

Fusion means business

Fusion and Industry at Culham Centre
for Fusion Energy

Research into fusion power presents UK industry with many business opportunities. In addition to winning contracts for products and services, simply meeting the technical and quality demands of fusion projects can create long term competitive advantages for companies.

Fusion with industry

Environmentally friendly energy

Fusion is the process that powers the Sun. The work at the Culham Centre for Fusion Energy (CCFE) in Oxfordshire is part of a global drive to produce carbon-free energy from fusion. CCFE is the UK's national centre for fusion research including the Mega Amp Spherical Tokamak (**MAST**) experiment, and the European flagship experiment, the Joint European Torus (**JET**), currently the world's largest fusion experiment, operated on behalf of partners across Europe.

With investment in fusion research greatly increasing for construction of the multi billion Euro International Tokamak Experimental Reactor (**ITER**), the next step in fusion research, never has there been a better time for UK engineering and advanced technology companies to compete for fusion business.

CCFE's Fusion and Industry team is dedicated to assisting UK companies in winning international supply contracts in this high technology field. We also invite UK companies to benefit from the problem-solving skills and advanced engineering techniques used in fusion research through our technology transfer programme.



Culham Science Centre.

What is the scope for winning business in fusion research?

Research into fusion energy is a global effort. After JET, currently world's largest fusion experiment, the ITER project is the next step in fusion research. Under construction in Cadarache, France, ITER builds on the success of JET and is intended to demonstrate integrated physics and engineering on a scale approaching that of a power station and is expected to produce 500 MW of fusion power.

MAST

The MAST facility at the Culham Science Centre is expected to go through a series of enhancements commencing shortly with a major upgrade to achieve near-fusion conditions in a compact device. This will enable MAST



MAST

to carry out studies for a future Component Test Facility to study the engineering of commercial fusion reactors. In addition MAST will study the physics and control of high-performance plasmas to improve the future operation of ITER. In so doing it will be the first machine to trial the Super-X divertor, an innovative plasma exhaust system capable of handling the huge power loads of future commercial reactors.

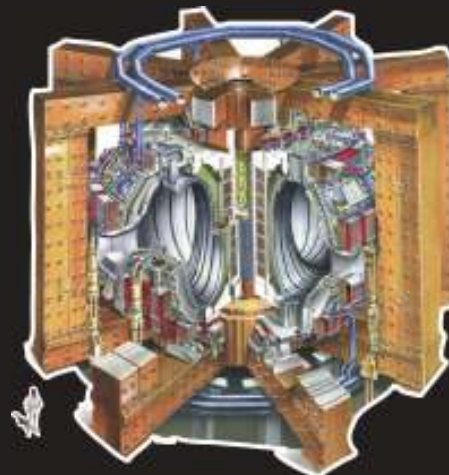
A range of engineering services will be needed for the MAST Upgrade which will provide business opportunities for UK companies.

JET

The Joint European Torus (JET), operated by CCFE on behalf of the European Fusion Development Agreement, has an important role in fusion research during the construction of ITER.

Following a major upgrade JET is beginning a new campaign of experiments involving new ITER-Like Wall, diagnostic and neutral beam heating enhancements. JET will provide conditions and constraints very similar to those expected in ITER. Further enhancement to JET will arise both

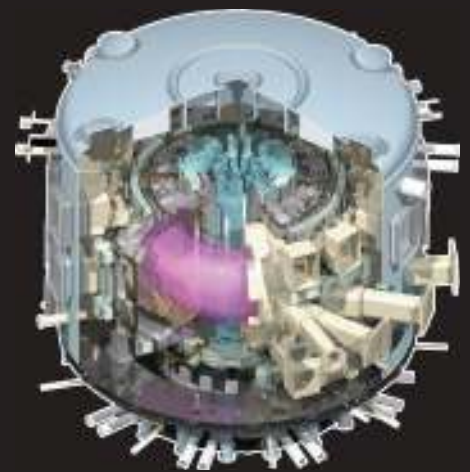
during and following the campaign which will also provide business opportunities for UK companies.



JET

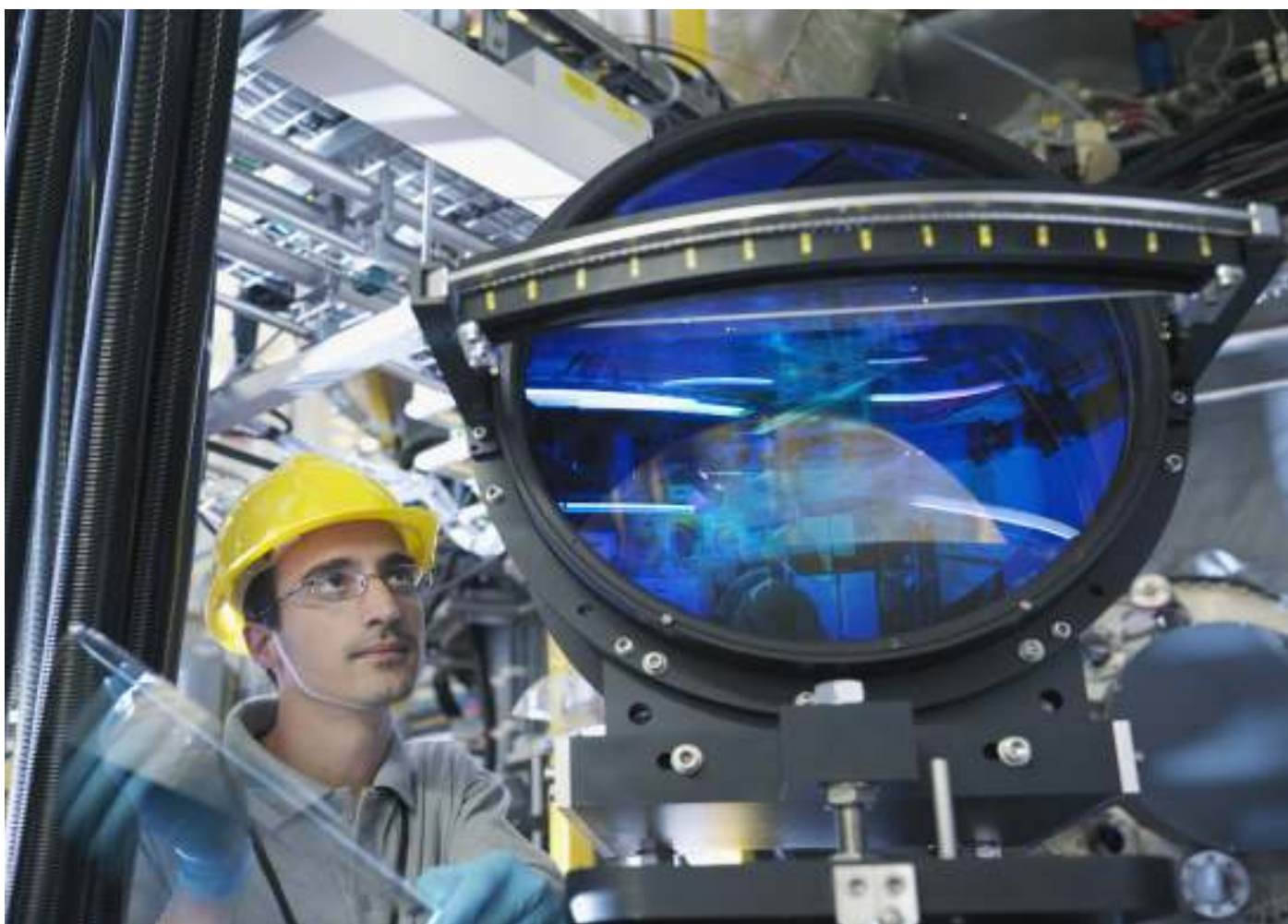
ITER

The construction cost of ITER is estimated to cost over 10 billion Euro over 10 years, with completion scheduled for 2019. Another 5 billion Euros will be needed for its 20-year operational costs. Europe is contributing 45% of the costs, while the other six parties to this joint international venture (Japan, China, the Republic of Korea, the Russian Federation, India, and the USA), will contribute the rest.



ITER

ITER site work has commenced with many companies from Europe already engaged. Procurement of key components such as the Vacuum Vessel and Magnets are already proceeding and many more packages worth several million Euros expected to be released annually for tendering, and providing substantial business opportunities for UK companies.



Thomson Scattering on MAST.

How can UK industry get involved with ITER?

UK industry is playing a significant role in fusion research through the supply of plant, equipment and technical expertise to MAST, JET and other European fusion projects.

ITER's construction and operation requires the services of numerous organisations. Depending upon the complexity and the value ITER's requirement, UK companies will have the opportunity to bid either on their own or through UK/pan European consortium. SMEs will also be needed to provide specialist technologies and support sub-contracting services to larger organisations.

Typical engineering expertises and technologies that are used in fusion research are:

- Civil, mechanical, electrical and electronic engineering
- Computer modelling
- Plasma technology and diagnostics
- Power supplies
- Electromagnets
- Cryogenic systems
- High integrity data capture
- Vacuum vessels and systems
- Advanced / neutron resistant materials
- Remote handling
- Nuclear systems (tritium)
- Neutral beam and microwave systems.

How do I find out about fusion business opportunities?

Making the most of the business opportunities arising from fusion research couldn't be easier. Although many of these opportunities will be published in the Official Journal of the European Union (OJEU), we recommend that you register your organisation on these three databases:

1) Fusion for Energy

<https://industryportal.f4e.europa.eu/default.aspx>



**FUSION
FOR
ENERGY**

Fusion for Energy (F4E) is Europe's Domestic Agency responsible for managing European industries supply to ITER. By pre-qualifying, F4E will alert mainly European companies of any forthcoming opportunities.

2) ITER Supplier Database

<https://user.iter.org/Portal/PublicPages/supplierregistration.aspx>



By pre-qualifying, the ITER International Organisation will alert companies from all the seven ITER partners' Domestic Agencies (including F4E) of any forthcoming opportunities. For these opportunities, UK companies will need to respond through F4E.

3) CCFE Fusion and Industry

www.fusion-industry.org.uk



CCFE
CULHAM CENTRE FOR
FUSION ENERGY

From us you will receive e-news notifying of any tendering opportunity, news related to MAST, JET and ITER, together with details of fusion projects and technology-related events, workshops and exhibitions organised by CCFE and other organisations. In addition, you will also receive our regular Fusion Business e-zine containing news of fusion projects, details of briefing events, 'Meet the Buyer' and workshops related to ITER and other projects.

CCFE is often asked to recommend suitably qualified and experienced UK companies. By registering your company we are able to suggest names of appropriate companies for relevant projects.

Moreover, with knowledge of your company we are in a better position to assist you in finding partners for fulfilling sub-contract opportunities with UK and other European companies, as well as maximising the benefit from regional and local business support services.

Fusion with Industry

Fusion research combines world class engineering and cutting edge research into plasma physics, computer modelling through to advanced diagnostics and materials.



Tim Benson of Advanced Magnetics Resonance Ltd. used the TSP to develop innovative Nuclear Magnetic Resonance (NMR) test equipment.

Technology transfer from fusion is available to assist UK companies in rising to the challenge of ITER and increasing the competitive edge of their businesses. It operates on many levels:

- Simply working on a fusion project such as MAST, JET and ITER exposes a company to technology briefings, ideas and problem-solving techniques developed by fusion scientists and engineers which they can then apply themselves.
- Contacting the Fusion and Industry team to provide 'new thinking' and an objective assessment of technical problems by an expert in the field, as well as advice on how these might be overcome.
- Access to specific technologies and skills to assist in new product developments such as innovative bonding techniques,

precision engineering, computer modelling and advanced laser diagnostics through CCFE's proven Technical Support Package.

- The Culham Innovation Centre is a business incubator on the Culham site. Managed by Oxford Innovation Ltd, it is a thriving community of knowledge-based and service companies. For suitably qualified companies in the Innovation Centre, CCFE offers the Technical Support Package where access to fusion expertise can benefit their businesses.

Technical Support Package

The CCFE's Technical Support Package (TSP) is designed to help companies overcome specific problems in areas where fusion scientists and engineers have specialist knowledge and experience. Typically the package

can vary from a one-off project through to a one year agreement providing five days' assistance.

CCFE's Special Techniques Group (STG) has played a leading role in delivering the TSP. STG acts as both facilitator and provider of technical support. TSP projects have ranged from assisting with the installation of a large and sophisticated coating line for Li-S battery research, to bonding silver to aluminium for millimetre-sized targets used in the development of ion sources.

To find out more about how your company could benefit from the CCFE's TSP contact the Fusion and Industry team.



Fusion Business e-newsletter

The 'Fusion Business' e-newsletter is distributed electronically to over 2,000 companies and individuals registered with the Fusion and Industry database. It features news of Fusion and Industry initiatives, fusion projects and UK companies' successes, technology transfer opportunities, and news of exhibitions at Culham. It is the only UK publication dedicated to inviting UK industry to engage with fusion research.

Culham Science Centre exhibitions

Suppliers to fusion research are encouraged to exhibit at the Culham Science Centre and meet scientists and engineers both from fusion research and the large number of technology based companies on the site. Exhibitions can range from tabletop to mobile trailers and there is an annual Technology Exhibition for suppliers to CCFE and the nuclear industry.



Many companies have generated new business from exhibiting at Culham.

ITER and beyond

Fusion research represents a significant business opportunity for UK engineering and high technology companies. The ITER project alone will spend several hundred MEuros over the next ten years in procuring goods and services associated with construction and commissioning. UK companies both large and small, with the assistance of CCFE Fusion and Industry, are in a strong position to compete for, and win, ITER contracts.

And this is just the beginning. With on-going supply opportunities for JET and MAST, and the wider business benefits of meeting the exacting quality and project management standards of fusion projects, the rewards for UK industry are substantial.



Looking north-east over the ITER construction site.

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