ITER opportunities

Martin Townsend - July19
What is ITER?

- International Mega project based in Cadarache, South of France.
- Primary objective: Demonstrate power plant scale burning plasma.
- Funding: Primarily in-kind contributions from members.
- EU contribution: Managed by Fusion for Energy, based in Barcelona.
From the air
From the side
From underneath
From the inside
Who’s the Customer?

- **ITER Organisation**
  - Central Fund
  - Services & Technical support
- **Fusion for Energy** *will spend an additional 4,000M Euro up to 2025*
  - EU In kind contribution
  - Services & Technical support
- **Construction Frameworks**
  - Tier 1 consortiums
F4E contracts to UK:

Total contracts attributed to UK companies and institutions by the European Domestic Agency for ITER (Fusion for Energy) amount to a total of 238.4 M€.

Examples of beneficiaries:

- United Kingdom Atomic Energy Authority (CCFE)
- University of Durham (DU)
- AMEC Nuclear UK limited
- Atkins Ltd
- Norton Rose LLP
- ASSYSTEM UK
- Oxford Technologies Ltd
- SERCO Limited
- Debevoise & Plimpton LLP

- Liberty Mutual Insurance Europe - LIM
- Knight Optical (UK) Ltd
- BURGES SALMON LLP
- The Welding Institute
- Frazer Nash Consultancy Limited
- Project Time & Cost International Ltd.
- Etc.
IO contracts to UK:

Contracts signed with UK companies cover a wide range of activities from Project Management, R&D, studies, as well as design support, engineering and procurement services.

- June 2016: a ten-year EUR 174 million contract with the MOMENTUM joint venture led by Amec Foster Wheeler (UK) (now “Wood”) in partnership with Assystem (France) and KEPCO Engineering and Construction (Korea).
- Major contractors (> 500 k€):
  - Project Time & Cost UK Ltd
  - PES Limited (UK)
  - FIRCROFT ENGINEERING SERVICES LTD
  - United Kingdom Atomic Energy
  - Nuvia Ltd
  - Charles Kendall & Partners limited
  - Element Materials Technology
  - UKAEA Ltd
  - Science & Technology Facilities
  - Etc.
- Worksite contractors:
  - Atkins Global (Design Engineering)
  - Kirkleatham Design Ltd (Technical assistance)
  - Leap 29 (Technical assistance)
  - Taskscene Ltd. (Electrical engineering)
  - Halcrow (EnergHIA consortium)
  - Etc.

These figures do not include UK companies based outside the UK, whose values are summed up with the country in which they are based.
Future Opportunities [next few years]

- **ITER Organisation**
  - Technical support services [Design, Modelling, Mgmt, Safety, Qualification etc]
  - Hot Cell
  - M/c Assembly, test, commissioning
  - Remote maintenance
  - Disruption mitigation

- **Fusion for Energy**
  - Heating systems [~100m]
  - Antennas [~60m]
  - In-vessel components [~600m]
  - Buildings & Civil [~700m]
  - Diagnostics [~90m]
  - Cryogenics & Fuel cycle [~180m]
Future opportunities – Hot Cell

Hot Cell Building (B21)
- Refurbishment, maintenance and testing of activated and contaminated Tokamak components
- Storage and maintenance of ex-tokamak equipment (e.g. port cell and interspace structures, galleries, etc), slightly activated and contaminated
- Maintenance, testing and storage of contaminated remote handling (RH) equipment
- Processing, characterization and storage of Type B (intermediate, long-lived) Waste
- Storage and Processing of effluent, including LOCA waste water
- Processing, characterization and storage of Purely-Tritiated Waste
- Processing, characterization and export of Test Blanket Modules
- Access to the Tokamak Complex for large components and personnel

Radwaste Building (B23)
- Treatment and Disposal of Type A (low level) Solid Waste
- Laboratories for Type A Waste, TCWS and Health and Physics Control
- Treatment and Disposal of very lower level waste (TFA)

Personnel Access Control Building (B24)
- Control access to all Project radiological-controlled areas
- Welfare facilities for personnel working in these areas
- Environmental laboratory
- Control rooms for RH in (1) Tokamak (2) Hot Cell (3) Radwaste
- Backup Control Room

All processing, repair, refurbishment, and testing of components that have become activated by neutron exposure will take place in the ITER Hot Cell, a 200,000-cubic-metre, five-level structure near the Tokamak Complex.
Future Opportunities – Heating systems

ITER Plasma Heating and Current Drive systems

<table>
<thead>
<tr>
<th>NB</th>
<th>IC</th>
<th>EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral Beam</td>
<td>Ion Cyclotron</td>
<td>Electron cyclotron</td>
</tr>
<tr>
<td>1 Mev</td>
<td>40-55MHz</td>
<td>170GHz</td>
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**33MW#**

+16.5 MW*

**20 MW#**

+20 MW*

**20MW#**

+20 MW*

Ion Cyclotron status: Antenna Design

Antenna design progressing with support contracts:
- Mechanical design
- Structural analysis
- Thermal cooling analysis
- RF analysis

Specific talk on this topic later in this session
Future opportunities - Diagnostics

- Joint team working closely together to integrate diagnostics and services
- Design for Safety / Function / Reliability / Maintenance
Future Opportunities – Fuel Cycle
Industry portals

- ITER Organization: https://www.iter.org/proc/overview

- Fusion 4 Energy: https://industryportal.f4e.europa.eu

- UK Fusion Industry Liaison Officer: Martin Townsend
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ITER is moving forward!

http://www.iter.org