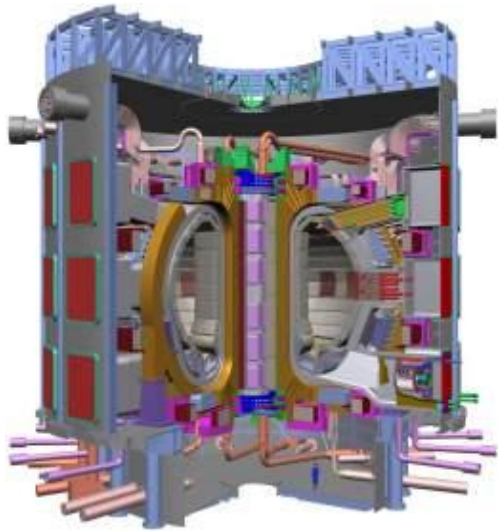
Clean Energy & Fusion
New Technologies for a New Industry

Greg Willetts



AMEC at a glance

- UK FTSE 100 company
- Market capitalisation c.£3.2 billion
- Revenue of some c.£4.2 billion

- Over 29,000 employees
- Engineers, Scientists & Project Managers
- Europe c.11,000
  - Nuclear c.3,500

- Operating in over 40 countries
  - Europe
  - Americas
  - Growth Regions

- Oil & gas
- Clean Energy
  - -Nuclear
  - -Conventional
  - -Renewables
- Mining
- Environment & infrastructure

* As at 9 August 2013

Clean Energy Europe - Nuclear

Nuclear new build

- Reactor Design
- Licensing, permitting, environmental and ground works
- Engineering, Procurement and Construction

Decommissioning and Waste Management

- Waste Management
- Decommissioning
- Site restoration and remediation
- Specialist scientific consultancy

Reactor Operational Support

- Programme Management
- Life Extension
- Performance Improvement
- Outage Support
- Safety and Licensing
- Defence

Site & Programme Management

- Site and operational management
- Programme management
- Integration & Supply chain management
- Stakeholder engagement

Research & Development Capability and Facilities

AMEC Fusion Activities

Early Involvement

- JET - including supply of components
- ITER - since 1993

  Framework contract from the European Commission for ITER design and safety support studies (c.€15 M)

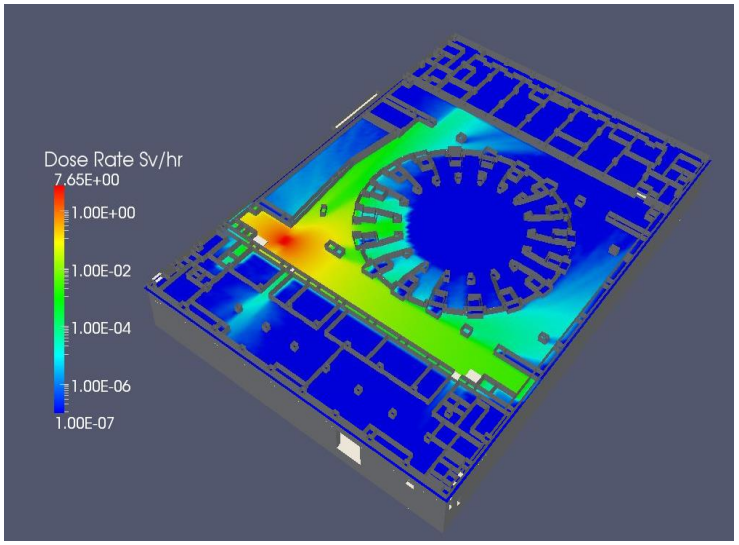
Recent & Current

- **Radiation mapping of the ITER facilities**
- **First Wall Panel semi-prototype development programme**
- **Test Blanket Module framework including remote handling**
- Hot cell complex concept design studies
- Formed European Remote Handling Alliance “ERHA” for Remote Handling opportunities
- Radiological Waste/Environmental Monitoring System framework
- Tokamak framework contract

- Range of nuclear, engineering and design contracts

ITER Radiation Maps

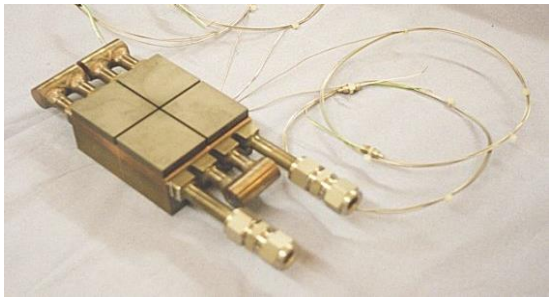
- **The IO requirements were to produce radiation maps of the neutron and gamma radiation fields throughout the ITER facility to enable:**
  - Safe operation of plant, minimise occupational radiation exposure and to provide input into the design of nuclear shielding.
- **AMEC's deliverable :**
  - Development of bespoke software platform to view 3D interactive maps
  - The application provides unprecedented levels of data interaction and manipulation through a standard web browser.
  - Can be used by non radiation physics experts for design or maintenance of complex nuclear facilities.



Through ..AMEC's radiological & physics skills, experience in reactor physics codes coupled with cutting edge software development skills

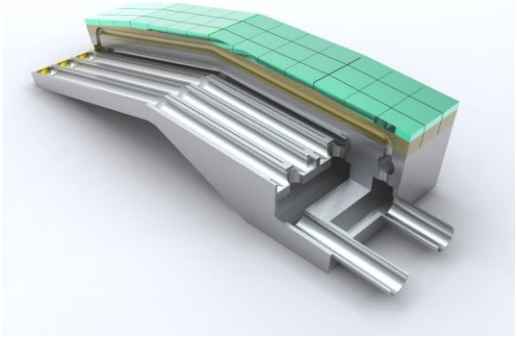
First Wall Panels

- Development of composite materials and bonding technologies are key to the realisation of the ITER Plasma Facing Components (PFCs)
- AMEC has been working on the development of beryllium PFCs since 1998 from studies, through small scale mock-up and up to semi prototype.
- AMEC developed low temperature Cu alloy /Be HIP bonding
- Now at Semi-Prototype phase, working with European partners Iberdrola and M.I.B



Initial small scale mock-ups

Full Scale First Wall Panel

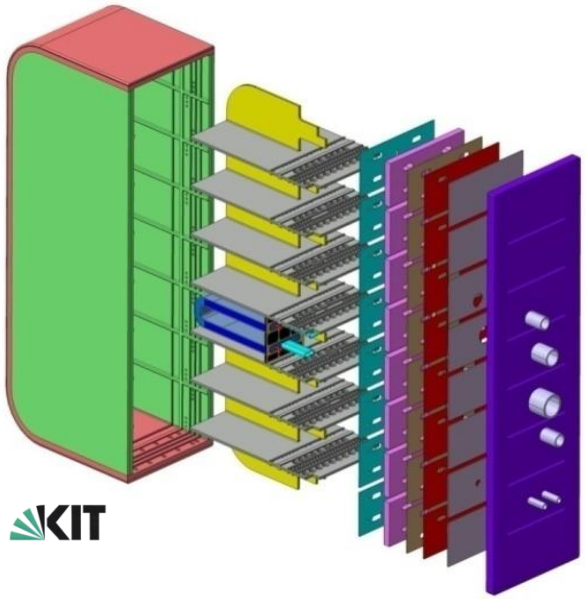


Semi-Prototypes

Test Blanket Modules

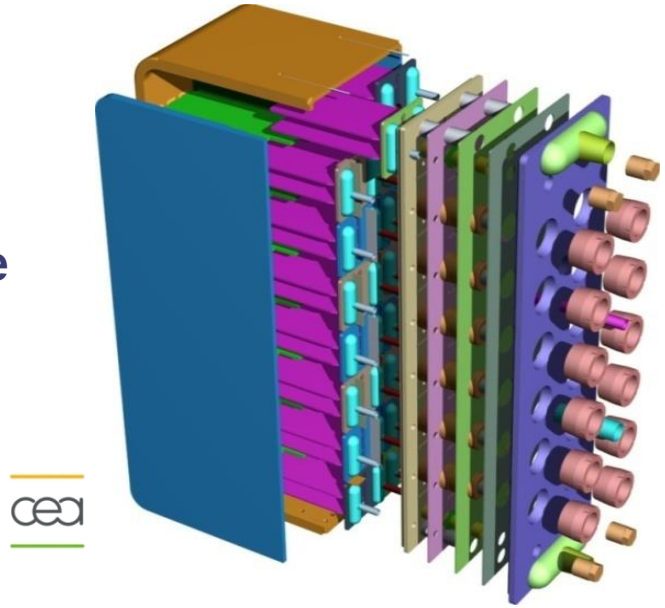
AMEC is investigating the two European blanket concept designs to confirm performance and safety in advance of deployment in ITER.

- Nuclear maintenance studies, remote handling and design
- Transient and accidental analyses and safety studies



Helium-Cooled Pebble Bed (HCPB)

European Test Blanket Module Concepts



Helium-Cooled Lithium Lead (HCLL)

A successful ITER TBM programme is an essential for DEMO and a Fusion Power Plant (FPP).

New Technologies for a New Industry

- AMEC is developing and qualifying advanced computer models for each of the **European TBM designs**, collaborating with Idaho National laboratory, using their fusion adapted MELCOR codes to support TBM safety analysis. AMEC will play a leading role in the optimisation of the tritium breeding design for DEMO.

- AMEC has contributed resources, facilities and expertise to develop composite materials and bonding technologies for **First Wall Panel** design and manufacture to develop the European supply chain for first wall manufacture.

- Worked with ITER on commercial issues on IPR resulting in the granting of sub-license for the specially designed computer application for **Radiation Maps** that AMEC can utilise on a global basis.

- AMEC has and will bring to the ITER project :
  - Close working partnerships and best practice collaboration behaviours with ITER, industry and research organisations
  - Drive innovation, both commercially, technically and in project management
  - Taken scientific concept through to full scale industrial implementation

- AMEC have a long term commitment to ITER and fusion energy and are ready to apply our programme and project management expertise in addition to engineering and technical skills