

9 INDUSTRY

9.1 INTRODUCTION

UKAEA's Fusion and Industry activities fall into two categories:

- Encouraging UK companies to bid for contracts the international fusion programme, especially ITER;
- Facilitating technology transfer from fusion to other applications.

Now that the international ITER agreement has been signed, the ITER team is building up in Cadarache, France, and the European Agency in Barcelona is being established, the work on interesting UK companies in ITER work is of even greater importance and urgency.

9.2 UK COMPANIES CONTINUE TO WIN KEY FUSION CONTRACTS

During the year, the Fusion and Industry programme has continued to seek UK companies to compete for international supply contracts for the construction and operation of ITER and for JET. UKAEA, like all the EURATOM Associations, has been invited by EFDA to nominate companies for tender lists for both ITER and JET contracts placed by the European Commission (see also Section 9.5.1). In future, ITER contracts will be placed by a new European Agency being established for this purpose in Barcelona, and by the international ITER organisation itself.

Last year we reported that a number of UK companies had won R&D and consultancy contracts for ITER. In 2006/07, following nominations for tender lists made mainly in the previous year, UK companies won several contracts for ITER-related work and also for the JET EP2 enhancements, especially the ITER-like wall project (see Chapters 3 and 4). These contracts ranged in monetary value from €24,000 to over €5M. The final round of contracts for EP2 was decided in late 2006. These totalled over €30M and UK companies won approximately a third of these by value in technologies including plasma-facing tiles that need to withstand high heat loads; specialist machining, casting, jigs and bolts and springs; and circuit breaker units. Reports on work undertaken by UK companies feature in our newsletter *Fusion Business*, which may be found at <http://www.fusion-industry.org.uk/newsletter.asp>.

The most important step for UK companies seeking opportunities from both the European Agency and the central ITER organisation is to register their interest on the EFDA database www.efda.org/eidi/ and on UKAEA's Fusion and Industry ITER Suppliers database www.fusion.org.uk/industry.

9.3 WORKING WITH GOVERNMENT AND REGIONAL ORGANISATIONS AND WITH OTHER “BIG SCIENCE”

The Fusion and Industry team continues to work in partnership with many government agencies including UK Trade and Investment (UKTI) and the Regional Development Agencies (RDAs) and Devolved Assemblies (DAs) in raising awareness in UK companies of business opportunities in fusion research in general and ITER in particular, giving them timely information and alerting them to procurement processes and deadlines. Presentations have been made at regional awareness events in the East Midlands and the South-East of England, in Nottingham and Oxford respectively.

On 1 April 2006, the new research facilities group of the Sensors Knowledge Transfer Network (KTN) commenced. This is funded 50% by the UK Department of Trade and Industry, and 50% by the other sponsors, i.e. UKAEA, the Particle Physics & Astronomy Research Council (PPARC), the Biotechnology & Biological Sciences Research Council (BBSRC), and the Council for the Central Laboratory of the Research Councils (CCLRC¹). The aim of this new group is to increase the involvement of UK industry in “big science”, recognising that many machine and instrumentation technologies are common to fusion, particle physics, astronomy and neutron and synchrotron facilities.

This new initiative was officially launched at CCLRC's Rutherford-Appleton Laboratory on 11 September. The event was attended by 250 delegates, including 180 from industry. Key speakers including CCLRC Chief Executive John Wood gave presentations on the services on offer from the KTN network. A UKAEA speaker gave a presentation on the technologies used in fusion especially ITER. During the year the KTN, with speakers from its sponsors including UKAEA, has held a number of meetings for industry on particular technologies including specialist metals machining (hosted by Culham), instrumentation and vacuum systems. The KTN has also launched its new research facilities database which will help to support and develop supply chains between industry and research facilities and hold details of companies and the products they supply. The network's website is <http://www.qi3.co.uk/sktn/>.

9.4 “ITER BUSINESS OPPORTUNITIES FOR UK INDUSTRY” EVENT

An event to highlight opportunities and challenges facing UK companies interested in competing for ITER business was held at UKAEA Culham on 28-29 June.

Over 230 delegates attended this event including representatives of over 175 companies, individuals from many government agencies

¹ On 1 April 2007, PPARC and CCLRC merged to form the new Science and Technology Facilities Council (STFC).

and Trade Associations, along with key engineers from the EFDA and ITER design team. The event was considered a success as it brought together a wide variety of UK companies ranging from large engineering companies to specialist small and medium enterprises in a range of markets to inform them of the forthcoming business opportunities that will be available from the construction and commissioning of ITER.

This was the first opportunity for UKAEA scientists and engineers, together with key representatives from ITER and EFDA to brief UK industry on the status of ITER, EU procurement opportunities and the project timetable. They gave presentations on the technical features and engineering challenges of ITER. Presentations were also given by UK companies who had already won ITER contracts. The talks at this meeting are available at <http://www.fusion-industry.org.uk/briefing.asp>.

The event which was hosted by UKAEA Culham's Director, Professor Sir Chris Llewellyn Smith, together with the Fusion and Industry team, was preceded on the evening of 28 June by a networking event and a tour of Culham's fusion experiments. The ITER event was run in parallel with the annual Technology and Innovation Exhibition (see Section 9.8.3).



Figure 9.1: Dr. Enrico Di Pietro of EFDA explaining ITER procurement arrangements, including which components will be bought in Europe



Figure 9.2: Attendees at the "ITER Business Opportunities for UK Industry" event visiting the MAST experiment

9.5 VISITS TO AND FROM COMPANIES

Many UK companies are contacting UKAEA's Fusion and Industry team as they become aware of the fusion and ITER programme. A number have already visited Culham to present their capabilities and, when accessible, to see fusion facilities. The Fusion and Industry team are also undertaking regular visit to companies to understand their capabilities and meet key individuals whom we can contact immediately in preparation for future business opportunity.

Many professional institutes such as IMechE, ICE, IET have offered to help make known to their members the potential business opportunities from fusion in general and the ITER programme in particular. Fusion and Industry have given talks to many of their local groups and these have been well received. Attendance at exhibitions and other industry events are also encouraging new companies to consider fusion in the hope that some of them will bid for contracts or will pass the word to other UK companies which may be interested in the ITER programme.

UKAEA Culham continues to be a member of the **UK Photonics Cluster** network. To increase awareness of the role of photonics in fusion research, and related business opportunities, members of the Fusion and Industry team attended the UK's specialist Photonics and Optical Technologies Event "Photonex" in Coventry in October 2006. This led to an article in the January 2007 issue of *Optics & Laser Europe* on the role of optical technologies in fusion research and UKAEA's involvement in the design of instrumentation for ITER especially the LIDAR Thomson Scattering system looking at the core of the ITER plasma (see Chapter 8). The LIDAR system includes, amongst other technologies, lasers, collection optics, mirrors and detectors. Since the meeting and the *Optics & Laser Europe* article, the Fusion and Industry team has assisted UKAEA's LIDAR team with visits to and from relevant companies.

9.6 EUROPE'S INDUSTRY LIAISON OFFICERS (ILOS) MEET IN FINLAND

In February UKAEA's Fusion and Industry Manager attended the first meeting of Europe's Industry Liaison Officers (ILOS) in Finland. The meeting proved to be a great success with agreement that ITER should benefit from the skills and expertise of companies that can supply the "best value" no matter where they are located in Europe.

A representative from EFDA in Barcelona gave an update on how the new European Agency there will procure its "in-kind" contributions to the ITER programme to ensure fair and transparent competition between European companies. This was followed by several presentations from various ILOS on their activities to engage industry from their countries. It was recognised that many of the ITER work packages will not be delivered by a single organisation and so discussion took place on how best to share information and also

encourage the formation of national/European consortia. Further meetings are being planned to share information and where possible help to try and form consortia; the next such meeting was scheduled for June 2007, at Culham.

9.7 TECHNOLOGY TRANSFER

9.7.1 UKAEA DIAGNOSTIC CHALLENGE DRIVES NEW PRODUCT DEVELOPMENT

The search for a calibration light source for MAST optical diagnostics has led one UK company, Bentham Instruments, to expand its product range and win new business as a result. The project resulted in the development of the Bentham Instruments ULS300, a uniform light source providing variable luminance at constant colour temperature along with the uniformity needed to calibrate wide-angle optics.

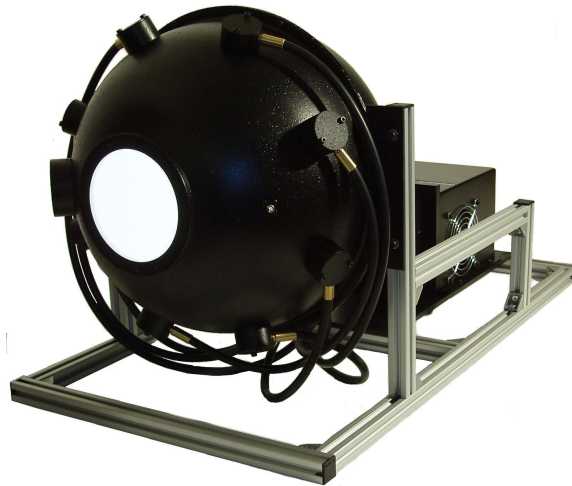


Figure 9.3: The Bentham calibration light source, developed with scientists at Culham

The ULS300 (Figure 9.3) is an integrating-sphere that gives UKAEA researchers a compact light source with excellent uniformity and is a significant improvement on other techniques for calibrating our wide angle optics. It is expected that the uniformity can be further improved by modifying the optical fibre bundles so that they launch light into the sphere obliquely; Bentham are working on this refinement. Feedback from Bentham indicates that they have learnt much from working with UKAEA. The ULS300 is a highly specialist instrument but several have already been sold to non-fusion customers and there are prospects from around the world for further sales. For further information visit www.bentham.co.uk.

9.7.2 CULHAM INNOVATION CENTRE AND THE TECHNICAL SUPPORT PACKAGE

The **Culham Innovation Centre** is part of a network of business incubators managed by Oxford Innovation. Eighteen companies are currently occupying office space or have taken advantage of Oxford Innovation's "OxiFlex" virtual office service. These companies work in a wide range of sectors from electronics engineering to marketing.

Last year, to celebrate five years of innovative success, the Culham Innovation Centre held a networking event in partnership with Southern Oxfordshire Enterprise Hub and sponsored by UKAEA. Various speakers showcased the support services available to technology businesses including a presentation by a member of the Fusion and Industry team on the advantages of UKAEA's **Technical Support Package** (TSP) that allows suitably qualified companies in the Culham Innovation Centre to benefit from the fusion research programme.

Via the TSP, through a combination of technical know-how and practical engineering, UKAEA is successfully transferring fusion technology and expertise to the UK businesses. Depending on their needs this could include technical advice or access to engineering, scientific and computing skills and technologies. The TSP has matured into a successful model of technology transfer with a proven track record of assisting start-up companies in the Innovation Centre with product development and problem solving, usually via the assistance of UKAEA's Special Techniques Group.

Seven companies currently benefit from access to fusion expertise through the TSP and all are enthusiastic in their praise for the scheme and endorse its value to the growth of their business. For example, drawing on the TSP a magnetic resonance imaging (MRI) company, Laplacian, is developing a new transportable MRI scanner for sampling objects in excess of 150mm diameter. MRI is no longer confined to medical applications as innovations by Laplacian in the areas of gradient winding, manufacture and complex fabrication techniques continue to create new applications.

Another company, Reaction Engines (Figure 9.4), which develops heat exchanger technology for advanced aerospace applications, has recently been using the TSP to visualise the flow path of gas through a tube matrix by using a high speed camera that is usually used to view plasmas in fusion experiments on MAST (see Chapter 5). The camera images have allowed Reaction Engines to capture the cross-counter flow across the matrix and identify any problem areas.

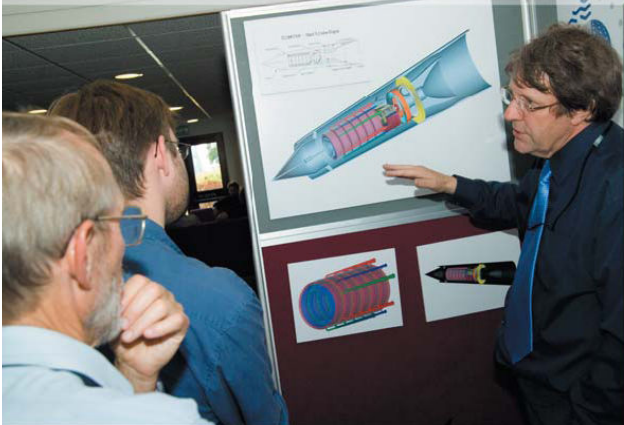


Figure 9.4: Reaction Engines MD Alan Bond explaining the principles of pre-cooled hypersonic engines. This company benefits from UKAEA's Technical Support Package

The TSP is already available to suitably qualified companies in Culham Innovation Centre. The Fusion and Industry team are now in discussions with the Culham Science Centre property management team with a view to rolling out the scheme more widely to other companies located at Culham.

In a bid to engage UK Science Park based companies with the business opportunities and technology transfer opportunities arising from fusion research, a member of the Fusion and Industry team presented a paper to 250 delegates at the UK Science Park Association (UKSPA) Conference in Edinburgh in January 2007. Given the interest among Science Park managers in developing new ways of assisting the development of their client companies, the presentation reported the success of the TSP as a proven model for technology transfer at UKAEA Culham, and suggested that other Science Parks should consider adopting a similar scheme if they have neighbouring research institutes like Culham.

9.8 PROMOTIONAL ACTIVITIES

9.8.1 FUSION AND INDUSTRY WEBSITE

The Fusion and Industry website www.fusion.org.uk/industry is currently being updated to reflect changes to the Fusion Business newsletter from a paper-based format to an electronic "e-zine" (see Section 9.8.2).

The Contracts Opportunities secure page introduced last year for accessing information received from European organisations asking us to nominate suitable qualified companies for tender lists for fusion work, especially ITER, is proving to be very successful. To gain access to this secured page companies must first have registered their details on our database, after which companies are issued with a Fusion and Industry number and password.

With over 550 companies now registered on the suppliers database, the Fusion and Industry team continues to encourage companies to register their details, enabling them to be kept informed of future contracts from fusion and of developments in fusion especially the ITER project via the new “E-News” system.

The industrial database for ITER (www.efda.org/eidi/) was launched by EFDA in 2006. This allows companies to register themselves adding a number of ITER-specific activity codes that detail areas of special competence of the company and allow focused information. The database can be used by ITER main contractors and by fusion laboratories to seek suppliers and partners, and will be used by the European Domestic Agency for ITER in Barcelona to seek companies for tender lists.

9.8.2 FUSION AND BUSINESS NEWSLETTER

Issues 35 to 38 of the Fusion Business newsletter were published during the year and featured a wide range of articles. The newsletter’s primary focus is on opportunities to win ITER business, and features 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.

The newsletter continues to contain a section dedicated to industry exhibitions taking place at Culham (see next section) and includes the exhibitors’ feedback. Issues of the newsletter can be found on our website <http://www.fusion-industry.org.uk/newsletter.asp>.

In light of the decision to proceed with the construction of ITER and the availability of e-publishing techniques, the Fusion and Industry team conducted a survey of registered readers of Fusion Business with the objective of reviewing the topics covered and the format and distribution of the newsletter. Feedback received was very positive and the Fusion and Industry team are now producing a new Fusion Business electronic newsletter (“e-zine”) format with shorter and more up-to-date articles as “tasters”, with fuller articles provided on a new Fusion Business web page on the Fusion and Industry website via a website link on the e-zine. The benefit of this e-zine approach is that companies will have access to the latest up-to-date news and more details on stories as well as useful web links for further information.

9.8.3. EXHIBITIONS AND EVENTS

Company exhibitions at Culham continue to be a successful feature of the Fusion and Industry events programme. Since their introduction in 1999, they have become increasingly popular for suppliers to UKAEA, and 2006 was a record year with over 35 companies exhibiting at the site. Demand for Culham exhibitions is now so high, with places booked up to six months ahead, that to enable more companies to exhibit, the Fusion and Industry team now arranges joint exhibitions by non-competing companies. This format is

particularly used for those companies who are requesting a return visit every year.

For most exhibitors a pop-up stand and tabletop in the Culham main reception area will suffice, but mobile trailers can also be accommodated.



Figure 9.5: Companies exhibiting in the main foyer at Culham

Exhibitors come from a wide cross-section of industries including precision engineering, fluid flow control, electrical supplies, technical optics, and vacuum component and polymer bearings, for example. In addition to meeting fusion scientists and engineers, exhibitors are able to meet staff from the many technology companies that share the Culham Science Centre site.

Building on the success of the individual exhibitions is the **annual Culham Technology and Innovation exhibition**. This was held in June 2006 for the sixth year and organised by Nu-Tech Associates in collaboration with the UKAEA Fusion and Industry team. It promotes innovation and technology transfer between nuclear, aerospace and defence markets, and gives companies an opportunity to demonstrate their capabilities to engineers involved in the assessment, provision or purchasing of technology components and equipment. Last year, for the first time, exhibiting companies had the opportunity to meet the UKAEA Contracts Procurement team at Culham and learn about how UKAEA procures products and services, as well as having an opportunity for a one-to-one meeting with a UKAEA buyer.



Figure 9.6: Annual Technology and Innovation exhibition in a marquee at Culham

In a marquee specially erected for the occasion, 30 companies exhibited, offering a wide range of engineering and nuclear services. There are clear indications from feedback received that attending the event has led to some excellent leads being made. The exhibition was held at the same time as the ITER Business Opportunities event reported in Section 9.4, to enable cross-fertilisation between the two events.

9.9 FUSION AND INDUSTRY PLANS FOR THE FUTURE

The main focus of the programme will continue to be ITER.

In addition the Fusion and Industry programme will continue to:

- Encourage and where possible help UK companies to bid for contracts from fusion in general and ITER in particular, through visits, events and other means, recommending that UK companies register their details on our website www.fusion.org.uk/industry and on EFDA's industrial database for ITER at www.efda.org/eidi;
- Develop further links with UK Regional Development Agencies, UK Trade and Investment and Manufacturing Advisory Services, and the new KTN, in their activities designed to make industry aware of business opportunities from "big science" in general and fusion and ITER in particular. We also hope to use their resources to form a stronger links with industries and to help with road shows or workshops that will be rolled out in due course;
- Publicise opportunities for contracts and technology transfer from fusion in the new electronic-format Fusion Business and on the website;
- Seek technology transfer opportunities, and if possible increase the number of companies benefiting from the Technical Support Package.