementation of the common policy,
- information - which is related to its normal activities.

The Agency's right to participate in the conclusion of supply contracts when one of the parties is a Community producer or user enables it :

- to ensure that the principle of non-discrimination is observed, with the necessary modifications to take account of the involvement of the parties;
- to ensure that supply contracts are in conformity with the policy regarding the orderly supply of the market;
- possibly, on a directive of the Commission, to intervene itself.

The implementation of the common policy, which must express the general objectives in practical terms, covers any tasks assigned by a Commission directive after a Decision of the Council, in particular the preparation and, where appropriate, carrying out of measures to overcome supply difficulties.

Information on market trends (requirements, availabilities, extent to which demand is covered, prevailing prices),while not disclosing trade secrets, enables :

- the Community authorities to shape the supply policy,
- producers and users to obtain a clearer view of the market, which will help them in their operations.

DRAFT RESOLUTION

on the development of nuclear energy

in the Community

THE COUNCIL OF THE EUROPEAN COMMUNITIES

Having regard to the Communications from the Commission entitled:

- Promotion of the use of nuclear energy[1]
- Towards a Community supply policy[2]
- Community energy policy: objective 1985[3]

Whereas the EAEC Treaty entrusts the Community with the task of creating the conditions necessary for the speedy establishment and growth of nuclear industries and having regard to the guidelines adopted by the Council on 17 September 1974;

Whereas, in its Resolution of 17 September 1974, the Council adopted certain guidelines concerning nuclear energy;

Whereas the Community's present energy supply situation and future prospects demand that all energy resources accessible to the Community be harnessed, and whereas, consequently, nuclear energy is required to contribute substantially to the coverage of the Community's energy requirements while also, like all other forms of energy, complying with the demands of ecology, economy and security of supply.

Whereas, with a view to the achievement of the above mentioned objectives, the Community must contribute towards the protection of the public against the hazards inherent in the use of nuclear energy and whereas it should continue and increase its efforts to strengthen the industrial, scientific and technological base and improve the security of nuclear fuel supplies;

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[1] COM(74)10 final, 1 February 1974

[2] COM 74/1963

[3] COM 74/1960

1. Takes note of the plan of action presented by the Commission in its Communication[1] on the protection of the public and strengthening of the industrial, scientific and technological base;

2. Affirms the need, in order to improve the security of nuclear fuel supplies, to define and implement a Community policy covering, in particular:

- the development of reliable resources in the Community and access to such resources in non-member countries;

- the promotion of an industry capable of covering an adequate proportion of the Community's requirements and of operating on a world market;

- the institution of cooperation with natural uranium producing countries;

- the development of research to promote technological innovation.

3. Declares that such a policy should be carried out by the following means:

- amalgamation of national and Community efforts;

- a constant supply of accurate and harmonized information;

- consultations with industrial operators.

4. Recognizes that the implications of such a policy are as follows:

(a) the illustrative programmes provided for under Article 40 of the EAEC Treaty must be drawn up annually;

(b) the Community must contribute towards strengthening industrial nuclear potential, in particular,

- by making a financial contribution to ore prospecting campaigns;
- by encouraging adequate advance notice of nuclear fuel orders to those undertakings which agree to supply the Community regularly;

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[1] COM (74) 10 final of 1 February 1974.

- by coordinating and, where appropriate, participating in the constitution of stocks;

(c) the Supply Agency must serve as an essential instrument for implementing the common policy;

5. Underlines that this policy must be backed by cooperation with non-member countries;

6. Confirms the urgency of the need to make progress in these fields, at both Community and national levels;

7. Invites the Member States and undertakings to assist the Commission in the preparation of practical proposals to be submitted to the Council.