

# COMMISSION OF THE EUROPEAN COMMUNITIES

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## COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

### POINTS FOR A COMMUNITY STRATEGY ON THE REPROCESSING OF IRRADIATED NUCLEAR FUELS

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REPROCESSING OF IRRADIATED NUCLEAR FUELS

Introductory note

In its communication to the Council of 13 May 1977, entitled "The Community and the International Nuclear Environment"\* , the Commission announced its intention to present to the Council certain additional communications at a later stage, particularly regarding Community guidelines on the reprocessing and storage of radioactive waste and the introduction of fast breeder reactors in the Community.

This communication contains proposals for Community guidelines on the reprocessing of used nuclear fuels.

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\* COM(77)163 final

## COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

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### POINTS FOR A COMMUNITY STRATEGY ON THE REPROCESSING OF IRRADIATED NUCLEAR FUELS

#### I. Foreword

Reprocessing is a complex chemical process applied to used fuels discharged from nuclear power stations. These used fuels consist of a mixture of re-usable products (unburned uranium, and plutonium generated during irradiation in the power station reactor) and radioactive wastes (fission products).

Reprocessing makes it possible to separate these various products and to recover those which can be used again.

Plutonium can be burned with uranium in light water reactors (LWR) and it is of greatest importance as the fuel necessary for the operation of fast breeder reactors, which could secure the long-term future of nuclear energy in the Community. It can also be used to manufacture nuclear explosives. It is not highly radioactive, but it is very toxic if absorbed through the respiratory system.

Recycled uranium can be used in reactors. It raises no problems, owing to its low level of enrichment.

Reprocessing is thus a factor to be taken into account in :

- medium and long-term energy policy;
- research, advanced industrial development and economic development;
- protection of the environment and the safety of workers and the population.

It must be subjected to the measures necessary to prevent the diversion of nuclear materials.

As was stressed by the European Parliament in its resolution of 10 May 1976<sup>\*</sup>, and having regard to the new American attitude in this field<sup>\*\*</sup>, steps are called for at Community level to examine the place for reprocessing within the pursuit of the Community's objectives - particularly in the energy field - and to define action to be taken on reprocessing, for:

- (a) The Community has responsibilities and powers, and is pursuing objectives, in the fields mentioned above.
- (b) National frameworks taken in isolation are clearly becoming increasingly unsuitable for the solution of the whole complex of difficulties which are at present holding up progress in the development of the reprocessing industry.
- (c) The Community and its Member States must work out solutions within the reprocessing field which will both meet the conditions set out above and respond to international preoccupations regarding the development of nuclear energy.

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## II. Reprocessing and the Community's objectives

### A. Objectives in the industrial and energy fields

Reprocessing may be seen to be one of the essential components of a policy designed to achieve the Community's objectives in the industrial and energy fields.

Indeed:

- The Community is in a difficult position with regard to energy; its fossil fuel resources are limited and to some extent costly; it is therefore heavily dependent on imported petroleum (55 % of Community energy requirements in 1976). The increased availability of petroleum from the North Sea is not likely to bring about any fundamental change in this situation.

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\* O.J. no C 125/14 of 10 May 1976.

\*\* Cf. document COM(77)163 final of 13 May 1977.

- recourse to nuclear energy is indispensable to securing a reduction in this level of dependency and to diversify sources of supply thus making it possible for the objectives which the Council has laid down on Community energy policy to be achieved.
- nuclear energy and coal are at present the main resources available to cover energy needs in the face of a progressive decline in petroleum reserves.
- but the Community's own resources of nuclear fuels fall far short of its requirements (approximately 80% of the uranium supplies to the Community as a whole are imported). These requirements may be expected to account for approximately one third of world requirements by the year 2000;

Consequently, reprocessing can make it possible to secure:

- a) in the medium term (1985-90), a reduction in the requirement of uranium (in the order, on average, of 20% per year) and in the workload of enrichment (in the order of 15% per year) in the Community, with the aid of uranium and plutonium recycling at LWR power stations. The present difficulties with regard to reprocessing and the supply of plutonium to the first fast reactor power stations would probably restrict this reduction to half of the percentage indicated above\*.
- b) In the long term, the prospect of virtual freedom from dependence on external supplies of uranium, thanks to fast breeder reactors. It is thus no accident that the countries most heavily committed to the development of fast reactors and reprocessing are in the Community. This commitment has so far been reflected in a very high level of expenditure and investment.

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\* The cumulative economy achieved during the period 1985-90 by partial recycling would lie within the order of 30 000 t of natural uranium, i.e. 300 million t petroleum equivalent (tpe).

Moreover, the Community has to balance its imports, particularly of raw materials, to the best of its ability by exports of manufactured goods and advanced technology. Nuclear power stations, in particular, constitute a major export market, but the export of nuclear power stations is and will continue to be made considerably easier if the vendor can also supply the buyer with certain services for the associated fuel cycle.

From this point of view, reprocessing is also an important factor in the industrial and commercial development of the Community.

B. Protection for the population and the environment

It has also become apparent that reprocessing and the industrial operations associated with it (fabrication of plutonium fuel elements, transport of recovered radioactive materials, waste management) are, as shown by experience to date, compatible with the objectives concerned with protection for the population and the environment of the Community and must continue to be so throughout this development process.

Indeed:

- the short-term radiological risks (workers and population) may be reliably assessed on the basis of past experience. The doses recorded hitherto have been below the limits imposed by the health and safety rules of the Member States of the Community and in conformity with the Community radiological protection standards (Euratom Basic Standards).
- the very long-term radiological risks (future generations) will arise mainly from certain long-lived radioactive wastes. Programmes in progress\* point to the existence of promising solutions for the isolation of these wastes from the biosphere (permanent storage in geological formations, for example).

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\* In particular, the Community research and development programmes in progress on the management and storage of radioactive waste.

- finally, the radiological risks for future generations would probably be increased if reprocessing were abandoned. Indeed plutonium\* would have to be added to the list of unusable products which remain radioactive for a very long time and the permanent storage of which (hundreds of thousands of years) is the cause of these risks.

C. Guarantee against the possibility of nuclear materials being diverted to purposes other than those for which they are intended

Plutonium can be used for the manufacture of nuclear explosives if certain conditions are present. The risk of plutonium being used for purposes other than that of a reactor fuel can be overcome by adequate and effective measures relating to the supervision of end-use and physical protection.

The Community has competence and resources to make a significant contribution to ensuring that nuclear materials are not diverted to purposes other than those for which they are intended (Article 2, e of the Euratom Treaty).

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\* This substance is in fact a mixture of plutonium isotopes, the radioactivity of which is of extremely long duration and the toxicity extremely high.

The Community:

- has at its disposal the Euratom system of safeguards which operates in accordance with Chapter VII of the Euratom Treaty and its implementing regulations;
- has concluded with the IAEA the Verification Agreements of 5 April 1973 and 6 September 1976;
- is empowered to conclude with third countries or international organizations, under the terms of Articles 101 and 77 of the Euratom Treaty, agreements involving special commitments concerning safeguards which seem appropriate to the situation and to international requirements in this field at any given time.
- may under the terms of Article 59 of the Euratom Treaty oppose the export of plutonium produced in the Community if such export is contrary to "the general interests of the Community", which may be assessed, in particular, in the light of the objectives of the Euratom Treaty.
- may contribute to the establishment of "regional" reprocessing and storage centres by applying certain provisions of the Euratom Treaty such as those referring to the Joint Undertaking (Articles 45 ff) and to the storage of fissile materials (Article 62 and, in particular, Article 80);
- The foregoing must be supplemented by physical protection measures; \* on the basis of Article 203 of the Euratom Treaty, the Community may take appropriate measures at Community level. These measures would basically be aimed at harmonizing within a Community framework the standards of physical protection adopted by the Member States \*\*.

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\* Protection against malicious acts, covering all operations associated with reprocessing, including transport.

\*\* Cf. Communication from the Commission to the Council on this subject, COM(76)76.



### III. The present position with regard to reprocessing; the difficulties

The industrial development of reprocessing is at present hampered by :

- problems in perfecting the technology of the processes involved and adapting them for practical application. Processes successfully developed during the 1940-60 period within the framework of first the American, then the British and French military programmes, using slightly irradiated metallic fuels, proved more difficult than had been expected to transpose to the reprocessing of highly irradiated oxide fuels at LWR power stations.
- financing problems. The commercial viability of reprocessing remains to be established, at least in the short term\*. Consequently industry is hesitating to invest, at least without heavy financial participation by public bodies or potential clients (electricity producers).
- problems associated with the industrial application of technologies concerned with radioactive waste and effluent and with the continued strengthening of safety arrangements. These problems give rise to uncertainty with regard to additional amounts of investment which may be required and delays in the preparation of safety reports.
- difficulties with regard to public acceptance which are making themselves felt in varying degrees in the Community and are at present slowing down certain plant construction projects;
- quite recently, by attitudes now being adopted in America.

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\* The economics of reprocessing and the associated operations are subject to a considerable margin of uncertainty ranging from profitability to a heavy burden of costs, depending on the hypothesis selected. The main sources of this uncertainty are the costs of management and storage of the radioactive waste and the values to be assigned to the materials (uranium and plutonium) recovered by reprocessing.  
The impact of the possible cost of these operations on the cost of nuclear energy is not considered to be prohibitive (4-5% of the cost per KWh). Moreover a strategy excluding reprocessing is bound to be costly since, in that case, the re-usable fuels (unburned uranium and plutonium) would be regarded as waste.

These difficulties are causing considerable delays in the decision to build, in the actual construction of plants and in the commissioning of commercial-scale oxide reprocessing facilities.

Although most countries with a significant nuclear programme have projects for reprocessing plants currently in hand, no large oxide fuel\* reprocessing facilities are at present in service anywhere in the world, with the exception of the big plant at La Hague (COGEMA, France) which began operating on reduced load in 1976.

Consequently, a comparison between present trends in requirements and available uranium oxide fuel reprocessing capacity in the Community and the world shows that capacity will be insufficient to meet the need in the years to come.

In the Community, capacity will remain below annual requirements up to around 1986-89\*\*.

This also means that the stock of irradiated fuel accumulated since 1975 will only be entirely reprocessed some years later, i.e. at best after 1988.

As far as the Community is concerned\*\*\*, the figures would be as follows:

	1980	1985	1990
Nuclear power station construction programmes (in GWe)	40-48	85-95	140-180
Cumulative reprocessing requirements from 1975 (in thousand tonnes of uranium content)	2	8-9	20-25
Cumulative requirements not covered (stocks awaiting reprocessing) (in thousand tonnes of uranium content)	1	3-4	10-15

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\* These are the only fuels to which consideration is henceforth given. They are the fuels of importance to light-water and heavy-water reactors and to the British AGR type.

\*\* According to pessimistic and optimistic forecasts made on the development of programmes for the construction of nuclear power stations and reprocessing facilities.

\*\*\* The Community's requirements account for approximately 75 % of European requirements.

N.B. These evaluations do not take into account the possibility that part of the capacity set up in Europe may be set aside for non-European requirements.

These difficulties, if not overcome in good time, could jeopardize the Community's nuclear energy objectives. Moreover, the lack of capacity imposes the need to stockpile used fuel elements pending reprocessing.

These storage requirements, which will be equal to the cumulative requirements not covered, will have to be met if severe adverse effects on the normal operation of the Community's nuclear power stations are to be avoided. They could be met during the period up to 1990 by doubling the storage capacity currently allotted to each nuclear power station\*, although it would seem preferable to limit this storage capacity to the immediate operating needs of each power station.

They could also be met by setting up centralized storage capacity. For example, the Community would by 1990 need to have available 10-15 units of 1 000 tonnes. This would represent an investment in the order of 1 000 million to 1 500 million units of account between now and 1990.

#### IV. Points to be covered by a Community strategy

The above analysis shows that:

- reprocessing is a necessary and decisive stage in a nuclear strategy designed to secure the Community's medium and long-term energy objectives;
- reprocessing is, on experience to date, compatible with concerns of safety and protection for the population and must remain so throughout the course of its future development. The alternative without reprocessing offers no decisive advantages from this point of view (see section B, p. 4);

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\* The present storage capacity of a power station is between one and two discharge per year plus a complete core (in the event that the reactor has to be completely unloaded for inspection). A complete core represents three discharges per year in the case of a PWR. Additional capacity of three discharges per year would be necessary. It may be noted that several operators have already embarked upon developments in this direction.

- the development of new measures, arrangements and techniques ensuring full compatibility of reprocessing with the exclusively peaceful use of nuclear materials on a large scale must be pursued in line with the industrial development of reprocessing.

A Community strategy in this field must therefore :

- Promote the coordinated development at minimum cost of the Community's reprocessing and plutonium industries;
- make sure that reprocessing is compatible with the Community's objectives of population safety and protection of the environment and with the exclusively peaceful use of nuclear materials.

#### A. Promotion

Industrial initiative based on commercial profitability, which is still lacking today, no longer seems adequate to serve as the driving force for the industrial development of reprocessing. The development of the firm United Reprocessors, since its establishment in 1971 in a totally different context, is an example of this\*.

The promoters, whether public (e.g. BNFL\*\* , COGEMA), private (e.g. KEWA) or mixed (e.g. BELGOPROCESS), do indeed subordinate the establishment of new capacity to a limitation of the financial risks and to the requirements of the national nuclear programmes. This assessment varies from one country to another in the Community. In particular, countries with nuclear power plant programmes of modest scope run the risk of being forced to set up companies which are, from the outset, bound to operate on an unsound economic basis\*\*\* in order to ensure at all costs that they have reprocessing services which foreign promoters would not be able - or willing - to provide during periods of world shortage.

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United Reprocessors is a firm providing reprocessing services, which from its inception has grouped British (BNFL), German (KEWA), and French (CEA) interests and whose job has been to coordinate investments in order to avoid superfluous capacity. The Commission accepted the establishment of this company in 1971, after notification in accordance with Council Regulation 17 and pursuant to Article 85 of the EEC Treaty (Competition Rules).

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| BNFL : British Nuclear Fuels Limited                               | (UK) |
| COGEMA : Compagnie Générale des Matières Nucléaires                | (F)  |
| KEWA : Kernbrennstoff-Wiederaufarbeitungs-Gesellschaft             | (D)  |
| BELGOPROCESS : shareholders to be specified (company being set up) | (B)  |

\*\*\* It will be recalled that a reprocessing plant of economic size must be able to serve a large number of 1 000 MWe power stations simultaneously.

The users\* - all of whom are electricity producers - are faced with the dilemma of themselves having to take on heavy financial commitments to ensure that they have the services which they alone require\*\*, or not to have their fuel reprocessed at all.

The Main points of a joint strategy designed to secure the development of reprocessing in the Community should aim at:

- bring about a convergence, between promoters and users interests and linking their action with that of the Community, whilst at the same time extending to third parties (particularly the Community's European neighbours) facilities for joining the group or groups formed;
- "extending to the users of all member countries, including those countries having nuclear power plant programmes of modest scope, facilities for ensuring, by way of participation in the groups formed, that they have the desired reprocessing services under optimum economic conditions, which would make it possible to limit the number of reprocessing plants in the Community to the bare minimum needed".
- facilitating cross-holdings in order to promote the establishment of efficient groups;
- providing certain financial aid (e.g. participation by the Community, participation by third parties).

The legal framework of the Joint Undertaking provided by the Euratom Treaty could be an excellent instrument for the application of this strategy, for it enables industrial initiative to be developed without the public service aspects associated with reprocessing being overlooked. The Commission therefore proposes that this facility should be used, having due regard in particular to the following provisions of the Treaty:

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The statement adopted by the Management Committee of the International Union of Producers and Distributors of Electrical Energy (UNIPEDE) on 17 May 1977 is worth noting in this connection: "The Members of UNIPEDE consider it indispensable, within the framework of existing laws and regulations at national level and where appropriate, within the framework of international cooperation, that urgent priority should be given to the early construction of reprocessing plants capable of meeting requirements. The electricity producers are resolved to make their contribution to the deployment of the necessary industrial effort".

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This is the position of the firm DWK, which groups the German electricity producers and is to take control of KEWA.

- possible participation by the Community in the financing of the Joint Undertaking (Article 46,2,d);
- possible participation by a non-Community country, an international organization or a national of a non-Community country in the financing or management of the Joint Undertaking (Article 46,2,e).

In addition, this promotion strategy would make it possible to establish a bridge with the compatibility strategy dealt with below. Indeed, a joint undertaking of this kind, to the extent that the plants to be covered by it would be concentrated, could constitute the Community formula for "nuclear fuel parks".

Such a strategy should enjoy the cooperation of the main repositories of reprocessing technology.

The Commission proposes that the Council should take a decision to set up a Committee whose task would be to assist the Institutions in the elaboration of this strategy on the basis of the main points set out above, taking into account the respective interests of the promoters and users concerned in the Community and which would report to the Commission and to the Council before the end of 1978 on follow-up action to be taken\*

The Commission proposes to supplement this strategy:

- by drawing the attention of promoters to Community financing facilities, particularly the "Euratom loans";
- by studying the Community provisions designed to ensure that additional storage capacity for used fuel elements will be available sufficiently early and will be accessible to all.

## B. Compatibility

### Health and safety rules

As has been said above, a closed fuel cycle (with reprocessing and re-use of recovered fissile materials) must remain compatible with the objectives of safety and health for the population of the Community, provided the efforts being deployed are vigorously pursued.

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\* Cf. Draft decision included as an annex.

In this connection, the Commission proposes to launch a programme of R&D on the processes which would make it possible to ensure that, in spite of the industrial development of reprocessing, the radioactive pollution of the environment, and particularly the atmosphere, by the big plants of the future will remain negligible.

It may also make proposals to broaden the scope of its current programmes on radioactive waste in a future communication on the subject.

Guarantees against the diversion of nuclear materials

The development of measures, arrangements and techniques to ensure full compatibility of reprocessing with the exclusively peaceful use on a large scale of nuclear materials must be pursued in line with the industrial development of reprocessing.

A reprocessing strategy must, for this purpose, give consideration to:

1. The possibility of influencing the technological processes now undergoing industrial development - all of which involve storage of pure plutonium in large quantities during the course of its re-use, in both light water and fast reactors - with a view to cutting out this storage phase; the joint reprocessing of uranium and plutonium (co-processing); the preparation of standard U-Pu mixtures and the immediate refabrication of control rods are some of the things which should be investigated. The Commission proposes to set up a working party which will make a detailed examination of measures, to be incorporated into proposals for future action in this field, which it might be possible to integrate into the INFCE programme recently proposed by the USA\*.
2. The development of regional structures concentrating the final operations of the fuel cycle in order to limit the geographical dispersion of fissile materials and to ease the task of supervision.

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\* Cf. COM(77)263 of 10 June 1977.

Such structures would offer certain economic advantages, in particular the possibility of increasing the unit size of plants and of reducing the cost of safeguards, and would be concentrated in a very small number of locations (e.g. five sites for Western Europe in the 2000). In the erection of these structures, care should be taken to ensure that they do not lead to situations which are incompatible with the conditions of competition required by the Treaties.

As far as the Community is concerned, such an organization could evolve within the framework of one or more joint undertaking, with possible financial participation by the Community and subject to Euratom safeguards, but with the possibility of participation by a non-member country not ruled out. Such an approach ties in with that recommended above for the promotion of reprocessing.

The (multinational) regional nuclear fuel centres would be governed by such undertakings: the fuel cycle services provided as part of sales of nuclear power stations abroad would be carried out on a commercial basis in these centres, and export of technology would be likewise avoided.

Community participation in the infrastructure costs in general and in the permanent storage of radioactive waste in particular would make it possible extend free access to the regional centre to all the industries of the Community and to relieve the host country of part of the burden by establishing the storage sites as Community undertakings.

3. The development of a system of international agreements and arrangements covering, in particular, the export of sensitive materials and technologies. Such a system which could involve measures aimed at international trade in fissile materials, including stockpiling, affects the nuclear industry as a whole and impinges upon the interests of the Community and its Member States. The Commission feels in this regard that the Community should participate as a Community in the international discussions on these subjects, in accordance with a suitable procedure\*.

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\* COM(77)163 final of 13 May 1977 "The Community and the International Nuclear Environment".



The Commission invites the Council to give its agreement to the following :

- The Community and its Member States must retain the possibility of recovering and recycling used fuels discharged from nuclear reactors.
- It is accordingly necessary to promote the coordinated development at minimum cost of the reprocessing and plutonium industries in the Community, while ensuring that these activities are compatible with the objectives of safety for the population of the Community and protection of the environment with the exclusively peaceful use of nuclear materials. The Joint Undertaking provided for in the Euratom Treaty would be an eminently suitable instrument for this purpose.
- It also asks the Council to take a decision setting up an ad-hoc Committee on the reprocessing of irradiated nuclear fuels (Cf. draft Decision attached as an annex).

DRAFT COUNCIL DECISION ON THE SETTING UP OF AN AD-HOC  
COMMITTEE ON THE REPROCESSING OF IRRADIATED NUCLEAR  
FUELS

The Council of the European Communities;

- Having regard to the Treaty establishing the European Atomic Energy Community;
- Having regard to the Commission draft;
- Whereas the Commission has presented to the Council a Communication on "Points for a Community strategy on the reprocessing of irradiated nuclear fuels";
- Whereas reprocessing is one of the necessary components of a policy aimed at securing the Community's objectives in the industrial and energy fields and whereas it is therefore important to promote the coordinated development at minimum cost of reprocessing;
- Whereas the safety and protection of the general public and the environment must be preserved from the potential hazards associated with nuclear activities;

has decided as follows:

- An ad-hoc Committee on the reprocessing of irradiated nuclear fuels, whose terms of reference shall be as set out in the Annex to this Decision, is hereby set up;
- The Committee shall consist representatives of the public bodies and undertakings concerned, with the various aspects of processing referred to in the recitals, a maximum of three members being appointed by each Member State Government. The Chairman of the Committee shall be supplied by the Commission; the Secretary shall be supplied by the Secretariat of the Council. The Committee shall be free jointly to call upon the services of representatives of non-Member States and of undertakings in non-Member States in a consultative capacity.
- The term of office of a member shall be terminated before its normal expiry if that member dies or resigns, or if the Government of the Member State which appointed him decides to replace him. His successor shall be appointed for the remaining of the term of office.

DRAFT TERMS OF REFERENCE OF THE AD HOC COMMITTEE  
ON THE REPROCESSING OF IRRADIATED NUCLEAR FUELS

1. The task of the Committee is:

1.a) to assist the Commission and the Council in the elaboration of a Community strategy on the reprocessing of irradiated fuels, based on the points presented by the Commission, aimed at:

- bringing about a convergence of the interests of the promoters and users in the Community and linking their action with that of the Community itself, whilst at the same time extending facilities to third parties (in particular, the Community's European neighbours) for joining the group or groups formed;
- extending to users in all Member States, including those countries having nuclear power programmes of modest scope, the possibility of ensuring, by way of participation in the groups formed, that they have available to them the desired reprocessing services under optimum economic conditions, and with due regard to the requirements inherent in the safety of the general public and in protection of the environment, which would make it possible to keep the number of reprocessing plants in the Community down to the bare minimum required;
- ensuring an even distribution of effort among the interested parties;
- facilitating cross-holdings in order to promote the establishment of efficient groups;
- providing certain financial aid (e.g. participation by the Community, participation by third parties).

1.b) To examine to what extent the provisions relating to the Joint Undertaking, as defined in Chapter V of the Euratom Treaty, could assist in the implementation of this strategy.

.../...

2. The Committee shall draw up a report showing :

- a) The objectives common to the promoters and to the users and the extent to which the application of the Joint Undertaking provisions could assist in achieving those objectives;
- b) any points of divergence which may exist between the promoters and the users and the extent to which the application of the Joint Undertaking provisions could contribute to their elimination.

On the basis of an analysis of the above points, the report shall evaluate the follow-up to be given to the strategy in question.

The report shall be forwarded to the Commission and to the Council as soon as possible but in any case not later than 31 December 1978.