1. Fusion, ITER and F4E
2. F4E Contracts & Finance overview
3. F4E Work Programme
4. F4E industrial policy
World Energy Outlook 1980-2030

An Energy Policy for Europe

• In early 2007 the European Commission put forward a fully integrated policy package covering both climate change and energy policies

• Aim by 2020 – the three 20s:
  • 20% reduction in greenhouse gas emissions
  • 20% reduction in global primary energy use
  • 20% of renewable energy in the EU's overall mix

• By 2050: indicative 60 to 80% reduction in GHG
Fusion is one of the answer

- Fusion is the source of energy of the sun and other stars
- When the nuclei of light atoms come together at very high temperatures, they fuse and release enormous amounts of energy.
- The only fusion reaction realistically exploitable on the earth is:
  \[ D+T \rightarrow He+n+Energy \]
- Deuterium is extracted from water
- Tritium is produced inside the reactor from Lithium, which is abundant in the crust of earth
How does fusion work .. in ITER?

• In the core of the sun or a star fusion happens at more than 10 million degrees Celsius

• On earth fusion can be exploited at around 200 million degrees Celsius

• At this temperature, strong magnets can be used to create ‘a cage’ that thermally insulates the fuel and protects the walls of the reactor chamber.

• This is realised in a doughnut shaped reactor called a tokamak.

• To reach 200M⁰C we need powerful heaters (73MW installed on ITER for 1gm of fuel!).
What are the merits of fusion?

- **Geo-political**: an enormous source of energy with basic fuels abundant everywhere - earth and water.

- **Environmental**: no CO\(_2\) emissions ⇔ very low global impact on the environment ⇔ no long-lasting radioactive waste ⇔ no burden on future generations.

- **Safety**: day-to-day-operation of a fusion power station would not require the transport of radio-active materials. Power stations would be inherently safe, with no possibility of “meltdown” or “runaway reactions”.
What are the merits of fusion? (cont’d)

The Lithium from a laptop battery, fused with the Deuterium of a full bath tab

=> would provide enough electricity for the needs of a family for the next 30 years!
The project & the participants

- As already mentioned, ITER is the world’s biggest fusion energy research project & world’s largest S&T cooperation endeavor.
- Objective: to demonstrate the scientific and technological feasibility of fusion power.
- To be built in Europe in Cadarache, France.
ITER technical aims

- Demonstrate steady state fusion power production.
- Study and optimise plasma behaviour.
- Demonstrate the technologies required for fusion power stations (except materials endurance).
- Size comparable to a power station.
- Produce about 500 MW of fusion power \( (Q \geq 10) \).
- Operate for about 20 years.
• **ITER Organization (IO), Cadarache**, undertakes reactor assembly & operational start of ITER device.

• **ITER France** agency, Cadarache, is in charge of ground preparation, safety related questions on behalf of IO, & on-site staff welcoming.

• **7 Domestic Agencies** manage the operational procurements and budget relative to their contribution. The DAs deliver in-kind contribution to IO in the form of components, works & services.

Fusion for Energy (F4E) is the European Domestic Agency
ITER Site
How will it look in 10 years
ITER site
What is the status?

- The ITER site is being prepared for construction in Cadarache in an area over 75 hectares.
- The ITER site levelling is complete.
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For the construction of ITER, Parties agreed that
- 90% of contributions are in-kind
- 10% are in-cash.

European Commission has created a specific legal entity in order to meet its obligation as a Party, including the participation of Switzerland.

Under Euratom Treaty, a Joint Undertaking was the most appropriate legal basis based on the experience of the Joint European Torus in the UK (1971-1999, EFDA thereafter).

So Fusion for Energy is:
- empowered to make decisions on behalf of the European Union.
- responsible of the EU budget.
F4E main facts and figures

- Established in April 2007 for a period of 35 years
- F4E is an industrial & procurement agency
- F4E members: 27 European Union states + Switzerland
- Headcount will be roughly 300 people in 2010
- F4E is based in Barcelona - Spain but has also an antenna in Garsching (D) and Cadarache (F).
The objectives of Fusion for Energy are threefold:

- Provide Europe’s contribution to ITER
- Implement the Broader Approach agreement between Euratom and Japan.
- Prepare for the construction of demonstration fusion reactors (DEMO).

All three objectives form part of the “Fast Track” approach.
F4E has to provide on behalf of the European Union and Switzerland
- 45% of ITER construction,
- 34% of operation, deactivation and decommissioning costs,

F4E manages 5B€ budget

Europe + CH (Euratom) are engaged in almost all of the Procurement Packages shared with the six other Parties.
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Rationale:

- Efficiency and reactivity, now for ITER then for DEMO
- Transparency, equal treatment and non-discrimination
- Ethical obligation vs. the tax payers
- Sustainable development obligation
- Best value for money is the core of our procurement activity.

Scope:

- Our natural supplier market is Europe.. but we go worldwide in exceptional cases
- We share with other Domestic Agencies, and steer potential partnership within the ITER world.
F4E contracts with organizations via:

- Grants through Calls for proposals
- Procurement contracts through calls for tender.

Grants support R&D at 40% through specific contracts or framework partnership agreements.

Procurement contracts will provide goods, works or services through:

- Open procedure
- Restricted procedure
- Competitive dialogue
- Negotiated procedure

Emphasis on restricted procedure and competitive dialogue due to technical complexity.
In case of **Open** or **Restricted** Procedure

- The contractor must comply with the instructions contained in the Tender

- First offer is the Best And Final Offer

- Any deviation to the process may lead to automatic exclusion of the bidder.
The Joint Team principles

Organization

- Each procedure is managed by a Technical Responsible Officer and a Procurement Responsible Officer
- Actions and information are shared.

Objectives

- Reach excellence in procurement thanks to an expert-oriented approach
- Ensure the implementation of the Work Program

Joint Team is supported by experts (QA, Finance, Business Intelligence, Legal ...)

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Some facts and figures

Operational budget 2009 is roughly M€ 290 (for procurements):

Since beginning of 2009:
102 procedures have been initiated (incl. 40 grants)
48 contracts have been signed (incl. 10 grants), among which
  ➢ Buildings and Power supplies M€ 9,4
  ➢ Engineering Support M€ 9,5
  ➢ HCD & Phys M€ 2,9
  ➢ Machine System M€ 53
  ➢ Plant System M€ 3,8

Until end of 2009:
Approximately 40 calls will be launched, worth M€ 38 M€, among which
  ➢ Ion source test facility (power supplies–ISEPS, Ion source)
  ➢ Infrastructures of the neutral beam test facility
  ➢ Magnetic diagnostic (design of in-vessel diagnostics to conceptual design review level)
  ➢ Excavation and drainage of Tokamak complex foundations
  ➢ Tokamak complex seismic isolators fabrication
  ➢ Mandatory and complementary building insurance
Some facts and figures

Work programme 2010

- To be published November 2009 with planned call for tenders
- Will include identification of necessary skills

Some topics

- [TF Coils]
- Vacuum Vessel manufacturing
- PF Coils fabrication
- Full excavation and foundation
- Tokamak building Call for Expression Of Interest, timing Q4 2010
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**F4E Industrial Policy rationale 1/2**

- **F4E Contracts & Finance** defines & enforces **F4E Industrial Policy**
- **F4E objectives** supported by F4E Director
- **Contracts** enhances F4E capacity to deliver
- **ITER components** contributes to the performance of European Fusion industry
- **Industries Associations Public bodies** framework for relations with
F4E industrial policy rationale

Enable knowledge sharing between associations and industry

Involve small, medium and big players. Bring opportunities and create value for industries and for ITER

Pave the way for a competitive industry for fusion in Europe
Actions and tools

Industry is more than a supplier and may be a partner

Industrial Liaison Officer is a preferred communication channel for industry

F4E provides as much information as needed for a mutual understanding.

- Publication of Work Programme on web site
- Publication of the list of companies selected to tender
- Implementation of a rule to invite 1/3 of SMEs for calls < 250 k€.

F4E takes Industry into consideration for possible inflexions on ‘touchy’ questions:

- Terms of payment,
- Insurance, Liabilities (nuclear and conventional and consequential), Conflicts of Interest,
- Intellectual Property Rights.

F4E develop an Industrial Portal

- include Supplier pre-qualification and assessment
- will include full electronic Call For Tender management.
Focus on Pre-qualification principles

The F4E suppliers Pre-qualification assesses the following domains:

- General information, Financial, Quality and Delivery records

*Industries have a chance to provide info on their experience*

For each criteria, traffic lights are used:

- **Green** for A and B, (A means outstanding and B means Good)
- **Amber** for C, (C means the delivered information are not accepted)
- **Red** for D, (D means information are not delivered)

A supplier will be considered as not pre-qualified if one of the domain is either **Amber** or **Red**.

A supplier not pre-qualified can still answer to a procurement or grant Procedure.

A pre-qualified supplier will not automatically be selected for a grant or Procurement procedure.

Pre-qualification data will be shared F4E-wide (ITER department) but also with other ITER Domestic Agencies.
Conclusion
• F4E – Fusion For Energy is a new and growing entity aimed to become a center of excellence for the development of Fusion (and associated technologies)

• F4E raises and will raise EU industrial resources (& research laboratories) to conceive, develop and provide the necessary ITER components.

• F4E defines the relevant industrial policy (adapted to strategic issues) for European enterprises wishing to participate to ITER project.
Thank you!

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