

COUNCIL DECISION

of 19 December 1991

adopting a research and training programme in the field of controlled thermonuclear fusion
(1990 to 1994)

(91/678/Euratom)

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 ⁽¹⁾, which has consulted the Scientific and Technical Committee,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas, by Decision 90/221/Euratom, EEC ⁽⁴⁾, the Council adopted a third Framework Programme of Community activities in the field of research and technological development (1990 to 1994), specifying *inter alia* the research activities to be pursued in the area of controlled thermonuclear fusion; whereas this Decision should be taken as appropriate in the light of the grounds set out in the preamble to that Decision;

Whereas for activities covered by the EAEC Treaty, Article 2 of Decision 90/221/Euratom, EEC provides for the implementation of the third Framework Programme through specific programmes adopted in accordance with Article 7 of the said Treaty;

Whereas the Commission has arranged for the evaluation and appraisal provided for in Article 3 of Council Decision 88/448/Euratom of 25 July 1988 adopting a multiannual research and training programme in the field of controlled thermonuclear fusion ⁽⁵⁾ and is submitting this proposal on the basis of that evaluation and appraisal;

Whereas the the Joint Research Centre will contribute through its own programme to the implementation of the aforesaid activities;

Whereas basic research in the field of controlled thermonuclear fusion must be encouraged throughout the Community;

Whereas, in addition to the specific programme concerning human resources and mobility, it might be necessary to encourage the training of research workers and engineers in the context of this programme;

Whereas, in the context of this programme, it is desirable that an assessment be made of the economic and social impact as well as of any technological risks;

Whereas, pursuant to Article 4 and Annex I of Decision 90/221/Euratom, EEC the amount deemed necessary for the whole Framework Programme includes an amount of ECU 57 million for the centralized dissemination and exploitation of the results to be divided up in proportion to the amount envisaged for each individual programme;

Whereas the implementation of the European Torus (JET) project has been entrusted to the 'Joint European Torus (JET), Joint Undertaking', established by Decision 78/471/Euratom ⁽⁶⁾, as last amended by Decision 91/677/Euratom ⁽⁷⁾;

Whereas the programme embraces all work carried out in the Member States in the field of controlled thermonuclear fusion by magnetic confinement; whereas the execution of this programme must involve the selection of research and development projects to enable them to benefit from Community participation;

Whereas the project to be carried out under the programme must be selected with special attention to the principle of economic and social cohesion in the Community, the transnational nature of the projects and the support to be given to small and medium-sized enterprises;

Whereas the Community's activities aimed at strengthening the scientific and technological basis of European industry and encouraging it to become more competitive include promoting cooperation on research and technological development with third countries and international organizations; whereas such cooperation may prove particularly beneficial to the development of this programme;

⁽¹⁾ OJ No C 261, 16. 10. 1990, p. 8.

⁽²⁾ Opinion delivered on 10 December 1991 (not yet published in the Official Journal).

⁽³⁾ OJ No C 120, 6. 5. 1991, p. 1.

⁽⁴⁾ OJ No L 117, 8. 5. 1990, p. 28.

⁽⁵⁾ OJ No L 222, 12. 8. 1988, p. 5.

⁽⁶⁾ OJ No L 151, 7. 6. 1978, p. 10.

⁽⁷⁾ See page 9 of this Official Journal.

Whereas, pursuant to Article 101 of the EAEC Treaty the Community has concluded Cooperation Agreements in the field of controlled thermonuclear fusion and plasma physics with the Kingdom of Sweden and with the Swiss Confederation; whereas the Community has entered into an Agreement of Participation in the International thermonuclear experimental reactor (ITER) conceptual design activities, together with Japan, the Union of Soviet Socialist Republics and the United States of America and is negotiating an Agreement of Participation in the International thermonuclear experimental reactor (ITER) engineering design activities together with the same countries; whereas the Community has entered into a Memorandum of Understanding with the Government of Canada on the involvement of Canada in the European contribution to the ITER conceptual design activities;

Whereas it is necessary, as Annex II to the Decision 90/221/Euratom, EEC provides, to conduct in the Community a fusion programme whose long-term objective is the joint creation of safe, environmentally sound prototype reactors,

HAS ADOPTED THIS DECISION:

Article 1

A research and training programme for the European Atomic Energy Community in the field of controlled thermonuclear fusion, as defined in Annex I, is hereby adopted for a period running from 19 December 1991 to 31 December 1994.

Article 2

1. The Community funds estimated as necessary for the execution of the programme amount to ECU 411,84 million, including expenditure on staff and administration amounting to ECU 77 million.
2. An indicative allocation of funds is set out in Annex II.
3. Should the Council take a Decision in implementation of Article 1 (4) of Decision 90/221/Euratom, EEC, this Decision shall be adapted to take account of the abovementioned Decision.

Article 3

Detailed rules for the implementation of the programme and the amount of the Community's financial contribution are set out in Annex III.

Article 4

1. In the course of the second year of implementation of the programme, the Commission shall review it and transmit a report on the results of the review to the European Parliament, the Council and the Economic and Social Committee, together with proposals for any necessary changes.
2. At the end of the programme, an evaluation of the results achieved shall be conducted for the Commission by a group of independent experts. This group's report, together with any comments by the Commission, shall be transmitted to the European Parliament, the Council and the Economic and Social Committee.
3. The reports referred to in paragraphs 1 and 2 shall be drawn up having regard to the objectives set out in Annex I to this Decision and in accordance with Article 2 (4) of Decision 90/221/Euratom, EEC.

Article 5

For the implementation of the programme, the Commission shall be assisted by the Consultative Committee for the Fusion Programme set up by Council Decision of 16 December 1980.

Article 6

The Commission is authorized to negotiate, in accordance with the second paragraph of Article 101 of the EAEC Treaty, international agreements with third countries members of COST, in particular member countries of the European Free Trade Association (EFTA) and central and eastern European countries, with a view to associating them with the whole or part of the programme.

Article 7

This Decision is addressed to the Member States.

Done at Brussels, 19 December 1991.

For the Council
The President
P. DANKERT

ANNEX I

Scientific and technical objectives and content

This programme fully reflects the approach embodied in the third framework programme in terms of the scientific and technical goals and the underlying aims which it pursues.

Paragraph 5C of Annex II to Decision 90/221/Euratom, EEC containing the framework programme forms an integral part of the present programme.

The scientific and technical objectives and content of this programme are in line with the recommendations of the Fusion Programme Evaluation Board (EUR 13104/1990).

The long-term objective of the Community Fusion Programme, embracing all activities undertaken in the Member States in the field of controlled thermonuclear fusion by magnetic confinement, is the joint creation of safe, environmentally sound prototype reactors referred to in Decision 90/221/Euratom, EEC. A step by step strategy towards the prototype commercial reactor is envisaged, including after JET, an experimental reactor (Next Step) and a demonstration reactor (DEMO).

The first priority objective of the Fusion Programme (1990 to 1994) is to provide the scientific and technological base, to establish environmental and safety criteria and to prepare industry for the construction of a Next-Step device. The major physics goal of the Next Step will be the achievement of self-sustained thermonuclear burn of a deuterium-tritium plasma and its control during long pulse operation. The Next-Step should demonstrate the safe operation of a device that integrates important technologies of a fusion reactor, and should test components and subsystems essential for a fusion reactor. The Next Step should provide the basic data for the engineering of a demonstration fusion reactor (DEMO) capable of producing significant amounts of electricity while taking due account of environmental constraints.

Other objectives of the specific programme are:

- to protect along the demonstration of the safety and environmental feasibility of fusion power in parallel with the demonstration of its scientific and technological feasibility,
- to enlarge the involvement of European industry, with the view of both injecting industrial expertise into the realization of the Next Step and ensuring that Europe will master all the technologies which will be required for the construction of future fusion reactors,
- to determine the reactor potential of toroidal magnetic configurations akin to the tokamak, concentrating on stellarators and reversed field pinches,
- to maintain a watching brief on other approaches to controlled fusion,
- to strengthen the links between the Association and the rest of the European scientific community, in particular with universities and similar institutions,
- to make available to the Community, if possible in the framework of an international agreement, the powerful source of neutrons necessary for the experiments,
- to widen current knowledge and techniques regarding the treatment of waste and tritium, the first wall, the effects on humans of powerful magnetic fields and scientific and technical alternatives to be implemented within the Fusion Programme.

In order to fulfil the first priority objective of the specific programme, a large fraction of the 1990 to 1994 activities, including those performed on JET and within the Associations, will be in support of the Next Step. Balanced efforts and coherent planning will be ensured the Next-Step design activities, supporting research and development in physics and technology, and industrial involvement.

The following presents an analytical description of the content of the programme, based on and taking account of the above elements as well as of the independent evaluation of the programme and of the appraisal of the environmental, safety-related and economic potential of fusion, performed in 1990 in accordance with Decision 88/448/Euratom.

AREA 1: NEXT-STEP DESIGN

Next Step conceptual design activities are reaching completion in the European framework, NET (Next European Torus), and also in the framework of a quadripartite international collaboration, ITER (International thermonuclear experimental reactor), between the Community, Japan, the Soviet Union and the United States of America. The engineering design of a Next Step device will be undertaken in accordance with the following guidelines:

- the quadripartite approach of ITER will be preferred for technical and economic reasons and the Community's current position of pre-eminence in large tokamaks, acquired especially through JET, will be maintained by a full commitment to the project,
- efforts will be made towards a convergence of the NET and ITER designs,
- a possible broadening of the scope of the ITER collaboration will be investigated with a view to sharing among the partners the main facilities in fusion reactor development. Experience of international cooperation gained in the framework of ITER will be assessed by the Commission for which purpose it will request that a corresponding report be drawn up for the benefit of other possible international cooperation projects,
- the Commission Fusion Programme will retain the capability to proceed with NET if the ITER cooperation proves too difficult to continue.

The engineering design of a Next Step will be started as soon as the framework within which it will be undertaken is agreed. In the proposed case of ITER, the fall back capability of designing a NET, still able to study ignition and long burn in reactor relevant conditions, will be preserved.

Next Step-related physics R&D actions will be undertaken on JET and on the specialized devices in the Associations (see Areas 3 and 4).

Actions in fusion technology, specific to the Next Step, in particular in the fields of superconducting magnets, plasma-facing components, operational and environmental safety, fuel cycle, remote-handling maintenance and decommissioning of the device, will be performed in the Associations, in the Joint Research Centre (JRC), and in industry. The specific actions will be made consistent with the Community commitment to the ITER engineering design activities. The actions aiming at preserving the fall-back capability of the Community to construct a Next Step on its own and involving a substantial financial commitment will be considered in the frame of the next Framework Programme.

The construction of the Next Step may be proposed during the period of the next Framework Programme, together with the required adjustments in organization, management and industrial policies. In defining these policies, experience gained in other large European projects will be taken into account.

AREA 2: LONGER-TERM TECHNICAL DEVELOPMENTS

Environmental and safety criteria will be essential elements governing the evolution of the Fusion Programme. In particular, work on such issues as the development of low activation materials relevant for a reactor, the development of reactor blanket modules, and a reference design for an electricity-producing fusion reactor will be undertaken in the Associations, in the JRC, and in industry.

Material testing requires a powerful source of high energy neutrons. Concept evaluation and possibly design work will be undertaken in the frame of the present programme. At a preliminary stage, adaptation and use of an existing device might be sought through international collaboration.

The development of DEMO-relevant tritium breeding blanket module will be pursued, in view of subsequent testing in the Next Step. These modules should be relevant for an electricity producing reactor, in particular regarding operating temperature and tritium-breeding ratio.

The reference design for an electricity producing reactor will be based on deuterium-tritium reactions. Consequences of using advanced fuels presenting additional advantages regarding safety and environment will be kept under review. The work on reference design will take into account views on social acceptability of fusion and on the requirements of utilities in operating such a reactor. It will constitute the technical basis for further safety analysis.

AREA 3: JET

The full exploitation of JET in its phases of deuterium plasmas, in the context of a prolongation of the Joint Undertaking to 1996, will be completed by establishing reliable methods of plasma purity control under conditions relevant for the Next-Step tokamak. Where appropriate, JET equipment and expertise will be used to perform specific developments in support of the Next Step. A substantial contribution to the JET programme will be provided by the Associations, both by supporting activities (see Area 4) and by transfer of staff.

Furthermore, preparation will be undertaken for the final phase of JET with deuterium-tritium plasmas, planned to take place in 1995 and 1996. A rigorous scientific, technical and safety assessment will be carried out as part of this preparation.

AREA 4: SUPPORT PROGRAMME**— Scientific support to the Next Step and to JET**

The activities of the specialized devices within the Associations will be focused on work programmes in support of the Next Step and of JET as well as on exploration of concept improvements. In particular studies on confinement, magneto-hydrodynamic stability, plasma-wall interaction, fuelling and exhaust, heating and current drive, will be carried out on existing devices: Tore-Supra, Asdex-Upgrade, Textor, FTU, Compass, TCV, RTP and Isttok. A revised proposal concerning a compact tokamak, Ignitor, might be submitted for in-depth examination.

New plasma diagnostic methods will be developed and theoretical activities, in particular on plasma modelling, will be carried out to support these studies.

— Studies on alternative lines in toroidal magnetic confinement

The newly built stellarator, Wendelstein VII-AS, will be fully exploited. Subject to the outcome of an in-depth examination, the engineering design of a large advanced stellarator, Wendelstein VII-C could be undertaken. The possible construction of such a device would be considered within the 1993 to 1997 Framework Programme. Another stellarator, TJ-II, is being constructed for operation to start in 1995.

Following its completion in 1991, the large reversed field pinch, RFX, will investigate plasma confinement and plasma purity at high current. The construction of Extrap-T2 will be completed and its exploitation undertaken.

Some devices, such as the Asdex and TCA tokamaks and the reversed field pinches HBTX, have been phased out having completed their experimental programmes; the full exploitation of the acquired data will be completed; several smaller devices, such as the stellarator STORM, the reversed field pinches ETA-BETA II and Extrap-T1 will be phased out after completion of their experimental programmes.

— Other Approaches to controlled fusion

Current work going on elsewhere on other approaches to controlled fusion will be followed closely. The present keep-in-touch activity with inertial confinement fusion will be continued, subject to a periodic reassessment of its reactor potential compared with that of magnetic confinement fusion.

ANNEX II

INDICATIVE ALLOCATION OF FUNDS ESTIMATED AS NECESSARY

Area	(ECU million)
1. Next-step design	75
2. Long-term technical developments	21
3. JET	210
4. Support programme	105,84
Total	411,84 ⁽¹⁾ ⁽²⁾ ⁽³⁾

(1) For Areas 1, 2 and 4, this includes administrative costs amounting to ECU 4,5 million and staff costs amounting to ECU 34,5 million. The budget of the JET Joint Undertaking includes provisions of approximately ECU 50 million for a maximum of 191 temporary employees assigned to the JET Joint Undertaking within the meaning of Article 2 (a) of the Conditions of Employment of Other Servants of the European Communities; the Community participation in the JET budget is about 75 %.

(2) An additional amount of ECU 42 million will be allocated to JRC research in the field of controlled thermonuclear fusion, including an amount of ECU 0,42 million representing the JRC's contribution to the centralized scheme for the dissemination and exploitation of results under this specific programme.

(3) An amount deemed necessary of ECU 4,16 million, not included in the ECU 411,84 million, will be earmarked as the contribution from the specific programme on controlled thermonuclear fusion to the centralized scheme for the dissemination and exploitation of results.

The breakdown between different areas does not exclude the possibility that projects could cover several areas. In particular, safety and environmental issues which will govern the evolution of the Fusion Programme will be addressed in all areas; in JET, these issues are an integral part of the exploitation of the device; in Areas 1, 2 and 4 approximately 10 % of the total will be allocated to these issues.

ANNEX III

DETAILED RULES FOR IMPLEMENTING THE PROGRAMME AND THE AMOUNT OF THE COMMUNITY'S FINANCIAL CONTRIBUTION

1. The Commission will implement the programme on the basis of the scientific and technical objectives and content described in Annex I.
2. The detailed rules for implementing the programme, referred to in Article 3, comprise research and technological development projects, the JET Joint Undertaking, accompanying measures and concerted actions. Selection of projects must take account of the criteria listed in Annex III to Decision 90/221/Euratom, EEC and of the objectives set out in Annex I to this programme.

A. Research projects

The projects must be the subject of shared-cost research and technological development contracts in the framework of Contracts of Association with Member States, organizations in the Member States, Sweden and Switzerland; the JET Joint Undertaking; the NET Agreement (to be extended and/or modified in view of the possible Euratom participation in ITER); the Long-Term Development Agreement (to be established) and other contracts of limited duration.

Community financial participation in the running expenditure of the Associations will normally be at an annual uniform rate of approximately 25 %. After consulting the CCFP, the Commission may finance:

- the capital cost of specifically defined projects at an annual uniform rate of approximately 45 %,
- certain tasks which can be exclusively carried out by industry at a rate of up to 100 %.

Universities and other research centres participating in shared-cost projects outside the framework of the Contracts of Association will have the option of receiving, for each project, either the uniform rates of funding on the total expenditure or twice the uniform rates of funding on the additional marginal costs.

Shared-cost research projects must, as a general rule, be carried out by participants established in the Community, Sweden and Switzerland. The projects, which may involve, for example, universities, research organizations and industrial firms, including small and medium-sized enterprises, should, where possible, provide for participation by at least two mutually independent partners established in different Member States of the Community and/or Sweden and Switzerland.

The projects shall be selected on the basis of the ordinary procedures defined in the Contracts of Association, the JET Statutes, the NET Agreement, the Long-Term Development Agreement (to be established), and any Community-wide agreements that may be concluded following the advice of the Consultative Committee referred to in Article 5. For projects that are awarded priority status by the Consultative Committee, all Associations shall have the right to take part in the experiments carried out on the equipment thus constructed.

B. Accompanying measures

The accompanying measures will consist of:

- the organization of seminars, workshops and scientific conferences,
- internal coordination through the creation of integrating groups,
- advanced technology training programmes, with emphasis being placed on multi disciplinarity,
- promotion of the exploitation of results,
- independent scientific and strategic evaluation of the operation of the projects and the programme.

C. Concerted actions

Concerted actions consist of action by the Community to coordinate the individual research activities carried out in the Member States. These actions benefit from funding of up to 100 % of coordinating expenditure.

3. The knowledge acquired in the course of the projects will be disseminated both within the programme and by means of a centralized activity, pursuant to the Decision referred to in Article 4 (3) of Decision 90/221/Euratom, EEC.