

9 Industry

9.1 OVERVIEW

The CCFE Fusion and Industry liaison programme has two main tasks, which are pursued via a wide range of activities:

- To increase the number of UK companies bidding for fusion contracts, especially from the ITER programme;
- To identify and promote areas of technology transfer between fusion and industry.

The first of these tasks continues to be the primary focus for the Fusion and Industry programme, especially encouraging UK companies to bid for ITER contracts from both (a) the European ITER Domestic Agency known as 'Fusion for Energy' (F4E) in Barcelona, and (b) the central ITER International Organisation (ITER IO) in Cadarache, France.

The technology transfer activity continues to focus primarily on the Technical Support Package where we provide assistance / support to suitably qualified start-up companies located in the Culham Innovation Centre through a combination of technical know-how and practical engineering.

9.2 PARTICIPATION OF UK COMPANIES IN FUSION & ITER CONSTRUCTION

9.2.1 CONNECTION WITH APPROPRIATE UK COMPANIES

The Fusion and Industry team has continued its awareness programme by identifying and encouraging appropriate UK companies for work packages that are being launched by F4E and also by ITER International Organisation. Typical activities undertaken include:

- Alerting / informing companies on our industry database of opportunities, events, etc., through email ('E-News'), our 'E-Zine' *Fusion Business* and our dedicated fusion & industry website <http://www.fusion-industry.org.uk/>;
- Connection with appropriate companies by working with government and other agencies (UK Trade & Investment, Regional Development Agencies, Devolved Agencies, Manufacturing Advisory Service and various Trade Associations), and attendance at various workshops/seminars;
- Visits to and from many UK companies.

9.2.2 EUROPE'S INDUSTRY LIAISON OFFICERS

Dan Mistry of CCFE is the UK's Industry Liaison Officer (ILO) for fusion. The European ILOs meet regularly with F4E to understand the forthcoming opportunities and also to raise any concerns from their

countries' companies. They are also in regular contact to try and help form pan-European consortia of companies.

9.2.3 ITER IO AND F4E'S WORK PLAN FOR 2010

Since November 2009 F4E have released regular updates on forthcoming Calls for Tender. This advanced list along with identification of key skills / expertise that will be needed has enabled us to identify and prepare companies to respond more proactively than reactively. F4E also have a 'portal' for industry at: <https://industryportal.f4e.europa.eu/default.aspx>.

Also, F4E is planning to hold regular 'Information Meetings' to disseminate technical / commercial information and also encourage companies to form consortium, especially as some packages will require comprehensive skills / expertise which are unlikely to reside in one single company.

ITER IO is also now providing information on its forthcoming Calls. Again the Fusion and Industry team, along with European ILOs, is working very closely to ensure European industry plays a key role in the construction of ITER.

Our role at CCFE is to advertise these opportunities and events to UK companies and use our fusion expertise to brief them as appropriate.

9.3 UK COMPANIES WINNING KEY FUSION CONTRACTS

A number of UK companies have won contracts for JET, ITER and MAST, including the following. CCFE has been instrumental in introducing several of these to fusion. Further examples may be found in our *Fusion Business* e-zine available at: <http://www.fusion-industry.org.uk/newsletter.asp>.

9.3.1 JET

Centronic Ltd, a specialist in manufacture of electronic and electro-mechanical components for high performance applications, supplied an Ultra High Vacuum electrical feed-through assembly for interfacing of the diagnostics related to the ITER-like Wall project, an EFDA-JET enhancement programme.

The ITER-like Wall project (see Chapter 3) involves adding a considerable number of new diagnostic instruments to the JET torus; for example, Langmuir probes (to measure the current density at the edge of the plasma) and thermocouples (to monitor the temperature of the first wall tiles). The UHV electrical feed-through acts as a vacuum chamber interface between the interior and exterior of the torus.

9.3.2 ITER

Oxford Instruments is to supply 58 tonnes of superconducting wire to ITER at a value in excess of £30million, via a contract with Fusion

for Energy. Deliveries will be phased over three years. The wire will be supplied by Oxford Superconducting Technology, USA, a wholly-owned subsidiary of Oxford Instruments.

Engineering consultancy **Assystem (UK) Ltd** has been awarded an ITER Remote Handling Framework Contract by F4E. Under the framework contract, Assystem is the primary consultant to Fusion for Energy on torus-related, remote handling systems. Assystem is responsible for assessing remote handling conceptual designs and the buildability of the remote handling systems. This will include a review of remote handling technology and its suitability for ITER.

Systems and engineering technology company **Frazer-Nash Consultancy** has completed an Explosion Risk Analysis for buildings that will store radiological materials on the ITER site, following the award of a contract by the central ITER Organisation in Cadarache.

The ENERGHIA consortium has been appointed to three framework contracts by Fusion for Energy, worth a total of up to €2million, to provide civil engineering analysis for the ITER tokamak complex. ENERGHIA comprises one of the UK's leading seismic design specialists, **Halcrow Group Ltd**, with Spanish independent engineering consulting company Idom and French-based engineering group Altran. ENERGHIA has engineering design capabilities in France, Spain and the UK.

AMEC, as part of the European Fusion Engineering and Technology (EFET) consortium, has been awarded a two-year framework agreement, with the option to extend it year-on-year for a further three years. Within the framework contract, EFET will provide mechanical, electrical and nuclear engineering support to assist the ITER Organisation in the activities required to design, procure and assemble the tokamak.

W S Atkins Ltd is one of four companies in a European consortium that won a contract of around €150million for the Architect Engineer role for the ITER buildings and Civil Infrastructures.

9.3.3 MAST

Scottish optical manufacturers **Spanoptic** played a pivotal role in the £2million upgrade to the MAST Thomson Scattering laser diagnostic (Chapter 5). A set of giant lenses supplied by the Fife-based company is now capturing highly accurate data on plasma temperature and density from 130 different locations inside MAST, collecting light scattered from laser beams fired into the tokamak. Manufacturing the six collection lenses presented unique challenges, not least the size – at up to 450mm in diameter, they are the largest lenses ever produced for a fusion research facility.

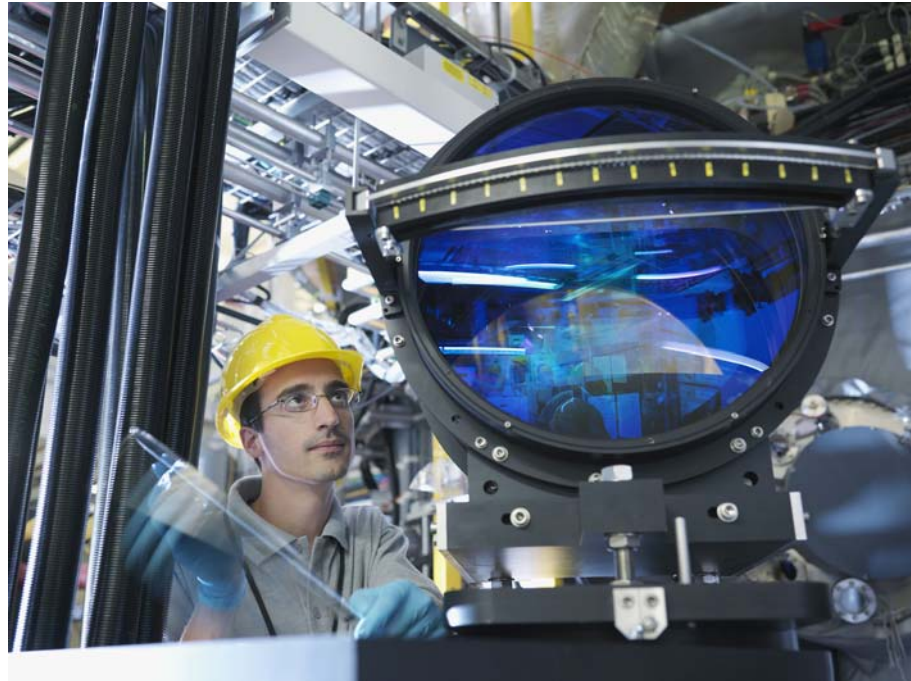


Figure 9.1: Collection lens for MAST supplied by Spanoptic (image copyright Monty Rakusen)

9.4 TECHNOLOGY TRANSFER AT CULHAM INNOVATION CENTRE

Culham Innovation Centre is part of a network of business incubators managed by Oxford Innovation and is home to a wide range of pioneering technology-focused companies, providing start-up companies with a professional infrastructure and image to grow their business, along with a range of business support services needed during the first vital years of operation. Nineteen companies currently occupy office space or have taken advantage of Oxford Innovation's 'OxiFlex' virtual office service. They work in a wide range of sectors from electronics engineering to marketing.

CCFE's Technical Support Package (TSP) continues to assist suitably qualified start-up companies located in the Innovation Centre. Through a combination of technical know-how and practical engineering, the TSP successfully transfers fusion technology and expertise to start-up companies working in other markets. Depending on their needs the TSP could include technical advice or access to engineering, scientific and computing skills and technologies. The TSP has assisted several start-up companies in areas such as product development and problem solving, usually via the assistance of CCFE's Special Techniques Group. Six companies currently benefit from the TSP and all endorse its value to the growth of their business.

For example, Magink Display Technologies is the latest company to benefit from the TSP, in development of its innovative display technology. Magink has developed a new kind of full colour digital

billboard that looks like paper, gives greater brightness and colour saturation and reduced power consumption, by utilising a little-used type of liquid crystal adapted by Magink for this application. Access to fusion engineers is allowing the company to develop jigs for test equipment used to measure the thickness of the various layers in the LCD display.



Figure 9.2: Magink digital billboard in Florida

9.5 PROMOTIONAL ACTIVITIES

9.5.1 FUSION & INDUSTRY WEBSITE AND DATABASE

The Fusion and Industry website <http://www.fusion-industry.org.uk> is regularly updated to reflect ITER developments. During the year, we have made it easier to go straight to the contracts news and secure pages and the ITER-related pages have also been revised, including updated links to F4E and ITER.

As F4E and ITER procurements ramp up in 2010, the CCFE Fusion and Industry team wanted to make sure it could track UK industry involvement and successes, better identify companies for ITER technology briefings and spot any gaps in the UK's response to ITER business opportunities. To this end the website has been improved to provide more project response tracking facilities and the 'e-news' system is used to circulate details of F4E and ITER projects and briefings together with web links for further information. There are now over 1,800 companies registered on our database.

Other changes have been updates to the fusion technology transfer pages including Technical Support Package case studies, fusion presentations and briefing materials pages.

9.5.2 FUSION BUSINESS E-ZINE NEWSLETTER

Issues 14 to 20 of the electronic Fusion Business e-zine were published during this year, with the primary focus on opportunities to win ITER business and features on UK companies who have successfully won ITER, JET and MAST contracts. Also covered are the activities of the Fusion and Industry team, progress on technology transfer and Culham Innovation Centre activities including the Technical Support Package. Current and back issues of the Fusion Business e-zine can be found at: <http://www.fusion-industry.org.uk/newsletter.asp>.

9.5.3 EXHIBITIONS AND EVENTS

Company exhibitions continue to be a successful feature of the Fusion and Industry events programme and demand remains high. Over 45 companies exhibited at Culham during the past year with companies booking up to 12 months ahead. Joint exhibitions by non-competing companies continue to remain very popular, especially for companies who are requesting a return visit every year. For most companies a tabletop exhibition in the Culham main reception area will suffice, but mobile exhibition trailers can also be accommodated.



Figure 9.3: Companies exhibiting in Culham Foyer

Exhibitors come from a wide cross-section of industries including precision engineering, motion control, cryogenics, fibre optic connectors, thermo analytical instruments, pressure regulators and vacuum equipment. In addition to meeting fusion scientists and engineers, exhibitors are able to meet staff from the many technology companies located at Culham Science Centre.

The annual Technology & Innovation exhibition, which promotes engineering equipment and associated services to the UK nuclear industry around the country, returned to Culham for its ninth year in

May 2009. Over 30 companies were on show, offering technologies ranging from glassblowing and lasers to vacuum technology and stainless steel fabrications. Some 240 people visited the exhibition. Feedback from exhibitors was very positive, with many commenting that it was an excellent turnout, and a good number of immediate sales enquiries were received.



Figure 9.4: Exhibitors and visitors at the Technology and Innovation Exhibition

9.5.4 REMOTE HANDLING WORKSHOP

Getting to grips with the breadth and complexity of remote handling applications for ITER was the subject of the ITER Remote Handling Workshop which was held at Culham in September 2009. Around 80 representatives from over 30 companies attended the workshop, organised by the Fusion and Industry team.

Delegates from F4E and the ITER Organisation gave presentations on the organisational and procurement aspects relating to remote handling. UK companies were given the opportunity to learn more about the many opportunities available to them in ITER remote handling projects.

The workshop looked at the remote handling technical requirements and design description of the vacuum vessel's blanket, divertor systems remote handling equipment, the transfer cask and port plug handling and in-vessel viewing systems. It also reviewed the remote handling requirements for the neutral beam system, hot cell, remote handling test facility, and multi-purpose deployer used to accomplish a variety of remote handling tasks.



Figure 9.5: Delegates attending the Remote Handling Workshop at Culham

9.5.5 POWER SUPPLIES WORKSHOPS

The importance of power supply equipment in fusion research was highlighted by workshops on the requirements for MAST at Culham, and for ITER at F4E's 'Information Day on Additional Heating Power Supplies for ITER' in Barcelona.

The MAST workshop was attended by representatives from seven power supply equipment companies and reviewed current power supplies and discussed technical requirements for the future upgrade of MAST. It also touched briefly on JET plans for power supply refurbishment, including possible replacement of old control systems.

The 'Information Day on Additional Heating Power Supplies for ITER' organised by F4E was attended by representatives from 35 companies at the F4E offices in Barcelona, including some from the UK.

9.5.6 MEET THE BUYER EVENT

Fusion and Industry attended the North East Regional Business Fair at Newcastle Racecourse and Conference Centre at the end of February 2009. Over 1,400 people attended the event, which was a combination of 'Meet the Buyers' with over 90 attending buyers, an exhibition with over 50 exhibitors, a business advice zone, and two days of seminars and workshops. The event was well worth attending given the strength of the engineering manufacturing sector in the North East. There were a number of specialist tool-making, general engineering and IT companies who visited the Fusion and Industry stand. Delegates were keen to find out about fusion and the potential business opportunities available from ITER and JET.