

# FUSION POWER CO-ORDINATING COMMITTEE

## FINAL STRATEGIC PLAN 2009-2011<sup>1</sup>

### Introduction

For the term 2009-2011, the strategy of Fusion Power Co-ordinating Committee (FPCC) will link very closely to the CERT strategy for 2007-2011, namely:

- *Stronger focus on the role of technology policy in developing cleaner, more efficient energy technologies and in deploying them, and on the role of policy in catalysing the scientific innovation needed to generate new energy technology approaches; constant efforts to distil for policy makers the important policy messages from work of the IEA energy technology network;*
- *Frequent, effective communication to policy makers of messages and perspectives extracted from analysis drawing on work and findings in the IEA's collaborative R&D network, notably from the Implementing Agreements, Working Parties, expert and ad-hoc groups, and from associated private-sector players and financial institutions;*
- *More fruitful liaison within the IEA family – including joint activities with the Standing Group on Long-Term Co-operation and “hot-line” communication with the IEA Governing Board – and with the OECD; and*
- *More vigorous collaboration with non-IEA countries.*

The strategy for the period 2009-2011 will address the following key areas:

- ITER and Broader Approach, including Fusion Power Demonstration
- Strengthened International Collaboration
- Communicating Technology and Technology Policy Messages

The FPCC is strongly committed to ITER and recognises that it will be the central activity in the world fusion program going forward. The FPCC activities are complementary to the ITER and Broader Approach (BA) activities. The later includes the EVEDA (Engineering Validation and Engineering Design Activities) phase of the International Fusion Materials Irradiation Facility (IFMIF). The FPCC and the Fusion IAs will strive to realise fusion power generation by sharing and contributing scientific expertise on a wide range of activities, including:

- Support for and enhancement of major burning plasma experiments (ITER project);
- Develop concepts and technologies for the DEMONstration power plant (DEMO, i.e. beyond-ITER programme);
- Carry out materials R&D, reactor system studies, safety, environmental, economic and social aspects of fusion (which have strong implications for the success of the overall fusion programme); and
- Study of the physics and technology of alternative confinement options.

The FPCC will continue to foster reinforced international co-operation through the activities of the Contracting Parties to the IEA fusion IAs with other international organisations, efforts and plasma physics agencies in other countries.

The FPCC will also advise the IEA Governing Board and the CERT on fusion-relevant topics and address specific questions raised by policy makers and general public regarding prospects and potential for fusion energy. The FPCC will provide periodic inputs to CERT on the roadmaps and progress of fusion R&D, particularly with regard to the environmental, safety and economy issues.

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<sup>1</sup> As presented to the Committee on Energy Research and Technology at its meeting 11-12 February 2009.

## ITER

The next term of the FPCC will focus on accompanying support to the implementation of the ITER project, the world's largest experimental fusion facility. Begun in 2007, the ITER project will be central to international cooperation going forward. Given the large scale and long-term nature, the project will require greater, stronger international cooperation. Each of the IEA fusion-related Implementing Agreements will give an important contribution to the success of ITER.

### Tokamaks

As ITER is a tokamak, the past international collaborative work of the three tokamak Implementing Agreements – *Large Tokamaks*, *Plasma-Wall Interaction in TEXTOR*, and *Plasma Physics and Technologies of Tokamaks with Poloidal Divertor* – have been instrumental in paving the way to make ITER possible. In the period 2009-2011 they will contribute experimental and theoretical work on plasma physics, plasma-wall interaction, and divertor physics technologies. In addition, they will complement the International Tokamak Physics Activity (ITPA). The ITPA provides the framework for coordinated physics research activities proposed by the ITER International Organisation.

Proposed tokamak activities include: physics R&D activities to prepare for ITER exploitation such as theory, modelling and experiments in the existing facilities; development of ITER candidate operation scenarios; potential for nearly steady-state operation; diagnostics and auxiliary systems; plasma-wall interaction; impact of plasma disruptions on plasma-facing components lifetime; definition of the physics basis to extrapolate ITER plasma to DEMO.

The IEA framework is also an important tool for integrating the new Tokamak experiments carried out in China, India and Korea within the international fusion community.

### Technology, Materials and Safety

The Implementing Agreement on *Nuclear Technology for Fusion Reactors*, with its emphasis on breeding blankets, contributes primarily to the development of the Test Blanket Modules for ITER. The *Fusion Materials* Implementing Agreement contributes largely to materials R&D. The *Environmental, Safety and Economic Aspects of Fusion Power* Implementing Agreement supports ITER by treating issues such as safety analysis and database preparation.

### Alternate Concepts

The IAs concerned with alternate concepts (*Reversed Field Pinches*, *Stellarator Concept* and *Spherical Tori*) contribute to the development and understanding of magnetic confinement physics in collaboration with Tokamak agreements, to broaden the range of plasma-operating conditions and to improve reliability of plasma physics models. The *Stellarator* IA will address in particular the key issue of steady-state operation.

## **Broader Approach including Fusion Power Demonstration**

The Broader Approach Agreement between Japan and EURATOM entered into force in June 2007. Specific guidelines on the participation of other ITER Parties in Broader Approach activities are also in force. The objective of this agreement is to establish a framework for specific procedures and details for the joint implementation of activities in support of the ITER project and an early realisation of fusion energy for peaceful purposes. The BA activities comprise the following three projects:

1. Engineering Validation and Engineering Design Activities for the International Fusion Materials Irradiation Facility (IFMIF/EVEDA);
2. International Fusion Energy Research Centre (IFERC) including DEMO conceptual design activities and R&D activities on DEMO technologies ; and
3. Satellite Tokamak Programme.

During 2009-2011, the IEA FPCC and the Implementing Agreements are very well positioned to contribute with accompanying support to the implementation of the BA project through coordinated international cooperation in the following principal areas:

- Developing materials and technologies for DEMO; qualification of low-activation materials; development of neutronics data libraries; plasma facing components and plasma-wall interaction; breeding blanket technology; tritium control and removal techniques; conceptual design studies for DEMO power plants; high temperature superconducting magnets; remote handling and remote maintenance; safety, environmental and economic analysis.
- Exploring advanced magnetic configuration concepts to provide basis for later generation of fusion power stations as well as an improved theoretical and experimental understanding of fusion plasma and improved tools for plasma heating and control.

### **Strengthened International Collaboration**

As in the past, the FPCC will continue to foster reinforced international co-operation through the activities of the Contracting Parties to the IEA fusion Implementing Agreements (Australia, Canada, China, Japan, Korea, Switzerland, Russia, United States, Ukraine and EURATOM), with the International Atomic Energy Agency (IAEA), the International Tokamaks Physics Activity (ITPA), the Nuclear Energy Agency (NEA), and plasma physics agencies in other countries such as India.

The FPCC has a unique position and an opportunity to play an important coordination role. As mentioned above, in addition to large projects such as ITER and IFMIF conducted under specific international frameworks, international fusion efforts will include a number of complementary R&D tasks where the IEA FPCC and Implementing Agreements can play a key role, either by providing direct R&D contributions, or by making available a proven and well-organised framework for reactor-oriented international collaboration.

With a view to providing more effective coordination and contribution to ITER, FPCC delegates have discussed the possibility of merging three tokamak IAs: *Large Tokamaks, Plasma Physics and Technologies of Tokamaks with Poloidal Divertor*, and *Plasma-Wall Interaction in Textor*. To date, it is expected that one tokamak-related Implementing Agreement will be established that will combine the work of two Implementing Agreements *Large Tokamaks and Plasma Physics and Technologies of Tokamaks with Poloidal Divertor*. The Executive Committee of the *Plasma-Wall Interaction in Textor* is expected to meet soon to discuss this matter.

Outreach to non-IEA countries will also be a focus of the FPCC for the period 2009-2011. China, Russia and the Ukraine currently participate in fusion Implementing Agreements. In addition, India is a partner of ITER. The FPCC will seek to formalise participation of China, India and Russia in accordance with the IEA Outreach Strategy approved by the Governing Board.

### **Communicating Technology and Technology Policy Messages**

Dissemination of reliable information will be an important focus of the FPCC. In the course of the new mandate the FPCC will continue to advise the IEA Governing Board and the CERT on fusion-relevant topics and addressing specific questions raised by policy makers and general public regarding prospects and potential for fusion energy. The FPCC will provide periodical inputs to CERT on the roadmaps and progress of the fusion R&D, particularly with regard to the environmental, safety and economy issues. The FPCC will also continue improving co-ordination and visibility of the IEA fusion activities and will support IEA member country initiatives in relevant fields, including specialised meetings, workshops and documents with a particular reference to the role of fusion power as a long-term, safe, CO<sub>2</sub>-free energy option.