

COMMISSION OF THE EUROPEAN COMMUNITIES

COM (78) 214 final

Brussels, 26 May 1978

Proposal for a COUNCIL DECISION modifying the Council Decision 74/642 adopting a research and training programme for the European Atomic Energy Community on plutonium recycling in light-water reactors

(Submitted to the Council by the Commission)

COM (78) 214 final

COMMUNICATION FROM THE COMMISSION
TO THE COUNCIL

Proposal to extend by one year the research and development programme on plutonium recycling in light-water reactors - indirect-action programme under the EURATOM Treaty

On 17 December 1974, a research and development programme on plutonium recycling in light-water reactors was adopted by the Council.

This programme, which was for a duration of four years, expires on 31 December 1978 (OJ N° L 349/61 of 28 December 1974).

The Commission has, with favourable opinion of the Advisory Committee on Programme Management, undertaken through contracts the projects deemed meriting a Community contribution with a view to:

- solving some general problems associated with the use of plutonium; against this background, the Commission will in 1979 be in possession of all the information needed for assessing the effects of plutonium in light-water reactors on the environment;
- to bridge some gaps in the available scientific and technical information on plutonium recycling in light-water reactors; against this background, the Commission participates in various studies and research projects with a view to advancing:
 - a) basic neutron physics knowledge of the higher isotopes of plutonium and the transplutonium elements;
 - b) knowledge of the static and dynamic behaviour of light-water reactors loaded with plutonium fuels;
 - c) technological knowledge of plutonium fuels (participation in fuel post-irradiation examination campaigns).

The programme is progressing satisfactorily. It has given rise to fruitful comparative and collaborative work, including during the precise specification of the projects to be performed. It has carried out a minimum cost by frequently using the Community system of discretionary tendering on the basis of detailed technical specifications.

An analysis of the progress of the programme carried out under contracts is set out in the Annex.

By June 1977, the ACPM and the Commission had not found any valid reasons for a programme revision; the Commission notified the Council accordingly on 19 September 1977 in Doc. R/2091/77 (ATO 96).

Although the initial results from this work are beginning to become available and are the subject of communications (Article 13 of the EURATOM Treaty) or publication, some activities, especially those relating to post-irradiation examinations, will not have been completed by 31 December 1978 and will, in a fair number of cases, proceed during 1979.

Such a state of affairs is inherent in this kind of research project, which requires work over several years, and in the fact that some post-irradiation examination contracts can only be signed in 1978, since they relate to fuels which the nuclear power station operators are still irradiating in their reactors.

Incidentally, the majority of the other final results of the programme will not be available until the end of 1978 and it seems desirable to produce a digest.

It is for this reason that, on the one hand, the staff of three needed to carry out this programme should remain seconded to it during 1979 and that, on the other hand, the Advisory Committee on Programme Management should continue to operate over the same period.

The Commission therefore shares the Opinions delivered by the Advisory Committee on Programme Management on 16 June 1977 and by the Scientific and Technical Committee on 17 February 1978 that it would be sound policy to extend the programme in progress by one year and requests the Council to adopt the Decision set out in Annex 1.



Proposal of a Council Decision
modifying the Council Decision 74/642

Adopting a research and training programme for the European Atomic Energy Community on plutonium recycling in light-water reactors

- (indirect-action nuclear project)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 7 thereof;

Having regard to the proposal from the Commission submitted after consultation with the Scientific and Technical Committee;

Having regard to the Opinion of the European Parliament;

Having regard to the Opinion of the Economic and Social Committee;

Whereas the Council has adopted, by decision 74/642 on 17 December 1974, a research and training programme for the European Atomic Energy Community on plutonium recycling in light-water reactors (indirect-action nuclear project);

Whereas, taking into account the present status of the work involved in the programme, the extension of its duration by one year would enable the best advantage to be derived from the efforts thereunder;

Whereas, since it is suitable to modify the Council decision mentioned before,

HAS ADOPTED THIS DECISION:

Article 1

Article 1 of the decision 74/642 is modified as follows:
"A programme of research and education on plutonium re-cycling in light-water reactors, as set out in Annexes I and II, shall be adopted for a period of five years starting on 1 January 1975".

Article 2

Article 2 of the decision 74/642 is modified as follows:
"For the implementation of this programme, the maximum amount of the expenditure commitments shall be 4 750 000 european units of account and the maximum staff shall be three persons. The european unit of account shall be as defined in the financial regulation applicable to the general budget of the European Communities.

Done at Brussels

For the Council

The president

INFORMATION NOTE ON THE PROGRESS

OF THE PROGRAMME ON

PLUTONIUM RECYCLING IN LIGHT-WATER REACTORS

1. Introduction

On 17 December 1974, subject to a budget appropriation of 4.5 MUC, including about 4 MUC to finance the project under contract, the Council approved the programme on plutonium recycling in light-water reactors put forward by the Commission.

This programme is aimed at acquiring the information needed for the optimum use of plutonium in light-water reactors before fast reactors come to industrial maturity.

It comprises two parts:

- a) the first is concerned with solving the general problems attendant upon the use of plutonium;
- b) the second is concerned with bridging the gaps in scientific and technical knowledge of plutonium recycling in light-water reactors.

An Advisory Committee on Programme Management (ACPM) was set up; it met three times during each of the years 1975, 1976 and 1977. In addition, the Commission has drawn on the advice of specialists for detailing the programme; hence it was that several groups of experts were formed in the following sectors:

- aspects relating to the environment of the plutonium industry (transport, fabrication of mixed fuels, radiological effects);
- neutron calculation codes (cell and assembly) adapted to the requirements of plutonium recycling;
- post-irradiation examinations of mixed fuels, including isotopic analyses;
- control and safety of plutonium-fuelled power station reactors.

The ACPM delivered three Opinions, in 1975, 1976 and 1977 respectively; in the light of the last-mentioned (see Annex A), the Commission decided not to revise the technical content of the programme and notified the Council accordingly (COM 77-402)-(ATO 96).

Cooperation with the ACPM and the various groups of experts has ensured a very large measure of consistency in the definition of the various projects undertaken.

By making frequent use of the Community system of discretionary tendering on the basis of detailed technical specifications, the Commission has ensured optimum execution of the programme at the lowest cost.

The status of the programme at the end of 1976 was the subject of a publication (Ref. 1).

In September 1977, thirty-three contracts, representing a financial commitment of 2.35 million U.a., were signed, seven contracts, representing a financial commitment of about 1.000.000 u.a. were in the course of negotiation; the last projects to be undertaken in 1978 were determined.

2. General aspects associated with the use of plutonium

The aims of this part of the programme are, on the one hand, to assess the quantitative use of plutonium up to 1990 with the aid of forward studies and, on the other hand, to define better the role of the plutonium industry against the economic and industrial background of the Community. To this end, and in the light of the probable situation in the Community in 1990-2000, the Commission has arranged for a survey to be made of the effects of plutonium recycling in light-water reactors on the environment and has initiated some preliminary research projects to reduce these effects. A sum of about 1.000.000 u.a. is allocated to this part of the programme.

2.1 Forward study of the use of plutonium

This study has been constructed by the Commission with the help of, amongst other things, information furnished directly by the members of the ACPM concerning the situations in the various Member States.

The first version, drafted in December 1975, was the subject of a publication (Ref. 2).

An updating amendment of this study is at the printers' (Ref. 3); it serves as a general framework for the survey of the effects of the plutonium industry on the environment.

2.2 Aspects relating to the plutonium industry environment

The Commission, assisted by various groups of experts, determined the topics to be considered for the purpose of the survey of the effects of plutonium recycling on the environment; these topics were then grouped into some twelve subjects for specific studies.

This concerted work has also enabled a list to be drawn up of research and development subjects meriting priority treatment, with the aim of reducing the effects of the use of plutonium on the environment.

The detailed technical specifications of these study or research and development subjects were then formulated and included in the Community system of discretionary tendering at the end of 1976 and the beginning of 1977.

All the contracts relating to these studies or research and development work were signed before the end of 1977.

- The forward studies (industrial outlook at the end of the twentieth century) cover the following subjects:
 - effects of plutonium fuel fabrication plants on the environment (normal and accident operating modes);
 - effects of plutonium transport on the environment (normal and accident transport conditions);
 - differential effects on the environment of light-water reactors burning plutonium fuel instead of uranium fuel;
 - differential effects on the environment of reprocessing plants reprocessing irradiated mixed-oxide fuels instead of irradiated uranium oxide fuels;
 - overall radiological effects of plutonium recycling in light-water reactors after a summary has been made of the metabolism and toxicity of plutonium and the actinides.
- The research and development work will be focused on the improvement of the condition under which plutonium is stored and conveyed.

The contracts relating to this part of the programme cover a sum of about 1.000.000 u.a.

An information meeting on all these activities was held by the Commission at the end of October 1977, under the plutonium recycling programme, for the benefit of Commission contractors.

The Commission will be in possession of the results of all these contracts by the end of 1978 or the beginning of 1979 and plans to produce a summary of them during 1979.

3. Improvement of scientific and technical knowledge of plutonium recycling in light-water reactors

The aim of this second part of the programme is the advancement of the scientific and technical knowledge needed for industrial plutonium recycling in light-water reactors.

A sum of about 3.000.000 u.a. is allocated to this purpose.

3.1 Improvement of knowledge of the neutron physics of the higher isotopes of plutonium and transplutonium elements

This part of the programme consists of four projects:

- a) a bibliographic study, summarizing the status of information in regard to the use of plutonium in light-water reactors. This study was carried out by the competent Commission department and has been published (Ref. 4);
- b) a sensitivity study carried out at the beginning of 1976 under contract, with the aim of setting in priority order the gaps to be bridged in the neutron physics information on the higher isotopes of plutonium, americium and curium. This study was completed and has been the subject of two communications (Refs. 5) and 6);
- c) the experimental determination of the capture cross-sections of the isotopes selected as a result of Study b); this is in progress and the results are expected at the end of 1978 or beginning of 1979.
- d) various isotopic analyses of the plutonium fuels listed below in section 3.4 will back up the fissile material neutron balance calculations.

3.2. Comparison of the neutron calculation codes adapted to light-water reactors loaded with plutonium fuels

The enquiry into the usefulness of comparing neutron calculation codes, initiated by the Commission in March 1975, revealed the desirability of such a comparison.

Representatives of the circles interested deputed experts to the Commission in order to specify a set of standard calculations (three plutonium cells and one fuel assembly), an exercise to be carried out on a voluntary and unpaid basis for the purpose of comparing the results.

The results were examined in depth by the participants during several technical meetings.

A summary study performed under an expert contract has enabled some conclusions to be reached (Ref. [77]), while allowing each participant to see where he stands in relation to the others.

This work will have significant repercussions on the advancement of the information on the subject, since the participants in this coordinated project represent the principal quarters concerned in the Community.

This exercise has now been completed.

3.3. Control and safety of light-water reactors burning plutonium fuels

An enquiry into research and development requirements in this field was initiated by the Commission in April 1976 with the aid of a questionnaire devised in cooperation with ACPM at its 1975 and 1976 meetings.

Having examined the proposals submitted, the Commission adopted, by agreement with the ACPM at its meeting of 15 October 1976, some fifteen studies and research projects.

.../...

The programme includes an experimental part slanted towards some neutron physics aspects of plutonium fuel assemblies (power distribution, reactivity coefficients) and towards the establishment of a tritium balance in a pressurized-water reactor.

A second, theoretical part is devoted to a study of the control and safety of plutonium-fuelled power stations, i.e., static and dynamic aspects of the station, fuel handling and storage problems and an analysis of the maximum credible accident.

The contracts covering these studies and research projects were negotiated and signed during 1977.

This work will be carried out during the years 1977 and 1978 and early 1979.

An important summarization task will remain to be carried out ; at best, it could not be started until the second half of 1978 and continue into 1979.

3.4. Post-irradiation examinations and isotopic analyses of plutonium fuels

The enquiry into the requirements of industry and the electricity producers as regards post-irradiation examinations and isotopic analyses of plutonium fuels, which was set on foot by the Commission in March 1975, aroused a great deal of interest ; all the proposals received far exceed the budget funds available.

The Commission examined these proposals with the help of experts and adopted some twelve projects.

Three contracts were concluded at the end of 1975 ; they cover post-irradiation examinations of a plutonium fuel assembly irradiated in the BR-3 reactor (Ref. [8]), post-irradiation examinations and isotopic analyses of a plutonium fuel assembly irradiated in the Dodewaard power station (Ref. [9]) and post-irradiation examinations of fuel pins fabricated by the Vibrasol technique (Ref. [10]).

.../...

Two further contracts were concluded in 1976 ; they cover post-irradiation examinations and isotopic analyses of fuel pins irradiated in the Garigliano power station (Refs. [I1] and [I2]) and isotopic analyses of the thorium/plutonium element irradiated in the Lingen power station. During the first half of 1977 the contract related to the verification isotopic analysis was signed. Another project covering the post-irradiation examination of fuels irradiated in the Dodewaard power station was postponed for a year in order to subject the fuel to an additional one-year irradiation.

In addition, five contracts are being drafted ; they cover post-irradiation examinations of fuels irradiated, or being irradiated, in the Garigliano, BR-3, SENA and Dodewaard reactors.

The work under these contracts will for the most part be carried out during 1979.

A technical information meeting held by the Commission on 15 June 1977, attendance at which was restricted to Commission contractors under the programme on plutonium recycling in light-water reactors, was the occasion for assessing the work performed. The quality and interest of the experiments were acknowledged by the forty or so specialists delegated by their firms or bodies to attend this meeting.

The work under this part of the programme, although it will have been contracted for before the end of 1978, will be carried out during 1979.

The execution of this work will exceed the four-year (1975-1978) period set for the programme.

Such a development is inherent in this kind of research project and in the fact that some projects relate to modern fuels still being irradiated.

Major summarization task has still to be carried out and it could only begin in 1979.

.../...

3.5. Second-generation recycling

Several projects covering second-generation recycling, put forward by various Community bodies in 1975, were judged in agreement with the ACPM, to be premature and may only be adopted as part of a later programme, mainly because of the financial implications.

4. Conclusions

The programme is progressing very well indeed, fully in line with the Opinions delivered by the ACPM.

Thanks to the high degree of cooperation reached within the groups of experts, a very large measure of consistency has been attained in the detailed specification of the work to be undertaken.

Furthermore, frequent use of the Community system of discretionary tendering for the execution of the work has enabled the Community's skills to be exploited rationally.

Nevertheless, the majority of the results of the programme will only be available as from the middle of 1978. Major summarization task has still to be carried out ; it is for this reason that the team assigned to the programme (2 A + 1 B) will be required to continue at work during 1979 if the maximum advantage is to be derived from the effort deployed (see the ACPM Opinion of 16 June 1977, set out in Annex A).

In conclusion, it has appeared to the Commission and the members of the ACPM that, in the light of the work undertaken, there are still some further research and development requirements to be satisfied in the use of plutonium in thermal reactors.

An examination of these requirements is proceeding and will form the subject of discussions by the ACPM at its forthcoming meetings.

Brussels, 16 June 1977

Directorate-General
Research, Science and Education
XII-D

OPINION

The Advisory Committee on the management of the research programme on plutonium recycling in light-water reactors,

Having regard to the programme adopted by the Council of the European Communities (O.J. L 349/61, 28 December 1974) ;

Having regard to the progress of the various projects now proceeding ;

Having regard to the various projects still planned under this programme,

IS OF THE OPINION THAT :

1. Whereas the programme of work needed to attain the objectives decided by the Council of Ministers is at an advanced stage, it is clear that some parts of the projects in the programme, in particular the assessment thereof, will not have been completed by the end of 1978 ;
2. The tasks performed by the competent department of the Commission have made it possible to start promptly on the projects needed to conform to the Opinions delivered by the ACPM ;
3. A revision of the content of the programme in progress is not desirable ;
4. An extension of this programme by one year is needed to bring to fruition the projects undertaken, without prejudice to the launching of a second programme.

Brussels, 16 June 1977

(signed)
ALAN CHAMBERLAIN
(Chairman)

- (1) Programme de Recherche et de Développement concernant le recyclage du plutonium dans les centrales à eau légère
Rapport d'avancement annuel
EUR 5780 d/e/f/i/n 1977
- (2) Plutonium production and utilization forecasts in Europe,
B. Haijtinck
EUR 5479e, 1976
- (3) Prospects for plutonium recycle in light-water reactors
B. Haijtinck
EUR 5936 e 1978
- (4) Status and requirements for plutonium, americium and curium nuclear data relevant to plutonium recycling in L.W.R.'s
A. Cricchio
EUR 5698 e, 1977
- (5) (6) Etude de sensibilité aux sections efficaces des isotopes supérieurs du plutonium et des isotopes de l'américium
M. Darrouzet et J. Pinel
Final report - Category 13-Communication 3402, 1977
Synthesis report - Category 13 - Communication 3420 - 1977
- (7) Synthèse des calculs "Benchmark" sur le recyclage du plutonium dans les réacteurs à eau ordinaire
P. Reuss
Final report to be communicated (1977).
- (8) Post-irradiation examination of the ZO-100 plutonium bearing fuel assembly irradiated in the B.R.3 reactor.
Topical report, On site post-irradiation examination, June 1976
(to be communicated)

REFERENCES (suite)

- (9) Post-irradiation examination and isotopic analysis of plutonium bearing fuel assemblies irradiated in the DODEWAARD reactor (20 KWD/kg)
Topical report. On site post-irradiation examination, April 1976 (to be communicated)
- (10) Post-irradiation examination results of sphere-pac mixed-oxide fuel pins irradiated under P.W.R. conditions.
Topical report. Non-destructive examinations (to be communicated)
- (11) Results from post-irradiation examination on the five rods irradiated in GARIGLIANO B.W.R. up to 15 MWD/Kg.
Topical report (to be communicated)
- (12) Non destructive testing of five fuel rods irradiated in GARIGLIANO B.W.R. up to 20 MWD/Kg.
Topical report (to be communicated)

FINANCIAL RECORD

1. RELEVANT BUDGET HEADING CODE: 3355
2. TITLE OF BUDGET HEADING:
Plutonium recycling in light-water reactors
3. LEGAL BASIS
Article 7 of the Euratom Treaty
Council Decision of 17 December 1974 (OJ L 349/61)
4. DESCRIPTION, OBJECTIVE(S) AND JUSTIFICATION OF THE PROJECT
 - 4-1 Description

This project executed by means of contracts completes the programmes undertaken in the various Member States; it can be divided into:

 - Programme of general interest in view of solving general problems linked with the utilization of plutonium
 - Basic programme in view of providing industry and electricity utilities the scientific and technical knowledge, still deficient at this moment, on rational utilization of plutonium fuels in light-water reactors.
 - 4-2 Objective

To allow industrial and electricity utilities who are interested, to define, with the obtained knowledge, their attitude towards the utilization of plutonium fuels in light-water reactors. .
 - 4-3 Justification
 - Industrial and energy policy
 - Rational utilization of plutonium permitting a reduction in the requirements for uranium enrichment services

- The services of the Commission are preparing the follow-up of this programme. In order to meet the objectives of the four-year programme (1975-1978), an extension for one year is absolutely necessary.
Therefore, an increase of the maximum amount set is absolutely necessary.

5. Financial implication of the project in EUA (current prices)

5.0 Implication on the expenditures

5.0.0 Total costs during the envisaged period

- the budget of the Communities:	4.500.000 EUA
- the national administration:	250.000 EUA
- other sectors at national level:	-

Total cost:	4.750.000 EUA
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5.01 Multiannual timetable

Appropriations for commitment

	1975	1976	1977	1978	1979
Staff				168.700	180.000
Admin. expend.				34.800	70.000
Techn. expend.				-	-
Contracts				490.386	-
Total	537.084	405.062	2.902.715	693.886 [⊛]	250.000

[⊛] 38.747 to take from appropriations of previous years

Appropriations for payments

	1975	1976	1977	1978	1979
Staff				168.700	180.000
Admin. expend.				34.800	70.000
Techn. expend.				-	-
Contracts				1.698.300	1.044.799
Total	198.911	317.971	1.036.519	1.901.800	1.294.799

5.02 Method of calculation

a) Staff expenditure

The appropriations were evaluated on the basis of the staff for this programme:

- 2 officials of grade A
- 1 official of grade B
- official of grade C.

The calculations take account of the data as established for the setting-up of the draft budget for the year 1979. No net increase of salaries is assumed. Only a variation of the weightings has been considered in order to take account of the trend in the general level of prices in the Community.

b) Administrative and technical expenditure

They cover expenditures on missions and the organization of meetings as well as the utilization of scientific and technical support if appears necessary for the good development of the programme.

c) Expenditure under contracts

A uniform method of calculation cannot be established, as the subjects as well as the qualifications of the contractors are varying.

Anyhow, the Advisory Committee on Programme Management will be consulted on the awarding of the appropriations.

d) Multiannual provisions

The rates held for the calculations of the provisions are resp.: 1979 - 1.07, 1980 - 1.13, 1981 - 1.20.

5.1 Implications on the funds

6. Control regime foreseen

Scientific controls: ACPM
Staff of DG XII

Administrative controls:

Budgetary execution: Financial control

Regularity of expenditures: Division Contracts DG XII

7. Project financing

7.0

7.1

7.2

7.3 Appropriations to be entered under future budgets.