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THE JOINT EUROPEAN TORUS
JET - PROJECT

A PRESENTATION TO THE WORKSHOP
ON INTERNATIONAL COLLABORATION
IN MAGNETIC FUSION
DECEMBER 14, 1983
WASHINGTON, D.C.

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THE JOINT EUROPEAN TORUS (JET) IS A LARGE TOKAMAK DESIGNED TO BURN DEUTERIUM-TRITIUM. IT HAS BEEN BUILT IN THE EURATOM MAGNETIC FUSION PROGRAM AT CULHAM, ENGLAND BY A MULTINATIONAL TEAM.

- COUNTRIES INVOLVED: BELGIUM, BRITAIN, DENMARK, FRANCE, ITALY, F. R. GERMANY, IRELAND, LUXEMBOURG, NETHERLANDS, SWEDEN (SWITZERLAND, GREECE).
- THE PROGRAM WAS INITIATED IN 1970/1971.
- PROGRAM DEFINITION WAS UNDERTAKEN IN 1972/1973.
- DESIGN PHASE START 1973, CONCEPTUAL DESIGN COMPLETED 1975.
- LACK OF AGREEMENT AMONG THE PARTICIPANTS DELAYED AND NEARLY ELIMINATED THE PROJECT BY 1977.
- THE ISSUES OF SITE AND MANAGEMENT STRUCTURE WERE THE MAJOR PROBLEMS.
- THE CONSTRUCTION PHASE WAS APPROVED IN 1978. THE DEVICE OPERATED ON SCHEDULE IN 1983.
- COST THROUGH 1986 INCLUDING OPERATION $\sim 700 \rightarrow 800$ M\$.

REFERENCES

- "A EUROPEAN EXPERIMENT," DENNIS WILSON, Adam Hilger Ltd. Bristol, England, 1981 (Highly Recommended).
- "THE JET PROJECT-DESIGN PROPOSAL FOR THE JOINT EUROPEAN TORUS," EUR 5516e, 1976, European Commission, Brussels, Belgium.
- "THE JET PROJECT," EUR-JET R7, JET Joint Undertaking 1975.
- Council, E. C., Decisions May 1978 78/470, 471, 472/Euratom
March 1980 80/318/Euratom
March 1981 81/380/Euratom
- Statutes of the Joint European Torus (JET) Joint Undertaking European Commission, Brussels, Belgium.
- Agreement between participating organizations for JET Joint Undertaking, European Commission, Brussels, Belgium.

CHRONOLOGY 1 BIRTH OF JET

Countries Involved

Belgium, France,
Germany, Italy,
Luxembourg,
Netherlands

1957

Euratom created under Treaty of Rome

1967

Organization of Commission, Council of Ministers, Parliament, Court of Justice

1970 June

Bas Pease (Culham) suggests 20 year plan to include a European ignition experiment

1970 Nov.

Groupe de Liason supports the idea

1971 March

Tokamak Advisory Group recommends setting up a study group

1971 Oct.

Joint European Torus Working Group set up

Denmark,
Britain

1972 Feb.

JETWG starts work.
In parallel, design studies are underway at Culham and Fontenay aux Roses

1973 Spring

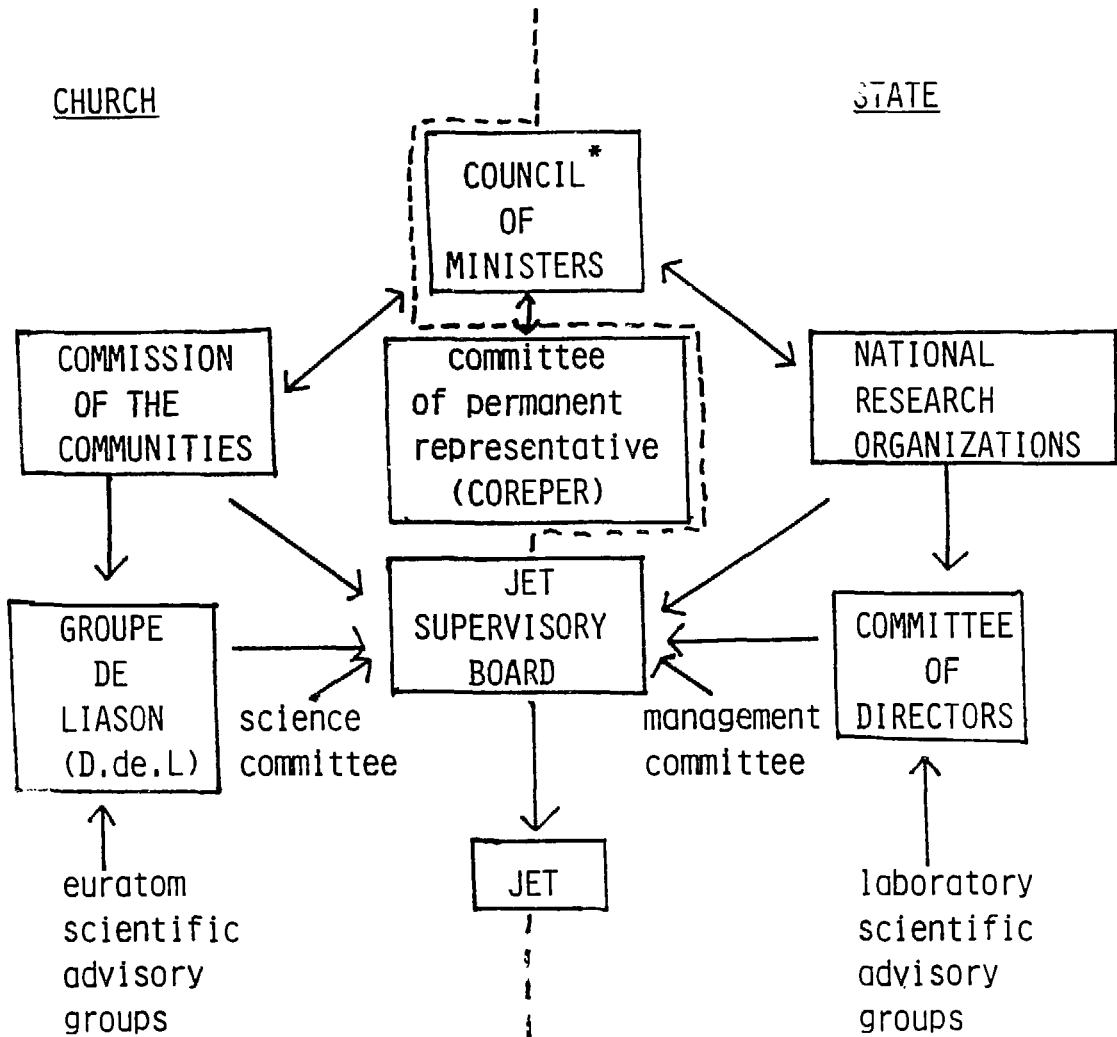
Final JETWG report proposes 3MA tokamak to do size scaling, physics and to study alpha particle effects (D-T burning)

1973 May

Groupe de Liason supports setting up a JET Design Team

CHURCH

STATE



(G. de. L. contained up to 3 scientists from each participating organization)

(Com. Dir. contained the Directors of the Associated Laboratories plus the Director of the Euratom Fusion Program)

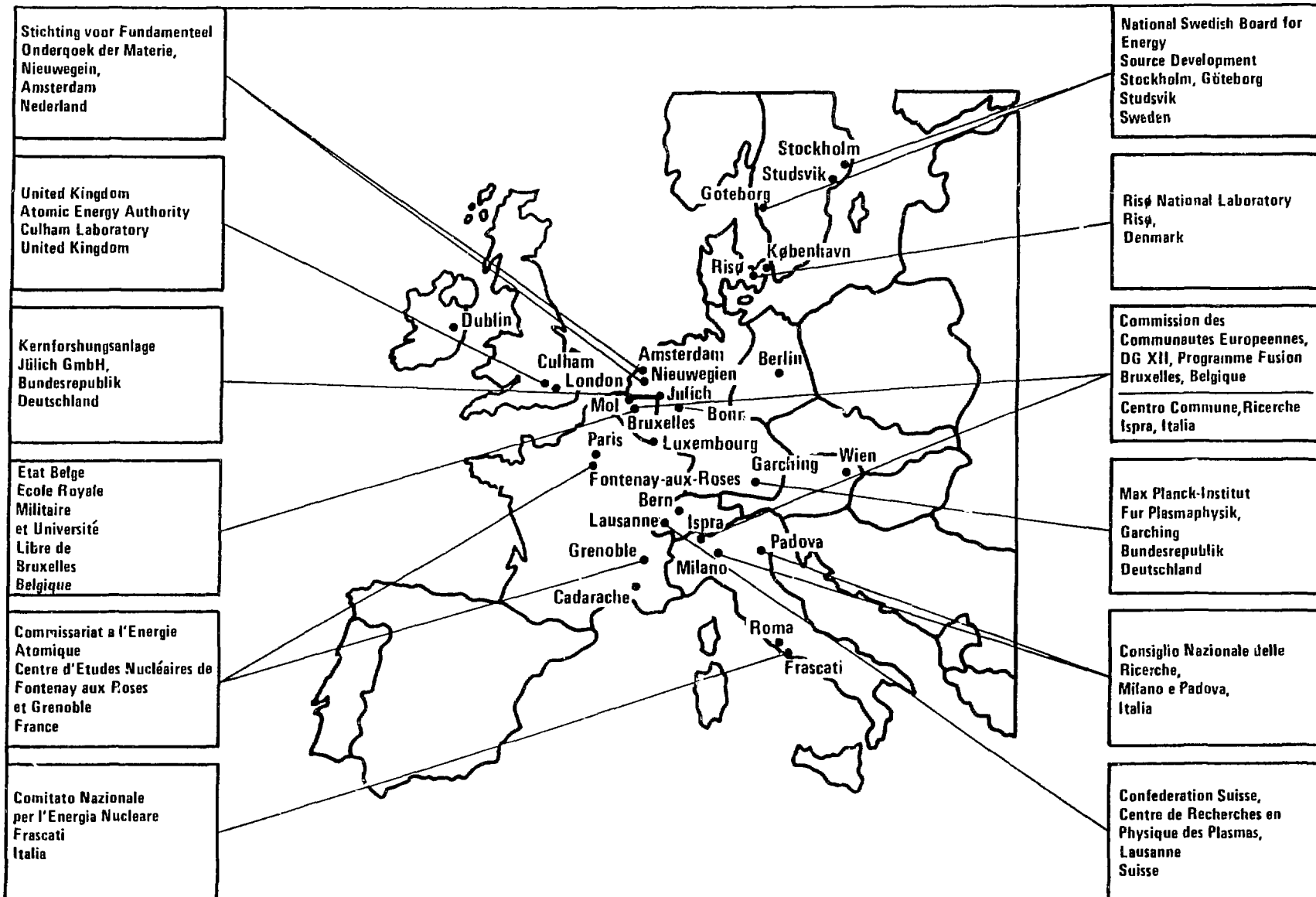
* In principle the Council of Ministers may be any European Council, i.e., Research, Foreign, etc.

ORGANIZATION STRUCTURE
FOR JET PROJECT DESIGN PHASE
1973 → 1976

CHRONOLOGY 2 DESIGN PHASE

Countries Involved

- 1973 Sept. JET Design Team set up at Culham under Paul-Henri Rebut. The French design is chosen.
- 1974 April Preconceptual Design and Project Plan completed.
- 1974 May Site questionnaire sent out.
- 1975 Feb. Site Committee Report completed.
- 1975 May Conceptual Design Completed.
Council of Ministers extend the Design Phase.
- 1975 Dec. Research Council JET/ISPRA issue-Italy intransigent.
- (Sweden) 1976 Jan. Commission proposes ISPRA site. Hostile reception from Britain, France, Germany.
Feb. Research Council - No decision.
- 1976 Oct. Commission and Consultative Council on Fusion agree on Financial and Legal arrangements.
COREPER supports site with existing fusion expertise.
Research Council unblocks Base Fusion Program 1980.
- 1977 March Research Council - No agreement. Britain and France intransigent.
Agree on Wind Down phase to be completed



The associated fusion laboratories in Europe

ASSESSMENT OF CANDIDATE SITES FOR JET

Site Committee Criteria

COREPER Criterion

Site	Electrical Power Supplies	Tritium Activated Material Handling Safety	Supporting Facilities	Social Aspects etc.	Existing Major Fusion Laboratories
Cadarache* (Fr)	good	excellent	good	very good	(No)
Culham (Br)	very good	fair ⁺	good	fair	Yes
Garching (G)	good	fair	good	very good	Yes
Ispra (I)(Eur)	excellent	very good	good	excellent	(No)
Julich (G)	very good	very good	very good	fair	Yes
MA (B)	fair	very good	fair	good	(No)

* Initially also Grenoble (Fr).

⁺ The partners subsequently agreed to change this to good.

- It was understood that other fusion work could be moved to the JET site and that the JET staff would constitute a strong team (CERN).
- Argument for no addition to existing fusion sites was made.
- The possibility for future expansion was not evaluated as the further program was not defined.
- Subsequently it was required that the Host country should raise their site(s) facilities to an agreed minimum level.
Power, Support Buildings, International School

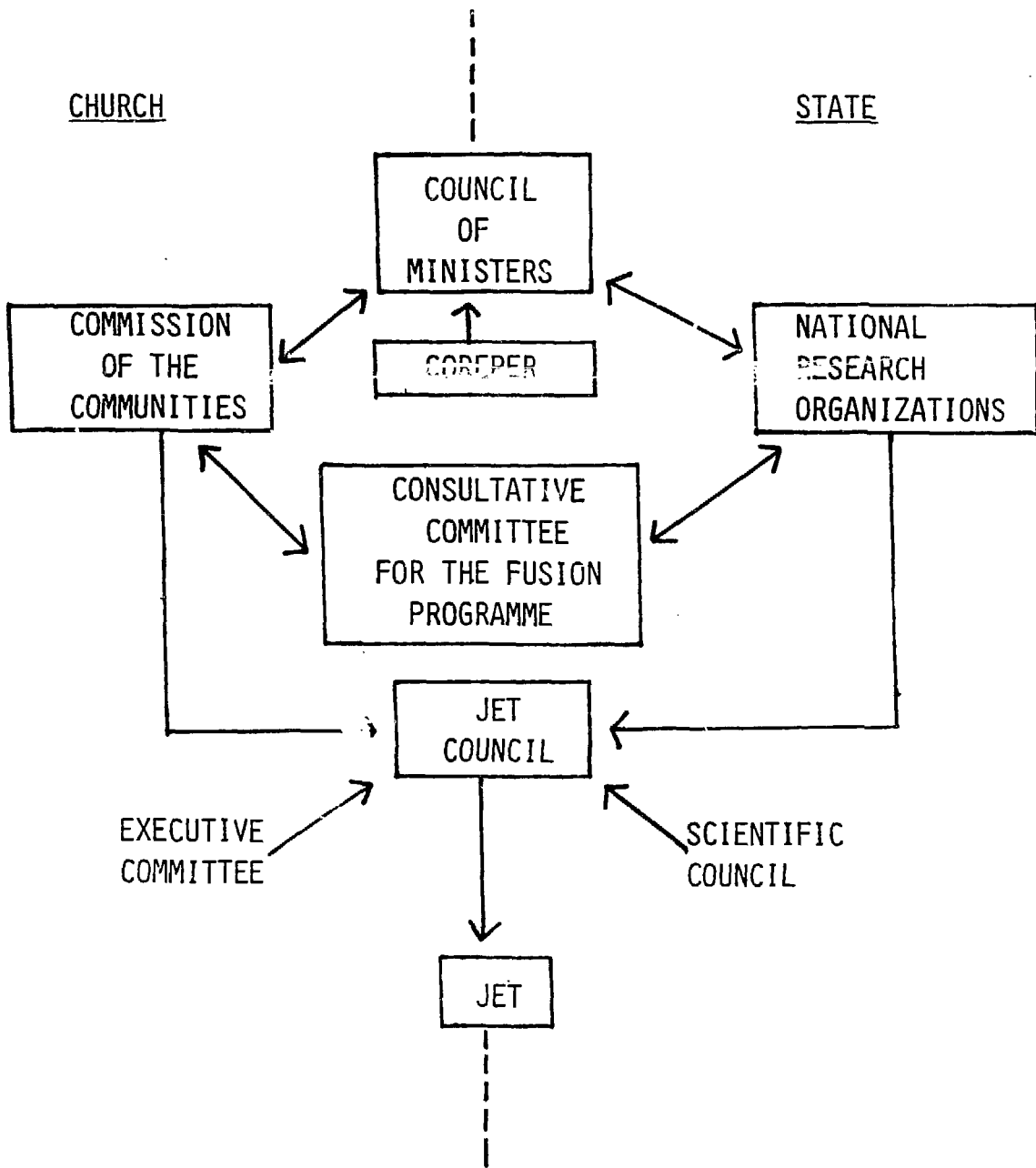
CHRONOLOGY 3 AGREEMENT-CONSTRUCTION-OPERATION

Countries Involved

- | | | |
|---------------|-----------|--|
| 1977 | June | Heads of State - No agreement |
| 1977 | July | Foreign Council. Defer to Sept. 20th |
| 1977 | Sept. | Foreign Council. No agreement.
Terrorists activity in Germany.
COREPER works out Management and Staff arrangements. |
| 1977 | Oct. 17 | Foreign Council accept COREPER Proposals. |
| 1977 | Oct. 18 | Lufhansa plane hijacked to Mogadishu.
Britain assists Germany in overcoming terrorists. |
| 1977 | Oct. 25 | Research Council agree on Culham site. |
| 1977 | Nov.-1978 | Mar. Interim JET Council produce
Statutes of Joint Undertaking
Financial regulations
Host support agreement
Staff arrangements |
| 1977 | Dec. | Head of Project - Hans-Otto Wuster selected.
Deputy - Paul-Henri Rebut |
| 1978 | May | Research Council approve JET Joint
Undertaking and Construction phase to
start June 1978. |
| (1982 Greece) | | |
| 1983 | June | JET operates on schedule. |

FINANCIAL MANAGEMENT, STAFF ARRANGEMENTS

- FINANCIAL
 - 80% COMMISSION
 - 10% HOST
 - 10% OTHER ORGANIZATIONS
 - HOST TO PREPARE STANDARD SITE AT OWN EXPENSE
 - HOST TO DISPOSE OF WASTE (PAID BY JET)
 - HOST RESPONSIBLE FOR DECOMMISSIONING
- MANAGEMENT
 - PROJECT UNDER JOINT UNDERTAKING (1957 Treaty of Rome)
 - STATUTES TO BE AGREED UNANIMOUSLY
 - APPROVAL BY COUNCIL OF MINISTERS
 - HEAD OF PROJECT REPORTS TO JET COUNCIL
 - INDEPENDENCE FROM HOST ORGANIZATION
- STAFF
 - STAFF EMPLOYED EITHER BY COMMISSION OR BY HOST ORGANIZATION
 - ALL STAFF UNDER HEAD OF PROJECT
 - RE-EMPLOYMENT BY PARENT ORGANIZATION GUARANTEED AT END OF PROGRAM
 - THIRD STATE NATIONALS WHILE WORKING ON JET GUARANTEED SAME RIGHTS AS COMMUNITY NATIONALS BY HOST COUNTRY



ORGANIZATION STRUCTURE
FOR JET CONSTRUCTION/OPERATION PHASE

1978 →

GOOD AND BAD FEATURES OF JET PROGRAM

GOOD

- SUBSTANTIAL DELEGATION OF AUTHORITY TO THE PROJECT FOR TECHNICAL DECISIONS AND PROJECT MANAGEMENT (see below)
- GOOD ORGANIZATIONS FOR DESIGN, SITE EVALUATION, CONSTRUCTION AND OPERATION
- GOOD COMMUNICATIONS IN JET TEAM
- MOBILITY ALLOWANCE, GUARANTEED RETURN TICKET TO ATTRACT GOOD STAFF
- PHASED CONTRACTS TO START INDUSTRIAL WORK PRIOR TO APPROVAL OF CONSTRUCTION

BAD

- NO SATISFACTORY ARRANGEMENTS FOR STARTING THE CONSTRUCTION PHASE
 - SITE DECISION
 - MANAGEMENT DECISION
- NO PROJECT CONTROL OVER PLASMA HEATING SYSTEMS AND DIAGNOSTICS, DEVELOPMENT (PRODUCTION)
- MULTIPLE GALAXY CLOGGING EFFECT
 - Council of Ministers + Commission + COREPER,
 - Atomic Questions Group, European Parliament + Foreign Ministers, Research Ministers, Treasuries, Atomic Energy Organizations, Fusion Labs, Scientific Advisory Groups, Design Team

LESSONS TO BE LEARNED

- START WITH A REFERENCE PLAN FOR MANAGEMENT, EMPLOYMENT, SITE REQUIREMENTS, ETC. AND A CLEAR SYSTEM FOR MAKING DECISIONS
- IF DECISIONS HAVE TO BE REFERRED TO A POLITICAL LEVEL, WHERE DECISION MAKING HAS A LOW PRIORITY, THEN MAKE A CLEAR RECOMMENDATION
- NOTE THAT IN A SITE DECISION IT IS NECESSARY ONLY THAT A SITE SHOULD MEET THE MINIMUM REQUIREMENTS - THE BEST SITE IS THE SITE CHOSEN
- HAVE A STRONG SUPERVISORY BOARD THAT IS PROPERLY REPRESENTATIVE OF INTERESTED PARTIES AND WHICH DELEGATES WELL
- DELEGATION OF AUTHORITY UNDER THE SUPERVISORY BOARD TO THE PROJECT OVER ALL ASPECTS OF THE WORK IS ESSENTIAL
- DO NOT REQUIRE UNANIMITY FOR DECISIONS IF AT ALL POSSIBLE USE A CAREFULLY WORKED OUT MAJORITY SYSTEM, i.e., DO NOT HAVE VETO POWER

The JET Project

The JET Tokamak

THE aim of the JET project is to build and operate a large tokamak device with overall dimensions of about 15 metres in diameter and 12 metres high. At the heart of the machine there is a toroidal vacuum vessel of major radius 2.96 metres having a D-shaped cross-section 2.5 metres by 4.2 metres. During operation of the machine a small quantity of hydrogen gas is introduced into the vacuum chamber and is heated by passing a very large current (2.6 MA to begin with and 4.8 MA at a later stage) through the gas. This current is produced by transformer action using the massive eight-limbed magnetic circuit which dominates the apparatus. A set of coils around the centre limb of the magnetic circuit forms the primary winding of the transformer with the hot gas or *plasma* acting as a single turn secondary. Additional heating of the plasma is provided by injecting beams of energetic hydrogen atoms into the system and by the use of high power radio frequency waves.

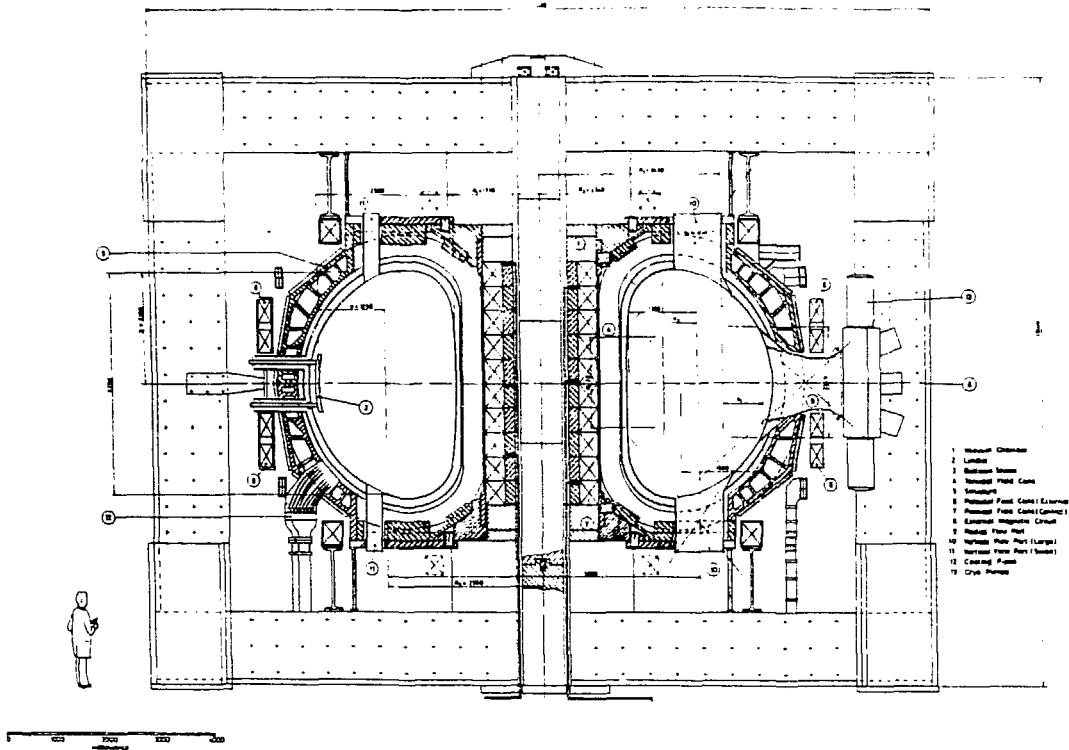
The plasma is confined away from the walls of the vacuum vessel by using a complex system of magnetic fields. The main component of the magnetic field, the so-called toroidal field, is provided by 32 D-shaped coils surrounding the vacuum vessel. This field coupled with that produced by the current flowing through the plasma, form the basic magnetic fields for the tokamak confinement system.

Additional coils positioned around the outside of the vacuum vessel are used to shape and position the plasma. These coils, together with the coils making up the primary winding of the transformer, are called poloidal field coils.

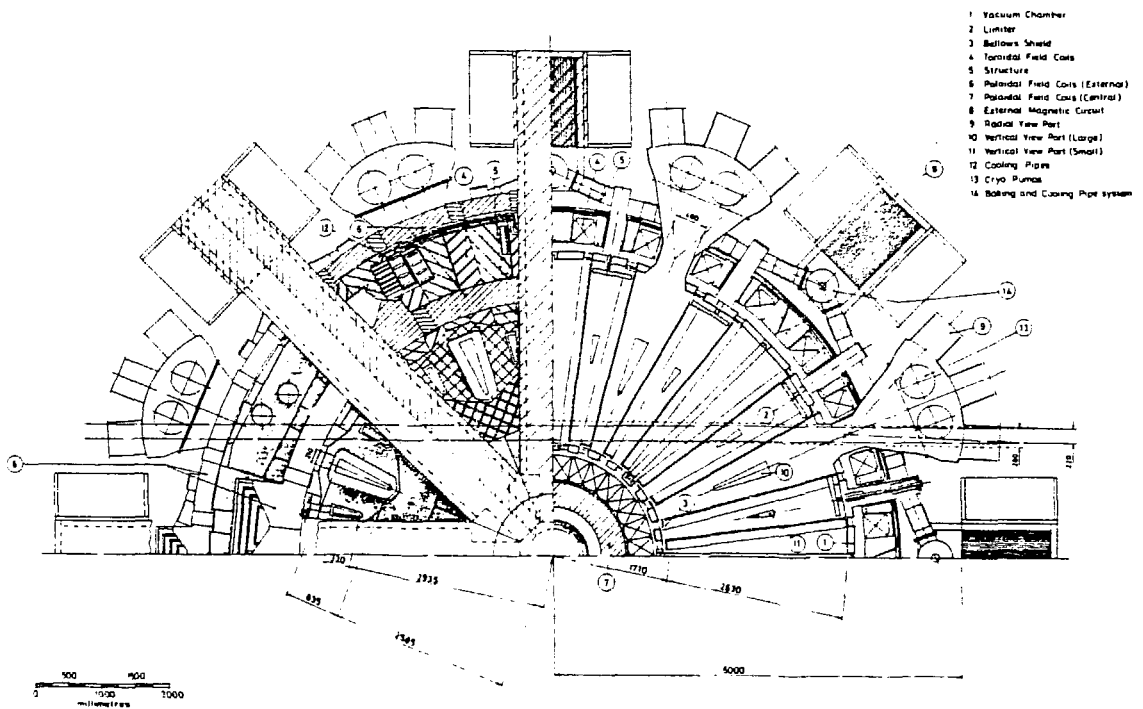
Initial experiments will be carried out using ordinary hydrogen plasmas; towards the later stages of the operation of JET it is planned to operate with deuterium-tritium plasmas so that fusion reactions can occur. Deuterium and tritium are the two isotopes of hydrogen; deuterium is very plentiful but since tritium is not a naturally occurring element it will be manufactured in a future fusion reactor from lithium. Lithium is also very plentiful.

Main JET Parameters

Plasma minor radius (horizontal)	1.25 m	
Plasma minor radius (vertical)	2.10 m	
Plasma major radius	2.96 m	
Flat top pulse length	20 s	
Weight of the vacuum vessel	100 tonnes	
Weight of the toroidal field coils	384 tonnes	
Weight of the iron core	2700 tonnes	
	Basic	Full Design
Toroidal field coil power (peak on 13 s rise)	250 MW	380 MW
Total magnetic field at plasma centre	2.8 T	3.4 T
Plasma current:		
circular plasma	2.6 MA	3.2 MA
D-shape plasma	3.8 MA	4.8 MA
Volt-seconds available to drive plasma current	25 Vs	34 Vs
Additional heating power	5 MW	25 MW



The JET Apparatus – Elevation



The JET Apparatus – Plan

2. Statutes

STATUTES OF THE 'JOINT EUROPEAN TORUS (JET), JOINT UNDERTAKING'

Article 1

Name, Seat, Members

- 1.1 The name of the Joint Undertaking shall be 'Joint European Torus (JET), Joint Undertaking'.
- 1.2 The seat of the Joint Undertaking shall be at Culham, Oxfordshire, in the United Kingdom of Great Britain and Northern Ireland.
- 1.3 The Joint Undertaking shall have the following Members:
 - the European Atomic Energy Community (hereinafter referred to as the Euratom),
 - the Belgian State (hereinafter referred to as Belgium), acting for its own part (Laboratoire de Physique des Plasmas of the Ecole Royale Militaire) and on behalf of the Université Libre de Bruxelles (Service de Chimie-Physique II of the ULB),
 - the Commissariat à l'Énergie Atomique, France, (hereinafter referred to as CEA),
 - the Comitato Nazionale per l'Energia Nucleare, Italy, (hereinafter referred to as CNEN),
 - the Consiglio Nazionale delle Ricerche, Italy, (hereinafter referred to as CNR),
 - the Forsøgsanlæg Risø, Denmark, (hereinafter referred to as Risø),
 - the Grand Duchy of Luxembourg (hereinafter referred to as Luxembourg),
 - Ireland,
 - the Kernforschungsanlage Jülich GmbH, Federal Republic of Germany, (hereinafter referred to as KFA),
 - the Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. - Institut für Plasma-physik, Federal Republic of Germany, (hereinafter referred to as IPP),
 - the National Swedish Board for Energy Source Development, (hereinafter referred to as the Board),
 - the Swiss Confederation (hereinafter referred to as "Switzerland")
 - the Stichting voor Fundamenteel Onderzoek der Materie, the Netherlands, (hereinafter referred to as FOM),
 - the United Kingdom Atomic Energy Authority, (hereinafter referred to as the Authority or the host organization).

Article 2

Object and location

- 2.1 The object of the Joint Undertaking shall be to construct, operate and exploit as part of the Euratom Fusion Programme and for the benefit of the participants in this programme a large torus facility of Tokamak-type and its auxiliary facilities (Joint European Torus - JET) (hereinafter referred to as 'the Project') in order to extend the parameter range applicable to controlled thermonuclear fusion experiments up to conditions close to those needed in a thermonuclear reactor.
- 2.2 The JET device and its auxiliary facilities shall be constructed at Culham, according to the general design set out in the report EUR-JET-R5 'The JET Project - design proposal' as may be modified in accordance with the present Statutes.

Article 3

Organs

- 3.1 The organs of the Joint Undertaking shall be the JET Council and the Director of the Project.
- 3.2 The JET Council shall be assisted by a JET Executive Committee and may seek the advice of a JET Scientific Council.

Article 4

JET Council

4.1 Composition, right of vote

- 4.1.1 The Members of the Joint Undertaking shall be represented in the JET Council as follows, the vote of each pair of representatives being weighted as indicated:

<i>Representing</i>	<i>Number of Representatives</i>	<i>Weighting of vote</i>
Euratom	2	5
Belgium	2	2
CNEN and CNR jointly	2	5
CEA	2	5
Risø	2	2
Ireland	2	1
Luxembourg	2	1
IPP and KFA jointly	2	5
Board	2	2

Switzerland	2	2
FOM	2	2
Authority	2	5

1.2 For their adoption acts of the JET Council shall require at least 26 votes in favour.

2 Functions

2.1 The Jet Council shall have the responsibility for the management of the Joint Undertaking. It shall take the basic decisions for implementing the Project and exercise overall supervision of the execution of the Project, and report to the Members.

2.2 In particular, the JET Council shall:

- (a) ensure the collaboration between the associated laboratories and the Joint Undertaking in the execution of the Project, including the establishment in due time of rules on the operation and exploitation of JET.
- (b) approve the agreements governing relations between the host country and/or the host organization and the Joint Undertaking;
- (c) approve the conclusion of agreements regarding cooperation with third countries and with institutions, undertakings or persons of third countries or with international organizations;
- (d) nominate the Director and the senior staff of the Project with a view to their appointment by the Commission or the host organization as appropriate and determine their period of assignment, approve the main structure of the Project Team and decide the procedures for the assignment and management of staff;
- (e) adopt the Financial Regulations in accordance with Article 11.4;
- (f) in accordance with Article 10 approve the annual budget including establishment of staff as well as the Project Development Plan and the Project Cost Estimates;
- (g) approve the annual accounts and balance sheet;
- (h) decide on any acquisition, sale and mortgaging of land and other titles to real property, as well as on the giving of any sureties or guarantees, taking out shares in other undertakings or institutions, and on any granting or taking of loans;
- (i) approve any proposal involving a significant change in the

design of the JET device and its auxiliary facilities;

- (j) issue the annual reports on the current status of the Project and its financial situation, referred to in Article 13.2;
- (k) have such other powers and perform such other functions, including the establishment of subsidiary bodies, as may be necessary for the purposes of the Project.

4.3 Meetings, Rules of Procedure

4.3.1 The JET Council shall meet at least twice a year. Extraordinary meetings shall be convened either at the request of one third of the members of the JET Council or at the request of its chairman, or the Director of the Project. The meetings shall normally take place at the seat. The JET Council shall elect its chairman from among its members. Unless otherwise decided in a particular case the Chairman of the JET Executive Committee and the Director of the Project shall participate in the meetings.

4.3.2 The JET Council shall adopt its Rules of Procedure.

Article 5

Jet Executive Committee

5.1 Composition, right of vote

The provisions of Article 4.1 shall apply to the representation of the members in the JET Executive Committee and its voting arrangements.

The Chairman of the JET Executive Committee shall be appointed by the JET Council.

5.2 Functions

The JET Executive Committee shall assist the JET Council in the preparation of its decisions and shall undertake any other tasks which the JET Council may entrust to it.

The JET Executive Committee shall in particular:

- (a) advise the JET Council and the Director of the Project on the status of the Project on the basis of regular reports;
- (b) comment and make recommendations to the JET Council on the Project Cost Estimates and the draft budget including the establishment of staff drawn up by the Director of the Project;
- (c) approve, in accordance with the rules on the award of contracts to be established by the JET Council, the tendering procedure and the award of contracts;

- (d) promote and develop collaboration between the associated laboratories and the Joint Undertaking in the execution of the Project.

5.3 *Meetings, Rules of Procedure*

The JET Executive Committee shall meet at least six times a year. The meetings shall normally take place at the seat of the Joint Undertaking. Subject to the approval of the JET Council, the JET Executive Committee shall draw up its Rules of Procedure.

Article 6

JET Scientific Council

6.1 *Composition*

The JET Council shall appoint the members of the JET Scientific Council and its chairman.

6.2 *Functions*

The JET Scientific Council shall:

- (a) upon the request of the JET Council advise on scientific and technical matters, including proposals involving a significant change in the design of JET, its exploitation and its long-term scientific implications;
- (b) perform such other tasks as the JET Council may request it to undertake.

6.3 *Rules of Procedure*

Subject to the approval of the JET Council, the JET Scientific Council shall draw up its Rules of Procedure.

Article 7

The Director of the Project

7.1 The Director of the Project shall be the chief executive of the Joint Undertaking and its legal representative.

7.2 He shall execute the Project Development Plan and direct the execution of the Project within guidelines established by the JET Council to whom he shall be responsible, and he shall supply the JET Council, the JET Executive Committee, the JET Scientific Council and other subsidiary bodies with all information necessary for the performance of their functions.

7.3 In particular, the Director of the Project shall:

- (a) organize, direct and supervise the Project Team;
- (b) submit to the JET Council proposals on the main structure of the Project Team, and propose to the JET Council the

nomination of senior staff;

- (c) draw up and regularly update the Project Development Plan and the Project Cost Estimates in accordance with the Financial Regulations and submit them to the JET Council;
- (d) draw up, in accordance with the Financial Regulations, the annual draft budget including establishment of staff, and submit it to the JET Council;
- (e) in accordance with the Financial Regulations, keep accounts and inventory records, draw up the annual accounts and the balance sheet, and submit them to the JET Council;
- (f) submit to the JET Council any proposal involving a significant change in the design of JET;
- (g) organize, together with the associated laboratories, special meetings ('workshops') on scientific and technical topics relating to the Project and submit reports on these meetings to the JET Council;
- (h) undertake, where necessary in conjunction with the host organization, steps to obtain the permits and licences required for the construction, operation and exploitation of JET, including buildings, as well as draw up any reports required in this respect;
- (i) be responsible for safety and undertake all organizational measures to meet the relevant safety requirements;
- (j) draw up in accordance with Article 16 rules on the dissemination of information and submit them to the JET Council;
- (k) draw up the annual report on the current status of the Project and its financial situation and such other reports as may be requested by the JET Council and submit them to the JET Council.

Article 8

Project Team

8.1 The Project Team shall assist the Director of the Project in the performance of his duties. Its staff shall be fixed in the staff establishment as defined in the annual budget. It shall be composed of staff coming from the Members of the Joint Undertaking as provided for in point 8.3 and of other personnel. The staff of the Project Team shall be recruited in accordance

with the provisions of points 8.4 and 8.5 below.

- 8.2 The composition of the Project Team shall strike a reasonable balance between the need to guarantee the Community nature of the Project, especially in the case of posts for which qualifications of a certain level are required (physicists, engineers, administrative staff at an equivalent level) and the need to give the Director of the Project the widest possible authority in the matter of staff selection in the interests of efficient management. In applying this principle account shall also be taken of the interests of the non-Community Members of the Joint Undertaking.
- 8.3 The Members of the Joint Undertaking shall make available to the Joint Undertaking qualified scientific, technical and administrative staff.
- 8.4 Staff made available by the host organization shall remain in the employment of the host organization on the terms and conditions of service of that organization and be assigned by the latter to the Joint Undertaking.
- 8.5 Unless decided otherwise in special cases in accordance with the procedures for the assignment and management of staff to be decided by the JET Council, staff made available by the Members of the Joint Undertaking other than the host organization as well as other personnel shall be recruited by the Commission for temporary posts in accordance with the 'conditions of employment of other servants of the European Communities' and assigned by the Commission to the Joint Undertaking.
- 8.6 All staff forming part of the Project Team shall come under the sole management authority of the Director of the Project.
- 8.7 All staff expenditure, including expenditure related to staff assigned to the Joint Undertaking by the Commission and the host organization shall be borne by the Joint Undertaking.
- 8.8 Each Member having a contract of Association with Euratom shall undertake to re-employ the staff whom it placed at the disposal of the Project and who were recruited by the Commission for temporary posts, as soon as the work of such staff on the Project has been completed.
- 8.9 The JET Council shall establish the detailed procedures for assignment and management of staff.

Article 9

Financing

- 9.1 The expenditure of the Joint Undertaking shall be borne by Euratom 80% and the Authority 10%.
The remaining 10% shall be shared between all Members other than Euratom, having contracts of Association with Euratom in proportion to the Euratom financial participation in the total costs of the Associations, including the general support for priority actions but excluding any additional support for these actions. The annual contribution of such a Member shall be calculated year by year and relate to the Euratom participation in its Association for the previous year, expressed in European units of account.
- 9.2 All revenue of the Joint Undertaking shall be applied in promoting the objects as defined in Article 2. Subject to Article 21 no payment by way of division of any excess of revenue over expenditure of the Joint Undertaking shall be made to the Members of the Joint Undertaking.

Article 10

Financial year, budgetary procedure

- 10.1 The financial year shall correspond to the calendar year.
- 10.2 The Director of the Project shall, before 31 March of each year, transmit to the Members the Project Cost Estimates as approved by the JET Council. The Project Cost Estimates shall include a forecast of annual expenditure for the following five years, taking into account the relevant decisions concerning the Euratom fusion programme. Within this forecast the estimates of revenue and expenditure for the first of those five financial years (preliminary draft budget) shall be drawn up in such detail as is necessary for the internal budgetary procedure of each Member regarding its financial contribution to the Joint Undertaking. The Director of the Project shall supply the Members with all supplementary information needed for this purpose.
- 10.3 The Members shall communicate to the Director of the Project forthwith their comments on the Project Cost Estimates and in particular on the estimates of revenue and expenditure for the following year.
- 10.4 Based upon the approved Project Cost Estimates, and taking into account the comments received from the Members, the

Director of the Project shall prepare the draft budget for the following year and submit it to the JET Council before 30 September.

- 10.5 After notification by the Commission of the appropriation relating to its financial contribution to the Joint Undertaking as shown in the finally adopted budget of the European Communities, the JET Council shall adopt the budget of the Joint Undertaking.
- 10.6 To meet the requirements of Article 171 (3) of the Euratom Treaty, the Director of the Project shall send to the Commission before 31 March of each year the budget adopted for the current year including the estimates of revenue and expenditure referred to in that Article, together with the operating accounts and the balance sheet of the previous year. The Commission shall place them, at the latest together with its preliminary draft budget for the following year, before the Council of the European Communities and the European Parliament.

Article 11

Financial Regulations

- 11.1 The purpose of the Financial Regulations is to ensure the economic and sound financial management of the Joint Undertaking.
- 11.2 In particular, they shall include the principal rules on:
- the unit of account or currency in which the accounts of the Joint Undertaking shall be kept,
 - the presentation and structure of the Project Cost Estimates and the annual budget,
 - the implementation of the annual budget and an internal financial control,
 - the calculation and payments of contributions by the Members of the Joint Undertaking in accordance with Article 9,
 - the keeping and presentation of accounts and inventory records as well as the drawing up and presentation of the annual balance sheet,
 - the procedure regarding calls for tenders, based on non-discrimination among the countries of the Members of the Joint Undertaking, the placing and the terms and conditions of contracts and orders on behalf of the Joint Undertaking.
- 11.3 As regards the placing of contracts, the Financial Regulations

shall provide for the selection of the tenders giving the economically and technically most efficient solution. The Director of the Project shall, in collaboration with the JET Executive Committee and the Members, strive to achieve as wide as possible a distribution of contracts, taking into account the Community nature of the Project.

- 11.4 The Financial Regulations shall be adopted by the JET Council in agreement with the Commission.

Article 12

Auditing

Within two months after the end of each financial year the Director of the Project shall submit the annual accounts of the preceding year and the annual balance sheet to the Court of Auditors of the European Communities. The audit executed by the Court of Auditors shall be based on records and performed on the spot. The Director of the Project shall present the annual accounts and the annual balance sheet together with the report of the Court of Auditors to the JET Council for approval. The Director of the Project is entitled and, if requested by the JET Council, obliged to comment on the report. The Court of Auditors shall send its report to the Members of the Joint Undertaking, to the Council of the European Communities and to the European Parliament.

Article 13

Project Development Plan, status and other reports

- 13.1 The Project Development Plan shall specify the plan for the execution of all elements of the Project, in particular work to be performed by the Project Team, by third parties and by the Members of the Joint Undertaking. It shall cover the whole term of the Joint Undertaking and regularly be updated.
- 13.2 The annual report shall show the current status of the Project, in particular with regard to timetables, cost, performance of the scientific programme, and its position in the Euratom Fusion Programme and in the world-wide development of fusion research.

Article 14

Work to be performed by the Associations

Where contracts of association contain provisions for work to be carried out in support of the Project, such work shall be specified and controlled

arrangements concluded between the Joint Undertaking and the association concerned, and the cost of such work shall be borne in accordance with the relevant provisions of the contract of association.

Article 15

Support from the host organization

- 1 The host organization shall make available to the Joint Undertaking land, buildings, goods and services required for the implementation of the Project as summarized in the Annex to the present Statutes and under terms outlined therein. The Annex shall form an integral part of the present Statutes.
- 2 Subject to the approval of the JET Council in accordance with Article 4.2.2(b), the details of such support, as well as the procedures of cooperation between the Joint Undertaking and the host organization, shall be covered by an agreement to be concluded between them.

Article 16

Information and patent rights

1 Information

- 1.1 All information generated in the execution of the Project, including but not limited to drawings, designs, computations, reports and other documents, know-how and inventions, whether or not patentable, shall be the property of Euratom, subject to the following provisions of this Article.
- 1.2 The Joint Undertaking shall be entitled to use the information referred to in point 16.1.1 without charge for the execution of the Project. The Members of the Joint Undertaking shall be entitled to use such information without charge for their own research purposes.
- 1.3 Each Member of the Joint Undertaking shall be duly kept informed on the progress of the Project through the JET Council and at regular intervals be provided with reports on the progress made and the results obtained (including the reports specified in Article 13 of the present Statutes).
- 1.4 The Commission will, in accordance with the provisions of Article 13 of the Euratom Treaty and subject to the conditions contained therein, communicate the reports referred to in point 16.1.3 to the Member States, to persons and undertakings (as defined in Article 196 of that Treaty) to the Governments of Sweden and Switzerland as well as to persons and under-

takings established on their territories.

Dissemination of such reports by the Commission to States and to persons and undertakings other than those specified above and dissemination as such of the report by the Joint Undertaking and by its other Members shall be at the discretion of and on conditions approved by the JET Council, but without preventing the customary exchange of views and ideas between scientists.

- 16.1.4 The JET Council shall establish terms and conditions under which the Joint Undertaking and its Members may proceed to dissemination and/or licensing of the information and in particular of the drawings, designs, computations, documents, know-how and non-patentable inventions referred to in point 16.1.1.

16.2 Patents

- 16.2.1 Where patentable inventions are made in the execution of the Project the Commission may, on behalf and at the cost of Euratom, file patent applications and obtain patents. The Joint Undertaking shall promptly inform the Commission about inventions and shall in due time forward to the latter any document and information required for filing of the patent applications. The Commission shall transmit to the Joint Undertaking the administrative data and a copy of such patent applications or patents.
- 16.2.2 Under the patent applications and patents referred to in point 16.2.1 the Joint Undertaking and the Members thereof shall be entitled to royalty-free, non-exclusive, irrevocable licences with the right to grant sublicences after consultation with the Commission.
- 16.2.3 Under the patent applications and patents referred to in point 16.2.1, the Commission may, in accordance with the provisions of Article 12 of the Euratom Treaty and subject to the conditions contained therein, grant on request non-exclusive licences to the Member States of Euratom, to persons and undertakings (as defined in Article 196 of that Treaty), to the Governments of Sweden and Switzerland as well as to persons and undertakings established on their territories. Granting of non-exclusive licences by the Commission to States, persons and enterprises other than those specified above shall be on the conditions approved by the JET Council.
- 16.2.4 Should the Commission in regard to any invention, patent appli-

cation or patent referred to in point 16.2.1 for adequate reasons (including in particular lack of budgetary allocations) intend to waive its right to file, or to abandon patent applications and/or patents, it shall inform the Joint Undertaking and the other Members thereof in due time. If in such event a Member requests assignment of the pertinent Euratom rights, the Commission shall comply with such request and the Member involved shall then be entitled to file patent applications and to pursue or maintain such patent applications and patents as were already filed or granted. If the request for assignment is made by several Members and no agreement can be reached among them on a sole assignee, then the Commission shall refer the matter to the JET Council for decision.

16.2.5 In regard to any invention, patent application or patent referred to in point 16.2.4 and assigned to a Member of the Joint Undertaking, or filed and obtained by such Member after assignment, Euratom shall be granted a royalty-free, non-exclusive licence for its own research purposes, and the licence and sublicensing rights granted to the Joint Undertaking and the other Members thereof shall be maintained and extended to the inventions, patent applications and patents filed and obtained after assignment.

16.3. *Other provisions*

16.3.1 Any contract or order concluded by the Joint Undertaking shall contain provisions to the effect that the rights conferred and obligations laid upon the Joint Undertaking and its Members under this Article shall not be affected by the terms and conditions of such contracts and orders.

16.3.2 The rights conferred and obligations laid upon the Members of the Joint Undertaking by the provisions of this Article shall subsist after the winding up of the Joint Undertaking.

16.3.3 Each Member of the Joint Undertaking, while retaining full ownership, shall undertake to make available free of charge to the Joint Undertaking any information and invention required for the sole purpose of the execution of the Project unless it cannot do so by reasons of obligations to third parties.

In particular, the Commission shall make available free of charge to the Joint Undertaking all information acquired under contracts and orders implemented under the JET Design Agreement.

16.3.4 The provisions of this Article shall apply without prejudice to applicable national laws relating to inventions made by employed inventors.

Article 17

Liability and insurance

17.1 The contractual liability of the Joint Undertaking shall be governed by the relevant contractual provisions and by the law applicable to the contract in question.

17.2 In the case of non-contractual liability, the Joint Undertaking shall make good any damage caused by it, to such extent as the Joint Undertaking is subject to a legal liability under the relevant national law.

17.3 Any payment by the Joint Undertaking for covering the liability referred to in points 17.1 and 17.2 and the costs and expenses incurred in connection therewith shall be considered as expenditure of the Joint Undertaking within the meaning of Article 9.

17.4 The Director of the Project shall propose to the Jet Council any necessary fire and other insurance, and the Joint Undertaking shall take out such insurance as the JET Council may direct.

Article 18

Accession by new Members

18.1 The Joint Undertaking is open for accession by new Members which can provide a useful contribution to the object of the Joint Undertaking.

18.2 Any request for accession shall be addressed to the Director of the Project, who shall transmit it to the JET Council. The JET Council shall decide whether the Joint Undertaking shall start negotiations with the applicant on the conditions of accession. In case of a positive decision, the Joint Undertaking shall negotiate the conditions of accession and submit them to the JET Council for agreement. If the JET Council agrees the Commission shall submit to the Council of the European Communities the proposal on the amendment of the present Statutes required for the accession of the applicant concerned.

Article 19

Duration of the Joint Undertaking

19.1 The Joint Undertaking shall be established for a period of 12 years.

- 19.2 According to progress in achieving the object of the Joint Undertaking as defined in Article 2 that period may be prolonged by amending the present Statutes in accordance with the provisions of Article 24. It may be shortened either by such an amendment or by action under Article 20.6 or Article 21.1.

Article 20

Withdrawal of membership

- 20.1 For a period of five years from the establishment of the Joint Undertaking, its Members shall not be allowed to withdraw their membership.
- 20.2 After that period each Member shall be entitled to give notice of withdrawal by registered letter to the Director of the Project, such withdrawal taking effect at the end of the financial year following that in which notice of withdrawal is given. However, the host organization shall not be allowed to withdraw.
- 20.3 If a Member gives notice of withdrawal, the JET Council shall decide within six months whether the Joint Undertaking should continue or be wound up.
- 20.4 If the JET Council decides that the Joint Undertaking should continue the Commission, acting on a proposal from the JET Council, shall submit to the Council of the European Communities the amendments to the present Statutes required for the continuation of the Joint Undertaking.
- 20.5 The Member so withdrawing shall bear its share as specified in Article 9 of all commitments and liabilities incurred by the Joint Undertaking up to the date when its withdrawal becomes effective. Furthermore, it shall not be entitled to claim from the Joint Undertaking or from any of its Members any compensatory payment with respect to the assets of the Joint Undertaking.
- 20.6 If the JET Council requests the winding up of the Joint Undertaking the Commission will submit to the Council of the European Communities the proposal on the winding up of the Joint Undertaking. If the Council of the European Communities decides to wind up the Joint Undertaking, Article 21 shall apply.
- 20.7 Subject to point 20.5 Members, having concluded with Euratom a cooperation agreement in accordance with Article 101 of the Euratom Treaty or a contract of association pursuant to such an agreement, shall cease to be a Member of the Joint Undertaking upon termination of that cooperation agreement.

Article 21

Winding Up

- 21.1 If the Joint Undertaking terminates, either by expiry of its term as specified in Article 19 or by decision of the Council of the European Communities, the Joint Undertaking shall be wound up.
- 21.2 For the purpose of conducting the proceedings in winding up the Joint Undertaking the JET Council shall appoint one or more liquidators, who shall comply with the instructions issued by the JET Council.
- 21.3 When the Joint Undertaking is being wound up, it shall:
- return to the host organization any physical support item made available to it in accordance with Article 15.
 - assign to the host organization the JET device, buildings and any other fixed or movable assets acquired by the Joint undertaking.
- The host organization shall at its own cost and liability:
- recover possession of the physical support items mentioned above.
 - take over and assume responsibility for the JET device, buildings and any other fixed or movable assets assigned to it.
- 21.4 If the Joint Undertaking decides to cease using any support item or any fixed or movable asset before the winding up, the provisions of point 21.3 shall apply to such specific support item or asset unless the Joint Undertaking decides to dispose otherwise of assets acquired by it.
- 21.5 If within a period of six months after the termination of the Joint Undertaking in accordance with point 21.1, the Commission requests the use for the Community fusion activity of any asset acquired by the Joint Undertaking and assigned to the host organization in accordance with points 21.3 and 21.4, the host organization shall make such asset available without any charge for depreciation or rent. This shall not prevent the decommissioning of the JET device.
- 21.6 When fixed and movable assets have been dealt with as provided in point 21.3, any further assets (cash, amounts receivable, intangible assets) shall be used to cover the liabilities of the Joint Undertaking and the costs relating to its winding up except

those to be borne by the host organization in accordance with point 21.3. Any surplus shall be distributed among the Members existing at the time of the winding up in proportion to their total contribution actually made by them in accordance with Article 9. In the event of a deficit, this shall be met by the existing Members in the same proportions as those in which their contributions have been assessed for the financial year then current in accordance with Article 9.

Article 22

Subsidiary reference to national law

- 22.1 In any matter not covered by these Statutes, English law shall apply.
- 22.2 Without prejudice to the provisions of the third paragraph of Article 49 of the Euratom Treaty, for the avoidance of doubt the Joint Undertaking shall not be regarded as a company within the meaning of the Companies Act 1948 and 1967 of the United Kingdom.

Article 23

Assignment of Commission rights

- 23.1 The Commission shall assign free of charge to the Joint Undertaking any title, rights and obligations with respect to the ownership of materials and other goods supplied or to be supplied under contracts and orders placed for the Project prior to the establishment of the Joint Undertaking to the extent allowed in such contracts and orders.
- 23.2 The Joint Undertaking shall take over any contract and order placed by the Commission for the Project prior to the establishment of the Joint Undertaking. Immediately after the establishment of the Joint Undertaking the latter and the Commission, shall take all necessary steps for this purpose.

Article 24

Amendments

- 24.1 Any Member of the Joint Undertaking may submit to the JET Council proposals for amendment of the present Statutes.
- 24.2 If the JET Council agrees to the proposals, the Commission will make a proposal to the Council of the European Communities for their approval in accordance with Article 50 of the Euratom

Treaty.

- 24.3 The amendments shall enter into force on the date on which the Council of the European Communities shall have approved the amendments, or on such other date as that Council may decide.

Article 25

Disputes

- 25.1 Any dispute either between Members of the Joint Undertaking or between one or more Members and the Joint Undertaking concerning the interpretation or application of the present Statutes, which is not settled by the good offices of the JET Council, shall, at the request of any party to the dispute, be submitted to an arbitration tribunal.
- 25.2 The arbitration tribunal shall be established in each individual case. It shall be composed of three members nominated jointly by the parties to the dispute. The members of the arbitration tribunal shall elect the chairman from amongst themselves.
- 25.3 If the parties in the dispute fail to nominate one or several members of the arbitration tribunal within two months of the request for submission of a dispute to the arbitration tribunal, or if within one month of the nomination of the members these members do not elect a chairman, such member or members or the chairman shall be nominated by the President of the Court of Justice of the European Communities at the request of one of the parties to the dispute.
- 25.4 The arbitration tribunal shall reach its decision by a majority of votes. Such decision shall be binding and final.

Article 26

Definitions

For the purpose of these Statutes the following terms shall have the following meaning:

- (a) 'Euratom Fusion Programme' means the research and training programme (1976 to 1980) in the field of fusion and plasma physics adopted by decision of the Council of the European Communities, pursuant to Article 7 of the Euratom Treaty, as well as any further programme in that field adopted by Council Decision;
- (b) 'Contract of Association' means a Contract of Association concluded between Euratom and any Member of the Joint Under-

taking which provides for the execution of part of the Euratom Fusion Programme;

- (c) 'Association' means the Association established by such a Contract of Association;
- (d) 'Associated Laboratory' means the laboratory or laboratories of each Member of the Joint Undertaking associated with Euratom by a Contract of Association, in which the programme of that Association is being executed;
- (e) 'JET Design Agreement' means the Agreement No 030-74-1 FUAC (Doc. XII/524/73) concluded between Euratom and the Members of the Joint Undertaking (other than Ireland and Luxembourg) on 4 April 1974 and modified by successive Supplementary Agreements;
- (f) 'Commission' means the Commission of the European Communities.

Annex to the Statutes of the Joint European Torus (JET), Joint Undertaking

SUPPORT FROM THE HOST ORGANIZATION

1. In addition to the financial participation specified in Article 9 of the Statutes the host organization shall bear the cost of putting the JET site into 'standard condition'.
2. The requirements for the 'standard condition' are summarized as follows:
 - (a) *Land* to be put at the disposal free of charge of the JET Project allowing for the construction and possible extension of all JET buildings and auxiliary services, including tritium handling and handling of radioactive materials.
 - (b) *Main services* to be supplied to the site boundary are: water, gas, electricity, sewage and drainage, alarm systems, telephone and telex.
 - (c) *Licensing and all official permits* needed for the erection and installation of buildings and services and the operation of the experiment including its operation under tritium.
 - (d) *Roads, paths and bridges* as necessary to provide access to the site boundary for the maximum size and weights of JET equipment and for staff and visitors.

- (e) *Temporary accommodation*
 - (i) offices, including drawing offices, and if necessary, small laboratories and workshops, to house the estimated growth of JET staff;
 - (ii) storage for housing equipment and supplies arriving prior to completion of permanent accommodation;
 - (iii) furniture and services for this temporary accommodation;

This accommodation will be free of charge for the first two years of the Project.

- (f) *Permanent accommodation*

This includes all working and storage accommodation other than the specific JET buildings which are referred to in the EUR-JET-R5 report and whose cost is included in the JET Project Estimate. The non-specific buildings to serve the Project are in net working space:

Offices	2 400 m ²
Small laboratories	2 000 m ²
Workshops	600 m ²
Auxiliary areas	1 000 m ²
	<hr/>
	6 000 m ²

These permanent buildings are to be provided with all necessary services and furniture for a suitable rental.

- (g) *Power supplies*

Installation and maintenance up to the site boundary of power supplies able to provide up to 500 MW and security line, with characteristics as specified in the EUR-JET-R5 report.
- (h) *Cooling system*

Water cooling capability of 25 MW continuous, capable of extension to 50 MW later, either by direct water supply or by recirculation with cooling towers.
- (i) *Computing*

Direct connection of the JET Project with a suitable computer.

3. In addition to providing the items summarized above the host organization shall undertake to supply, at proven cost (unless any of them are offered free), such technical, administrative, and general services as are required by the Joint Undertaking.

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Community

Examples of such services are:

- Safety (doctor, fire brigade, watchmen);
- Workshop approximately 1 000 m²;
- Site services (waste disposal, cleaning, gardening);
- Restaurant;
- Documentation (library, translation, reproduction);
- Communications (mail, telephone, messenger, telex, conference rooms);
- Office equipment;
- Welfare (schooling, housing, language courses);
- General support services;
- Computer time;
- Electricity;
- Water;
- Gas;
- Heating.

4. In addition to providing staff in accordance with Article 8 of the Statutes the host organization shall provide support staff at proven cost, to meet the requirements of the JET Project. Such staff shall be under the management authority of the Director of the Project.
5. The host organization shall be responsible for the disposal of radioactive waste at the expense of the Joint Undertaking. Upon the termination of the Joint Undertaking in accordance with Article 21.1 of the Statutes, the cost of the disposal of radioactive waste will fall upon the host organization.
6. Forward estimates of the requirements of the Joint Undertaking for services and support staff in accordance with paragraphs 3 and 4 above shall be agreed between the Joint Undertaking and the host organization in a manner to be specified in the agreement to be concluded between them in accordance with Article 15.2 of the Statutes.

Extract covering "Joint Undertaking"

carried out by the undertaking with its own resources, three months before the work begins.

The Council may, acting on a proposal from the Commission, alter this time limit.

Article 43

The Commission shall discuss with the persons or undertakings all aspects of investment projects which relate to the objectives of this Treaty.

It shall communicate its views to the Member State concerned.

Article 44

The Commission may, with the consent of the Member States, persons and undertakings concerned, publish any investment projects communicated to it.

CHAPTER V

JOINT UNDERTAKINGS

Article 45

Undertakings which are of fundamental importance to the development of the nuclear industry in the Community may be established as *Joint Undertakings* within the meaning of this Treaty, in accordance with the following Articles.

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Article 46

1. Every project for establishing a Joint Undertaking, whether originating from the Commission, a Member State or any other quarter, shall be the subject of an inquiry by the Commission.

For this purpose, the Commission shall obtain the views of Member States and of any public or private body which in its opinion can usefully advise it.

2. The Commission shall forward to the Council any project for establishing a Joint Undertaking, together with its reasoned opinion.

If the Commission delivers a favourable opinion on the need for the proposed Joint Undertaking, it shall submit proposals to the Council concerning:

(a) location;

(b) statutes;

(c) the scale of and timetable for financing;

(d) possible participation by the Community in the financing of the Joint Undertaking;

(e) possible participation by a third State, an international organisation or a national of a third State in the financing or management of the Joint Undertaking;

(f) the conferring of any or all of the advantages listed in Annex III to this Treaty.

The Commission shall attach a detailed report on the project as a whole.

Article 47

The Council may, when the matter has been submitted to it by the Commission, request the latter to supply such further information or to undertake such further inquiries as the Council may consider necessary.

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If the Council, acting by a qualified majority, considers that a project forwarded by the Commission with an unfavourable opinion should nevertheless be carried out, the Commission shall submit to the Council the proposals and the detailed report referred to in Article 46.

Where the opinion of the Commission is favourable or in the case referred to in the preceding paragraph, the Council shall act by a qualified majority on each of the proposals from the Commission.

The Council shall, however, act unanimously in respect of:

(a) participation by the Community in the financing of the Joint Undertaking;

(b) participation by a third State, an international organisation or a national of a third State in the financing or management of the Joint Undertaking.

Article 48

The Council may, acting unanimously on a proposal from the Commission, make applicable to each Joint Undertaking any or all of the advantages listed in Annex III to this Treaty; each Member State shall for its part ensure that these advantages are conferred.

The Council may, in accordance with the same procedure, lay down the conditions governing the conferment of these advantages.

Article 49

Joint Undertakings shall be established by Council decision.

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Each Joint Undertaking shall have legal personality.

In each of the Member States, it shall enjoy the most extensive legal capacity accorded to legal persons under their respective national laws; it may, in particular, acquire or dispose of movable and immovable property and may be a party to legal proceedings.

Save as otherwise provided in this Treaty or in its own statutes, each Joint Undertaking shall be governed by the rules applying to industrial or commercial undertakings; its statutes may make subsidiary reference to the national laws of the Member States.

Save where jurisdiction is conferred upon the Court of Justice by this Treaty, disputes in which Joint Undertakings are concerned shall be determined by the appropriate national courts or tribunals.

Article 50

The statutes of Joint Undertakings shall be amended, where necessary, in accordance with the special provisions which they contain for this purpose.

Such amendments shall not, however, enter into force until they have been approved by the Council, acting in accordance with the procedure laid down in Article 47 on a proposal from the Commission.

Article 51

The Commission shall be responsible for carrying out all decisions of the Council relating to the establishment of Joint Undertakings until the bodies responsible for the operation of such Undertakings have been set up.

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