



Politecnico
di Torino



DIMEAS

Dipartimento
di Ingegneria Meccanica
e Aerospaziale

Fusing Europe

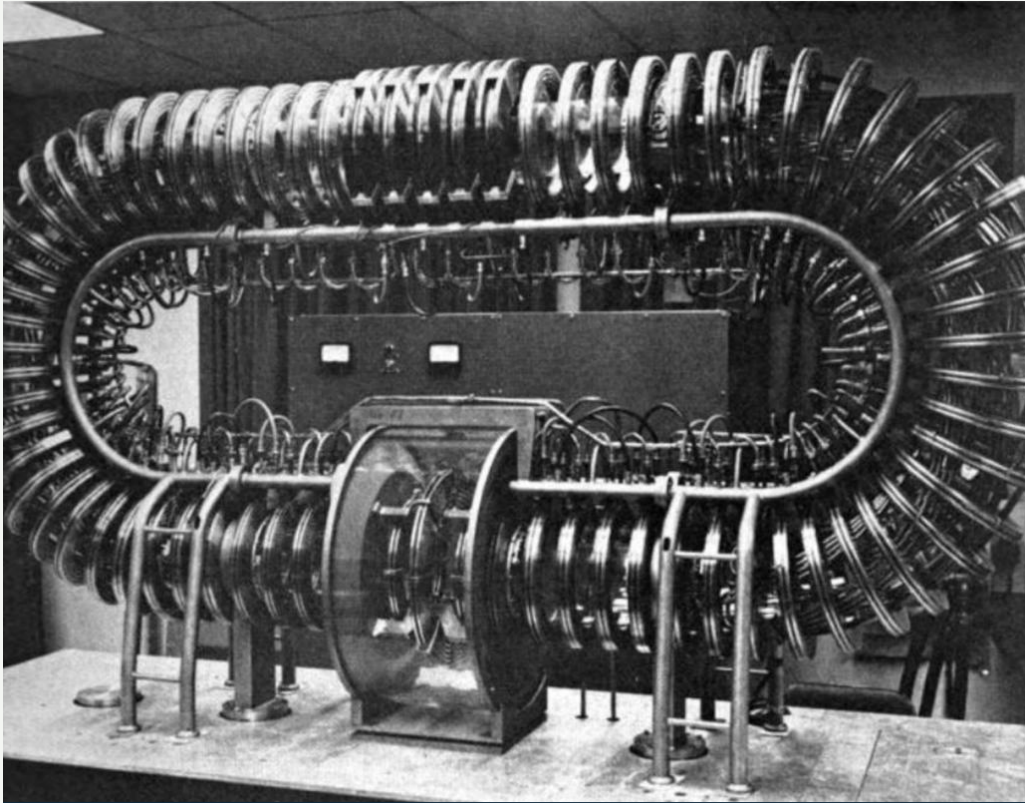
Thermonuclear fusion cooperation between science
diplomacy and political integration, 1957–2006

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Workshop 'Nuclear Energy and Applications'
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The fusion quest



Demonstration of a stellarator, Geneva 1958

THE GOAL

Fuse light nuclei and release energy.

THE CHALLENGE

Confine a plasma above 100 million °C long enough for fusion reactions.

THE STATUS

ITER is an experimental long-term project.
Commercial fusion remains a future objective.

1958



Declassification
and Geneva
Conference

1968



Tokamak
breakthrough

1978



JET Joint
Undertaking

2006



ITER
Agreement

Science diplomacy: a new name for an older practice

The 2010 Royal Society–AAAS report gave science diplomacy a widely used policy framework.



01 SCIENCE IN DIPLOMACY
Scientific advice informs foreign policy.

02 DIPLOMACY FOR SCIENCE
Diplomacy enables international research.

03 SCIENCE FOR DIPLOMACY
Scientific cooperation is used to improve relations.

One attractive promise: science can keep channels open when formal diplomacy is strained.

A MAJOR CASE OF SCIENCE DIPLOMACY



ITER cited as
DIPLOMACY FOR SCIENCE



“ITER stands as a monumental example of scientific and engineering prowess, a unique testimony to the merits of international collaboration and a triumph of human aspiration” (ITER Press Release, May 14, 2022.)

Science diplomacy in an era of disruption

2010

Bridge-building

Science as a relatively neutral space for dialogue

Shared problems

Global challenges justify openness and cooperation

Three-part framework

Science in / for diplomacy; diplomacy for science



2025

Strategic tool

Science diplomacy serves state or organizational objectives

Openness and security

Collaboration coexists with competition, sanctions and research security

More actors

Industry, technology firms and other non-state actors



Who uses cooperation, for what purpose, and under whose rules?



ITER

textbook case — and stress test

International experimental tokamak under construction in France

7 MEMBERS

EU · China · India · Japan · South Korea · Russia · United States

**Russia remains a formal member:
Russian-made gyrotrons were
installed at ITER in 2026.**

Cooperation persists amid geopolitical conflict

The familiar origin story: Geneva, 1985

1985

Reagan and Gorbachev endorse an international fusion initiative.

1986

The EC, Japan, the USSR and the U.S. begin joint design work under IAEA auspices.

2006

Seven parties sign the ITER Agreement in Paris.

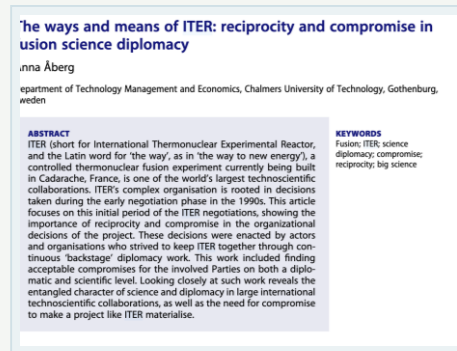


A political landmark — but not the beginning from zero.

Cooperation for what?



Technical choices serve political aims — and can reshape those aims.



Compromise can make a project less efficient technically but more viable politically.

John Krige · power and asymmetry

Knowledge-sharing is never detached from hierarchy, control, security, and unequal access.

The historical task is to reconstruct the arrangements, interests and exclusions that made it possible.

From European integration to the making of Europe

TRADITIONAL LENS

Treaties
Governments
Supranational institutions

Integration was long narrated mainly through diplomatic bargains and formal institutions.

BROADER HISTORICAL LENS



Infrastructures
Standards
Expert networks and mobility

Inventing Europe: technology and the hidden integration of Europe

Th.J. Misa, J.W. Schot

Research output: Contribution to journal › Article › Academic › peer-review

In this talk, “integration” means growing European-level capacity to fund, coordinate and represent nationally rooted programmes.

European cooperation in nuclear fusion research: from history to future policy design

- 01 How did forms of cooperation change over time?
- 02 Which institutions made cooperation durable?
- 03 How did fusion cooperation and European political integration shape one another?

European cooperation in nuclear fusion research: from history to future policy design

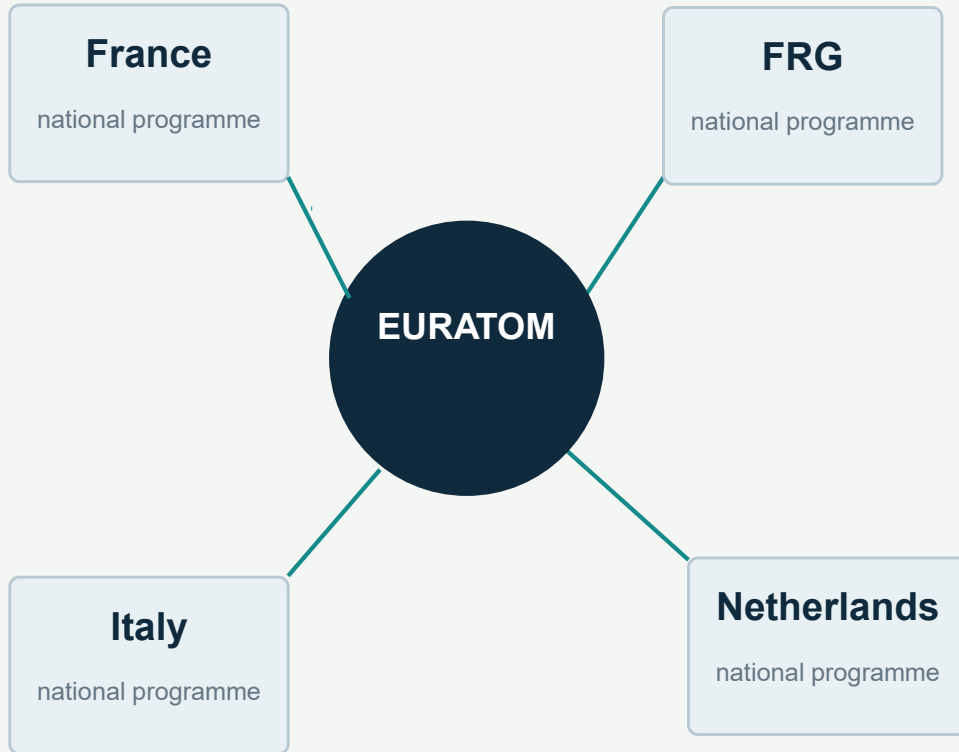
FusEUrope is a multidisciplinary project on the history of European techno-scientific cooperation in nuclear fusion energy research and its interplay with the process of European political integration from the creation of EURATOM in 1957 to the establishment of ITER in 2007.

Funded by the Italian PRIN PNRR 2022 program, FusEUrope combines historical, epistemological, and public opinion analyses to provide new insights into the role of fusion research in Europe's scientific and political landscape.



A Tokamak Design from 1975. Credit Unknown, Courtesy IAEA Archives

Euratom: coordination, not centralization



**Community funding and coordination
of nationally based research laboratories**

WHAT THE SYSTEM DID

- 1959** Association contracts funded national programmes
- 1961** Joint committees linked research, budgets and procurement
- 1962** The Liaison Group compared plans and promoted mobility

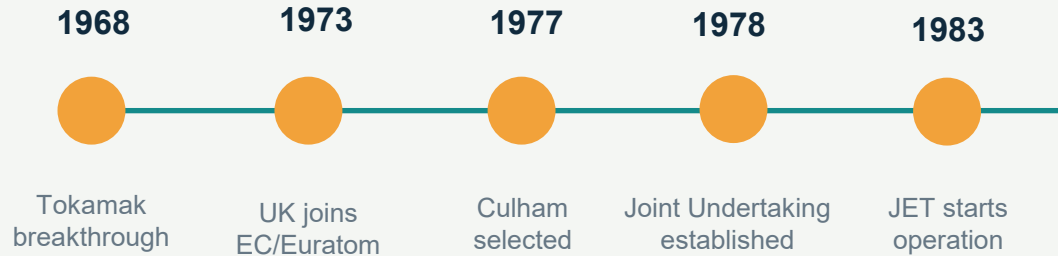
WHY FUSION WAS DIFFERENT

- Fusion** Distant application; shared scientific risk; fewer immediate commercial stakes.
- Fission** Reactors, industries, fuel cycle and sovereignty created stronger immediate constraints.

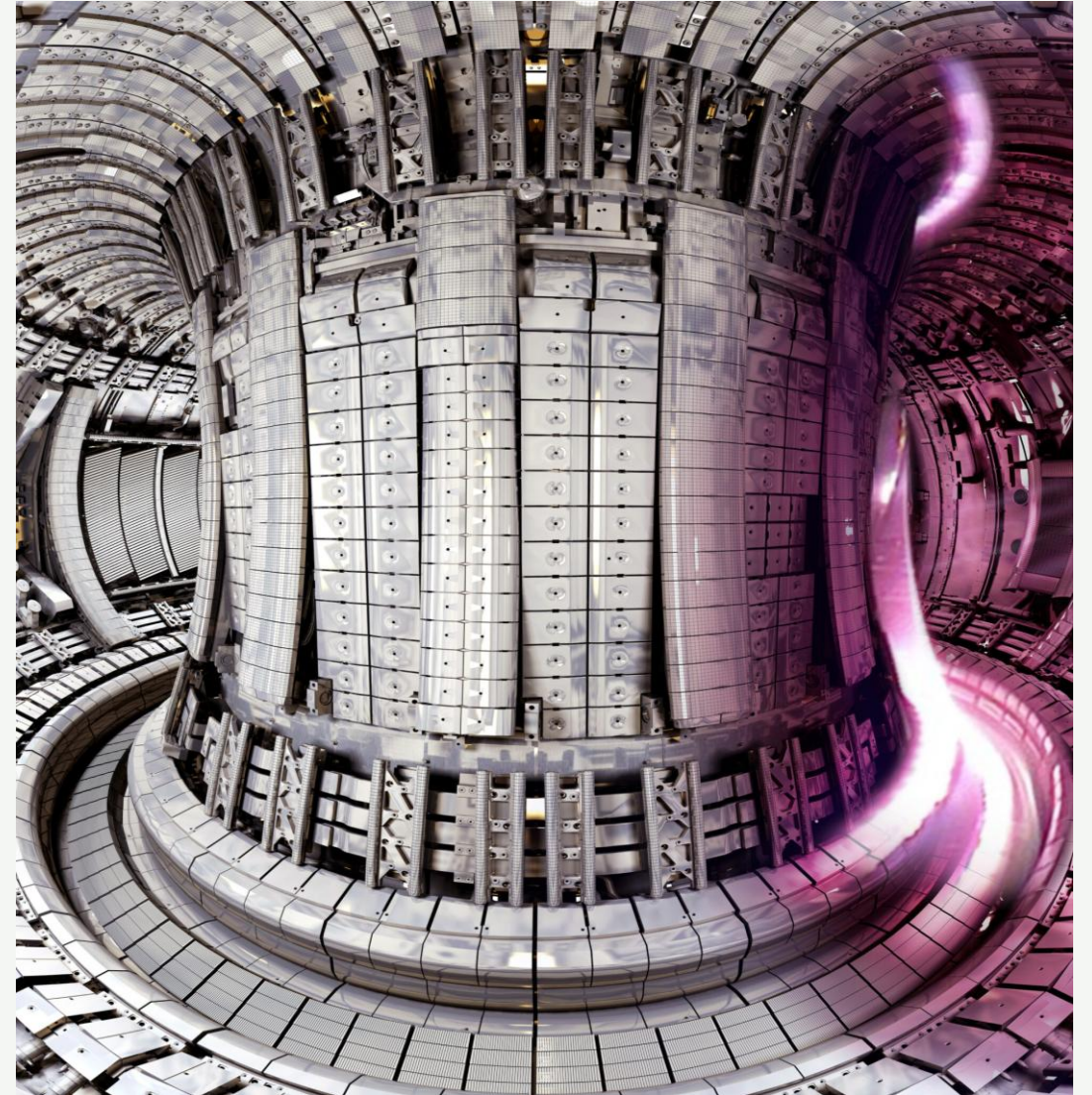
JET: building Europe around a common machine

Joint European Torus

The tokamak breakthrough made a large shared experiment scientifically credible.



- A common design team; a politically contested site decision
- Shared staffing, procurement, experimental time and operational rules
- A European facility embedded in — not replacing — national programmes



From JET to ITER: Europe learns to speak with one voice



Signing of the ITER Agreement, Paris, 21 November 2006

2002-03

France and Spain advance competing European bids.

Nov. 2003

The EU selects Cadarache; Barcelona is designated for the European agency.

2004-05

Europe negotiates externally against Japan's Rokkasho bid.

2006

Euratom signs as one party alongside six governments.

Europe had to compromise internally in order to negotiate externally as one partner.

What did fusion actually integrate?

- 01** **PROGRAMS** Euratom made national plans comparable, discussable and governable.

- 02** **HARDWARE** JET concentrated people, resources, standards and experimental practice.

- 03** **REPRESENTATION** Europe developed the capacity to act as one partner in ITER.

Fusion did political work long before it produced electricity.