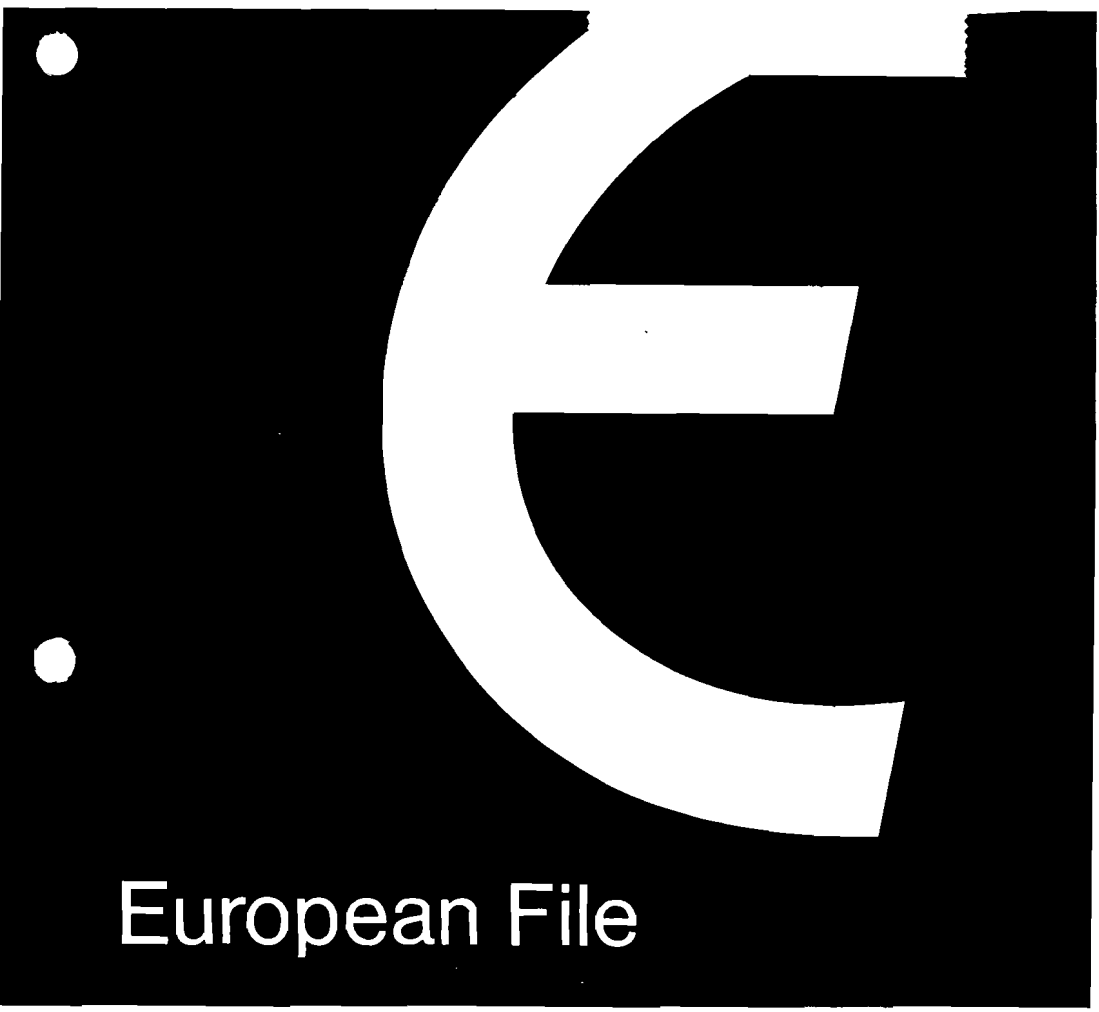
The nuclear industries in the European Community



European File

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From 1973 to 1984 the nuclear contribution to meeting the European Community's total energy needs increased from less than 2% to over 10%. Its share of electricity production now exceeds 27%.

On the basis of investment programmes started by the end of 1984, it may reasonably be estimated that in 1990 the capacity of nuclear power stations in service will cover about 35% of Community electricity output and about 14% of the Community's overall energy needs.

This will be a remarkable achievement. Nuclear power has become a vital component in the energy strategy of the Community. The main objective of this strategy is to reduce the dependance of Europe on external energy supplies. None the less, the position in the different Member States varies considerably: in 1990 some countries will still not be producing any electricity by nuclear means, while in the same year others will have developed nuclear energy as their main electricity source.

The growth of nuclear energy production in the Community has been matched by a boom in all the industries involved in this form of power generation.

The strategic importance of nuclear energy

☐ The *supply* of uranium, the raw material of nuclear energy, has two positive aspects for the Community, which has to import most of its supplies:

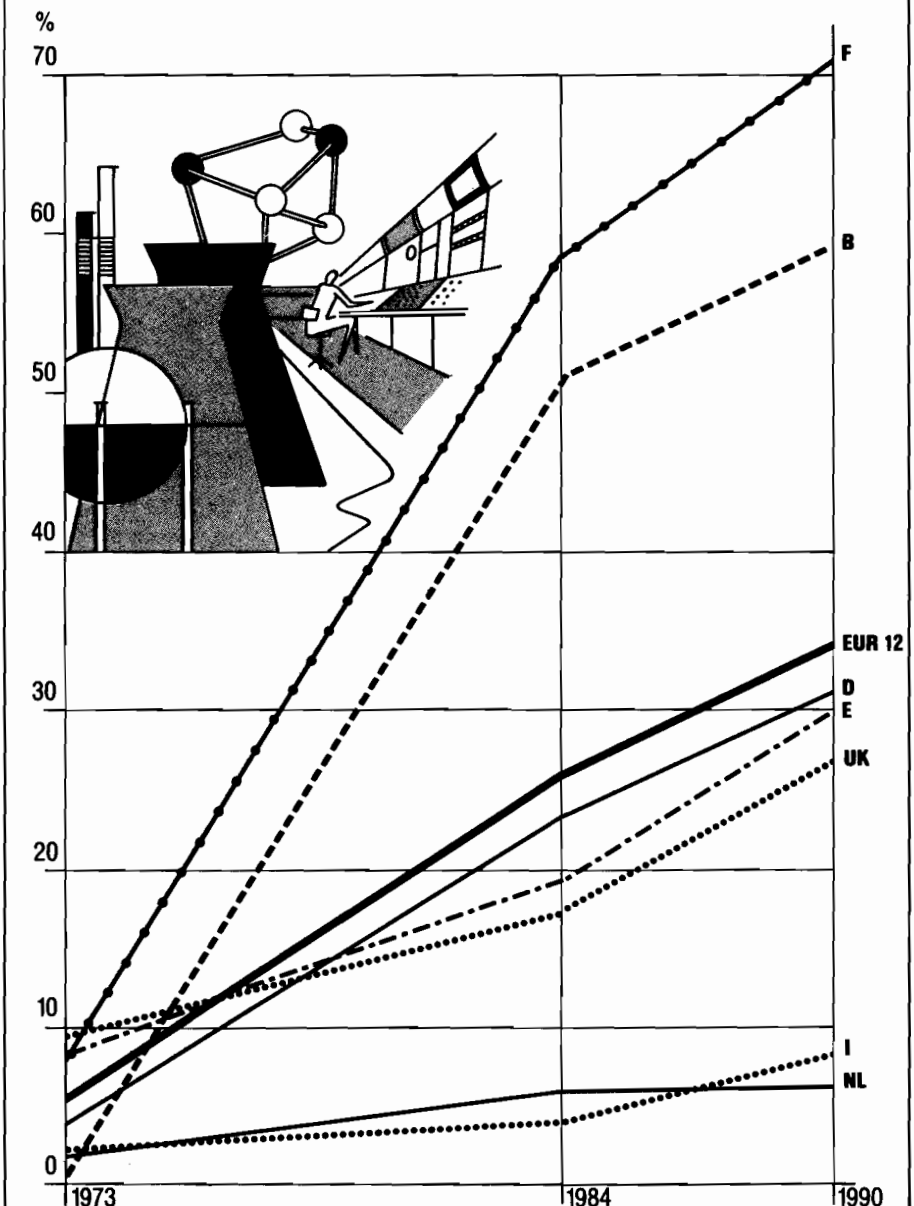
- The world uranium market is supplied by countries other than those which provide the Community with oil and natural gas;
- These countries belong neither to one single geographical area nor one political bloc.

Uranium supplies are based on known resources of ore that can be worked at an acceptable cost and are capable of meeting foreseeable requirements for about 20 years. Moreover, it is believed that other resources can be developed to meet the needs of the following 20 years.

☐ The *use* of uranium has two important aspects:

- Uranium can be stored in large quantities at low cost, without giving rise to practical difficulties, on account of the great energy density of the material;
- When used in the present generation of reactors, uranium expends only a very small fraction (around 1%) of its energy content. The remainder, which can be utilized only in a new type of reactor, the fast breeder, now being demonstrated, represents a considerable quantity of material. This feature makes it possible to consider the nuclear energy produced by fast freeder reactors as virtually nenewable energy.

Increase in the nuclear share of electricity generation in Community (EUR 12) countries* (in %)



* No nuclear generation of electricity is expected before 1990 in Denmark, Greece, Ireland, Luxembourg and Portugal.
Source: Commission of the European Communities, DG XVII.

The economic benefits of nuclear energy

The economic benefits of nuclear energy should be evaluated from three standpoints:

- ☐ The *competitiveness* of electricity of nuclear origin is constantly being closely studied by the public authorities and the electricity producers. The Commission is involved in these evaluations. The results are in agreement: when compared with other possible energy sources for power stations to be constructed over the next few years and intended for large-scale continuous energy production. nuclear energy is advantageous. It costs between 30% and 90% more to generate electricity from coal, and oil-fired production is even more expensive.

- ☐ The *balance of payments*, a very important consideration for countries with limited indigenous energy resources, tends to be favourably influenced by the use of nuclear energy. The proportion of the (presumably imported) primary energy source in the cost of electricity production varies considerably according to whether that material is uranium (accounting for some 10% of production costs), coal (approximately 60%), or oil (approximately 80%).

- ☐ The *macro-economic impact* of nuclear energy is also positive. It allows electricity production at a price which is little influenced by fluctuations of the world market for energy raw materials. The relatively low cost also reduces inflation and promotes the competitiveness of the electricity consuming industries downstream.

  There is also an appreciable qualitative impact from the extremely high value of the technology employed in all phases of nuclear activity. This has a knock-on effect for large sectors of industry in the countries concerned.

Objectives of the illustrative nuclear programme for the Community

The questions examined here are tackled in greater detail in the illustrative nuclear programme for the Community,[1] adopted by the European Commission in November 1984 and approved in May 1985 by the Economic and Social Committee, which unites representatives of employers, trades unions and interest groups. This programme analyses the situation in the nuclear industry and presents perspectives for its medium and long-term development. Two types of objectives are identified:

- ☐ Objectives for the end of the century, i.e. the period 1995-2000;

- ☐ Objectives for the beginning of the next century, i.e. for the longer term.

[1] *Nuclear industries in the Community – Illustrative nuclear programme under Article 40 of the Euratom Treaty* (Document(84) 653).

These objectives are intended as a guide. They are not binding on the Member States or the enterprises involved. They are very useful, however, in clarifying the options and stimulating initiatives by economic operators.

☐ For its end-of-century nuclear objective, the Commission proposes:

- By 1995 about 40% of Community electricity to be nuclear generated;
- Subsequently to increase the nuclear share of electricity production in order to approach 50% by the end of the century.

To attain the 1995 objective it would be necessary to have 120 gigawatts of nuclear capacity in service. This means that 25 gigawatts would have to come into service between 1991 and 1995. No target figures have been given for the year 2000 in view of the uncertainty surrounding the trend in electricity consumption in the last few years of this century.

☐ As its longer-term objective, the Commission envisages investment in a network of fast breeder reactors which would be economically competitive in 2005, in other works 20 years from now.

Such reactors would multiply by 50 the energy potential of uranium. The system has already reached the demonstration stage on a representative scale. In other words the major technical operating difficulties have been mastered or are on the way to being mastered.

Availability of resources on the uranium market does not require fast breeder reactors to come on stream in the short term. The economic performance of such reactors would make them competitive in the short term with coal-fired power stations but not with conventional reactors.

After 2000 it would be very advantageous to possess a type of reactor which would reduce the Community's dependance on uranium imports and place a reasonable ceiling on price rises for that raw material. This is the European Commission's objective.

The cost of developing fast breeder reactors can be restrained if it is programmed and coordinated at Community level by all those concerned: Member States, producers, designers and builders. To this end the appropriate industrial strategy must be carefully worked out. The entire system which characterizes the concept, including the fuel cycle, should be taken into consideration and the installations to be ordered should be defined. The European Commission considers that a reasonable scenario would be as follows:

- Economic and financial appraisal of a programme for the construction of a small number of power stations to be constructed one after the other. Four is probably the right number. Their design would be progressive and make

the most of the experience acquired during the design, construction and operation of previous power stations, starting with Superphenix, near Lyon. This power station is an international joint venture involving, directly or indirectly, firms from France, Italy, Germany, Belgium, the Netherlands and the United Kingdom.

- Introduction when necessary of a plant for reprocessing the irradiated fuel elements of these power stations. Its capacity must be sufficient to establish with reasonable certainty the cost of the fuel cycle of reactors of this type.

In order to possess sufficient operating experience by 2005 of the five installations mentioned in the programme just sketched out, it would be advisable for the construction of the next fast breeder plant to begin in 1987 and for the reprocessing plants to be in service before 2000.

☐ The commercial development of fast breeder reactors depends on the industrial reprocessing of spent fuel elements and the recovery of the plutonium which will allow the reactors to make use of all the uranium's energy content. At the outset the amount of plutonium produced will exceed the needs of the first fast breeders. The Commission therefore proposes that, as far as necessary, the plutonium should be recycled in the first instance in the traditional nuclear reactors already in service, a technique which has reached the stage of industrial application.

What attainment of the objectives involves: the Commission's recommendations

The European Commission has pledged to take those steps, at the appropriate time, which are in its power to promote the above developments. The nature and scope of the investment needed may demand the participation of Community financial instruments (notably Euratom and European Investment Bank loans) alongside finance generated nationally.

The Community will also fulfill the responsibilities laid down for it in the Euratom Treaty, notably:

☐ The updating and laying down of basic standards of health protection against radiation dangers for power station workers and the public at large;

☐ The control of fissile materials to ensure that they are not diverted to uses other than those claimed by the operators;

☐ Research which aims to develop, deepen or substantiate nuclear knowledge. Current programmes include the recovery of radioactive wastes, the decommissioning of nuclear plants and the safety of reactors.

Achievement of these objectives depends on all those involved in the nuclear industry: the public authorities, the electricity generators and the construction industry.

First and foremost it depends on the public authorities persisting with their efforts to develop nuclear energy.

It also involves, more specifically, concertation between Member States on the one hand and the electricity generating companies on the other to draw up investment programmes. Nuclear policy must be rationalized at Community level. The European Commission favours efforts by electricity producers to take a stake in power stations in neighbouring countries. This would enable the increase in nuclear power capacity to be spread over a period of time in accordance with the specific requirements of certain countries or even certain regions. The examples which already exist are very encouraging and indicate that a certain amount of programmed reciprocity, according to the principle of 'mutual investment', will give the partners equal benefits. In addition the cross-frontier acquisition of holdings provides the industries of the cooperating countries with an effective means of achieving the international partnership which has long been desired.

Turning to the role of industrialists, the indicative programme examines the present situation and future prospects of a large number of sectors involved in the production of nuclear energy. By way of example, three such sectors are considered here: uranium supplies, radioactive wastes and the power station construction industry.

- *Uranium supplies:* security of supply remains a major objective. Community firms have already taken a large financial stake in worldwide mining activities. Nevertheless, the cutbacks in prospecting that can now be observed could make the Community even more dependent on those few countries which possess mines capable of being worked at low cost. The continuation of this trend would limit the necessary diversification of the Community's sources of supply.

  It would therefore be desirable for the Community to implement a supply strategy capable of:

  - Encouraging the Member States and companies involved to continue their prospecting activities both within their own territories and outside the Community. These efforts must be maintained, with Community financial support if necessary, on a scale consistent with the expected requirements of electricity producers and the considerable lead times needed to bring new mines on stream.

  - Encouraging the companies active in this sector to pursue stockpiling policies with two aims: firstly, to offset market fluctuations and any interruption of supplies from non-Community supplier countries; secondly, to lessen any tensions which exist between the Community and these countries

by providing them with stable and predictable outlets for their products.

☐ Radioactive waste: disposal of radioactive waste means final storage in artificial or natural structures in conditions which mean that any exposure affecting the public complies with public health standards.

Following the terms of an 18 February 1980 resolution by the Council of Ministers, approving 'an action plan for radioactive waste', the European Commission has launched a major Community research, development and demonstration programme on the management of waste, and, in particular, its safety aspects.

For many years low and medium-activity wastes have been disposed of by Community countries. They are generally disposed of in underground or deep geological structures depending on the characteristics of the waste.

High radioactivity wastes and wastes containing long-lived elements are stored, at present, in liquid or solid form in special facilities. There has been no disposal of such wastes as yet.

- It is expected that by the start of the 1990s some Community countries will begin to dispose of long-lived wastes at intermediate depth in geological formations.

- The disposal of highly radioactive wastes is being studied at national and Community level. The aim is to make use, ultimately, of deep-lying continental geological formations such as salt, clay and crystalline rocks. The results obtained from research and experiments confirm that disposal in these types of formations is feasible. But the final storage of such wastes is simplified if they are allowed to cool down for several decades. It is therefore unlikely that industrial scale application of final disposal will take place before the end of the century.

A regional approach to the problem of waste disposal, involving several countries, could offer certain advantages. It would be desirable for Community countries to seek, in a spirit of mutual assistance, solutions that would enable a country to store waste from other countries, while observing the principles of reciprocity in the long-term. Such a policy would enable storage centres to be set up under the best conditions, would avoid individual, premature and costly experiments with new installations and would enable the geological characteristics of the European substratum to be used in an appropriate fashion.

☐ *Construction of power stations:* the European industry has opted, in most cases, for one of two types of reactor: the pressurized water reactor, which is widespread already; or the new fast breeder reactors. Such uniformity should facilitate intra-Community trade in nuclear equipment, as well as joint construction projects. Both, in principle at any rate, are permanent objectives of the

Community's nuclear energy development strategy, with, as a corollary, the promotion of exports.

However, even in the case of Member States with the most ambitious nuclear programmes, the prospects for the nuclear market are tending to look bleaker rather than brighter. The industry is entering a transitional phase in which it must progressively reduce and diversify its production.

As regards fast breeders, it seems the present situation is favourable to the setting up of an industrial structure whose style and capacity would suit the needs and size of the European market. As with the construction of Superphenix, there will be opportunities for particularly qualified firms in all the countries involved.

The industrial rationalization required does not necessarily have to result in an integrated structure, but neither should one reject such a possibility from the outset. In any case it should result in the creation of a true common market in fast breeder reactors, even though, at present, certain Member States are not seeking to construct reactors of that type on their territories. It is also most desirable that pressurized water reactors should be taken into account and that this sector should also be rationalized. Difficult though this task may be, it will have to be accomplished sooner or later ■

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