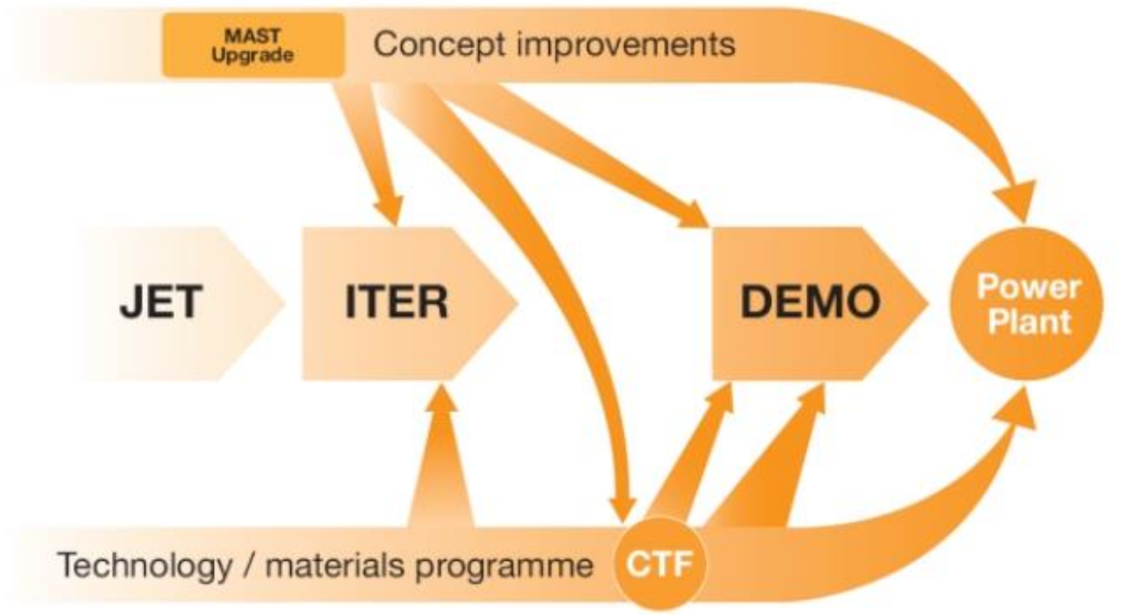
# Outreach – Visit to Culham

A total of 10 eager souls braved the pouring rain to visit to Culham Centre for Fusion Energy on a rare public open-day. Security was tight and after gaining entry to the complex the group of around 40 enjoyed a comprehensive briefing about the experiments and objectives of the centre.

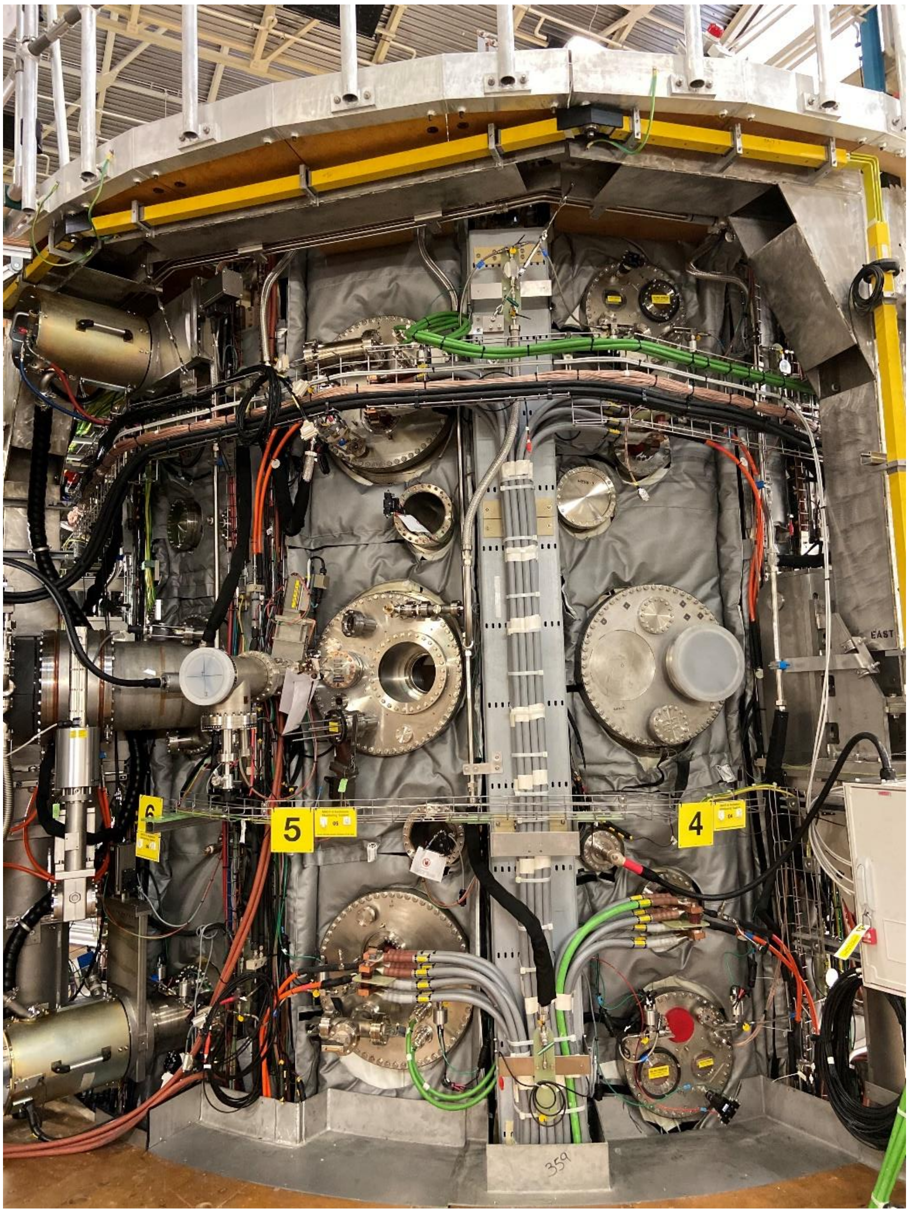



In outline, the current JET experiment will provide basic plasma and containment design knowledge that will feature in the ITER (Latin for "The Way") experiment, which is currently under construction in Cadarache in France. Knowledge gained from this, together with plasma control systems perfected in MAST will be the basis of a future DEMO experiment and, perhaps (my word) actual power generation. The DEMOnstration power plant, DEMO, will be ITER's successor. With the transition from ITER to DEMO, fusion will go from a science-driven, lab-based exercise to an industry-driven and technology-driven programme. A key criterion for DEMO is the production of electricity although not at the price and the quantities of commercial power plants. DEMO will have dimensions about 15% larger and a plasma density about 30% greater than ITER. As a prototype commercial fusion reactor, DEMO could make fusion energy available by 2033. It is estimated that subsequent commercial fusion reactors could be built for about a quarter of the cost of DEMO.

After our briefing, as were split into smaller groups for the site visit, which lasted some 3 hours.

**Culham site primary buildings housing JET**

We started in the building that houses the Mega Amp Spherical Tokamak Upgrade (MAST-U) plasma generator project.




**The MAST containment vessel**

The upgrade will be implemented in three stages. Funding has been agreed with the Engineering and Physical Sciences Research Council for the core upgrade (Stage 1a), which will be ready for plasma operations in 2019. Two additional phases (Stage 1b and Stage 2) will follow in later years, subject to funding, and comprise a new centre column, divertor coils, cryopump and power supplies; improvements to MAST's neutral beam heating system; designing a novel approach to examine plasma escaping from the core; and improved machine parameters enabling study of steady-state plasmas at near-fusion conditions. When complete, the experiment should draw 2 million amps and consume 12.5 gigawatts of energy, to maintain plasma for some 5 seconds.

We then moved on to the JET experiment, which is housed in many buildings, some of which are inaccessible to the public owing to elevated levels of radiation from burning Tritium. Thus, we went to a mock-up of the JET containment vessel used for operator training and for the development of robotic tools needed to maintain the vessel remotely.

The Joint European Torus (JET) is the world's largest and most powerful tokamak and the focal point of the European fusion research programme. It is the only device currently operating that can use the deuterium-tritium fuel mix that will be used for commercial fusion power.

Since it began operating in 1983, JET has made major advances in the science and engineering of fusion, including the world's first controlled release of deuterium-tritium fusion power (1991) and the world record for fusion power (16 megawatts in 1997). In recent years, JET has carried out much important work to assist the design and construction of ITER – an international project now being constructed at Cadarache in France – will be a scaled-up version of JET, with linear dimensions twice the size, and ten times the plasma volume.

**Mock-up of JET containment vessel used for training and development.**

**JET Interior viewed through an observation window**

After JET our time was up and we all met again at reception where tea and refreshments help to cool our frazzled brains! Our day was most interesting from scientific, engineering and political viewpoints and raised many questions in our collective minds.