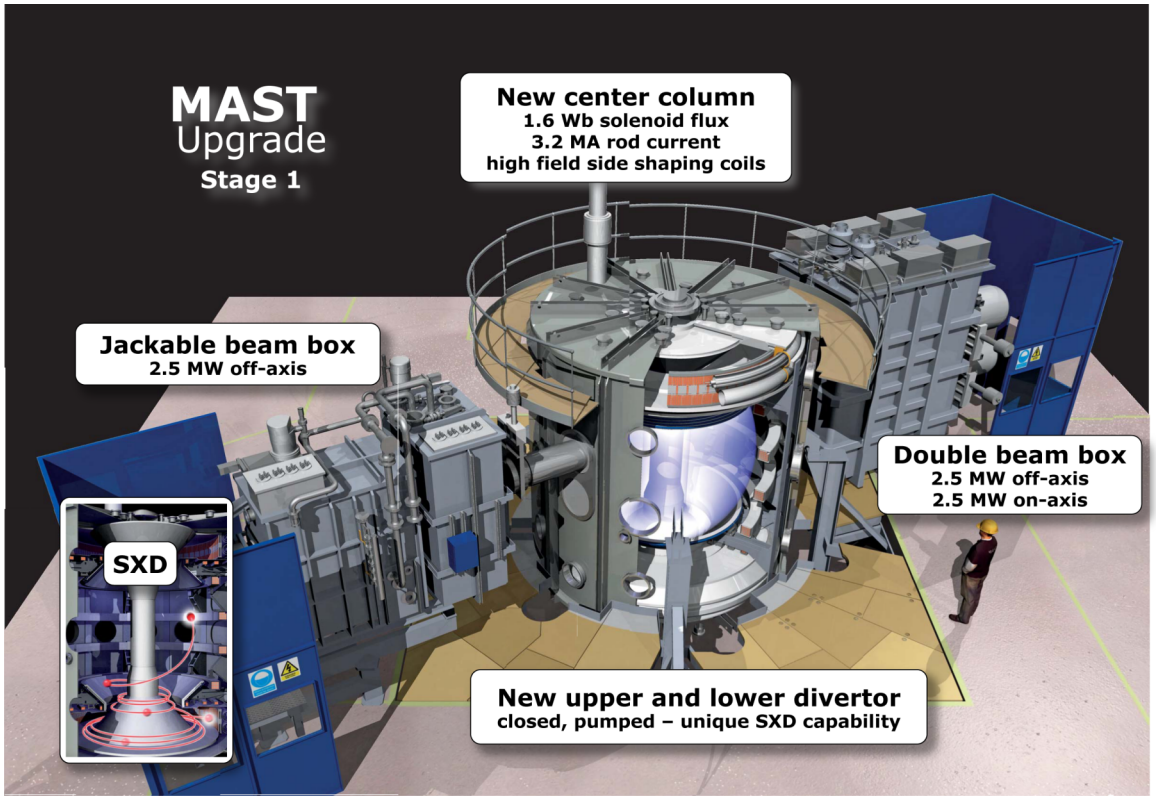
CCFE -- Strategy - Vision - Roadmap

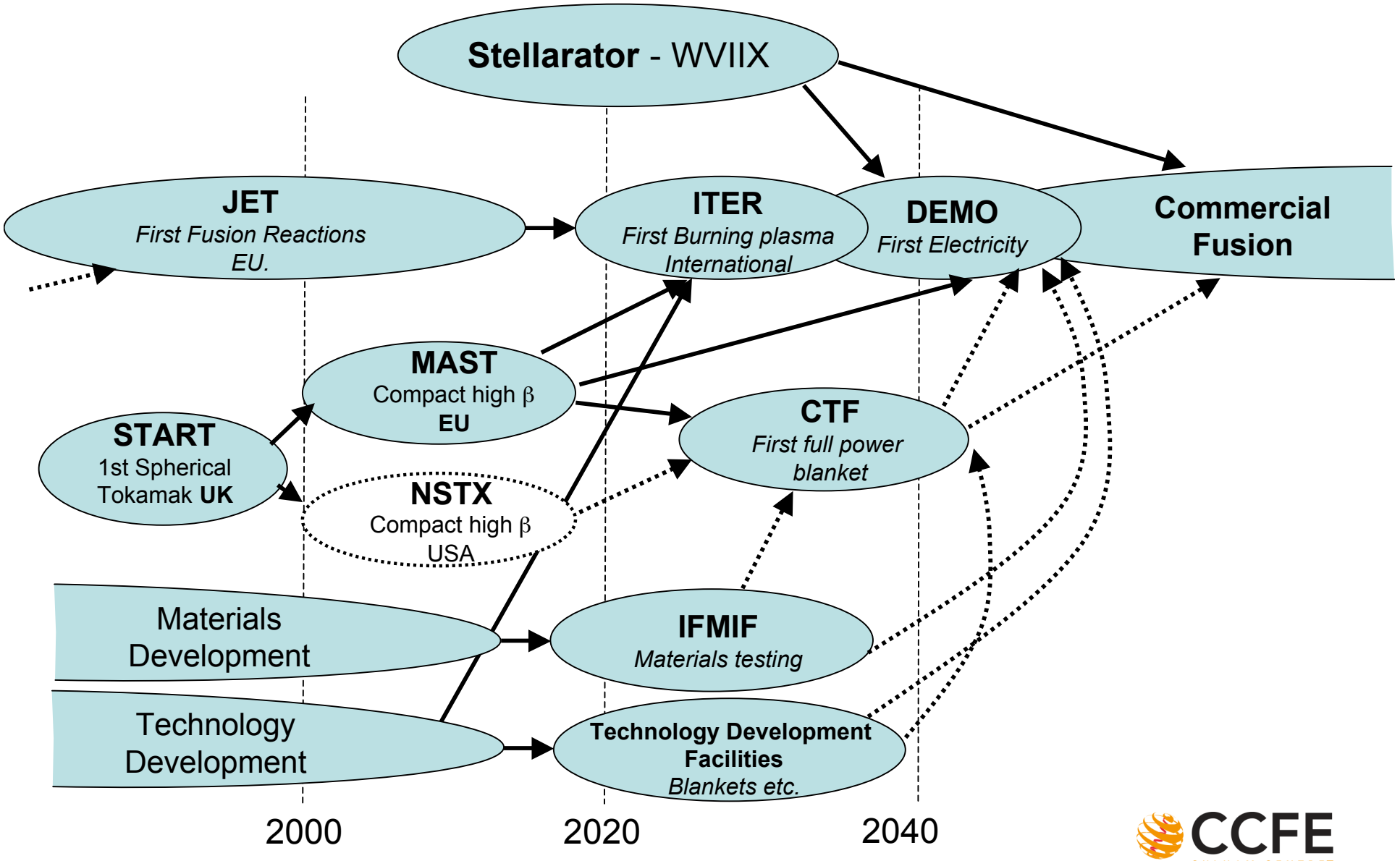
CCFE + UK Universities, presented by Steve Cowley



United Kingdom Atomic Energy Authority

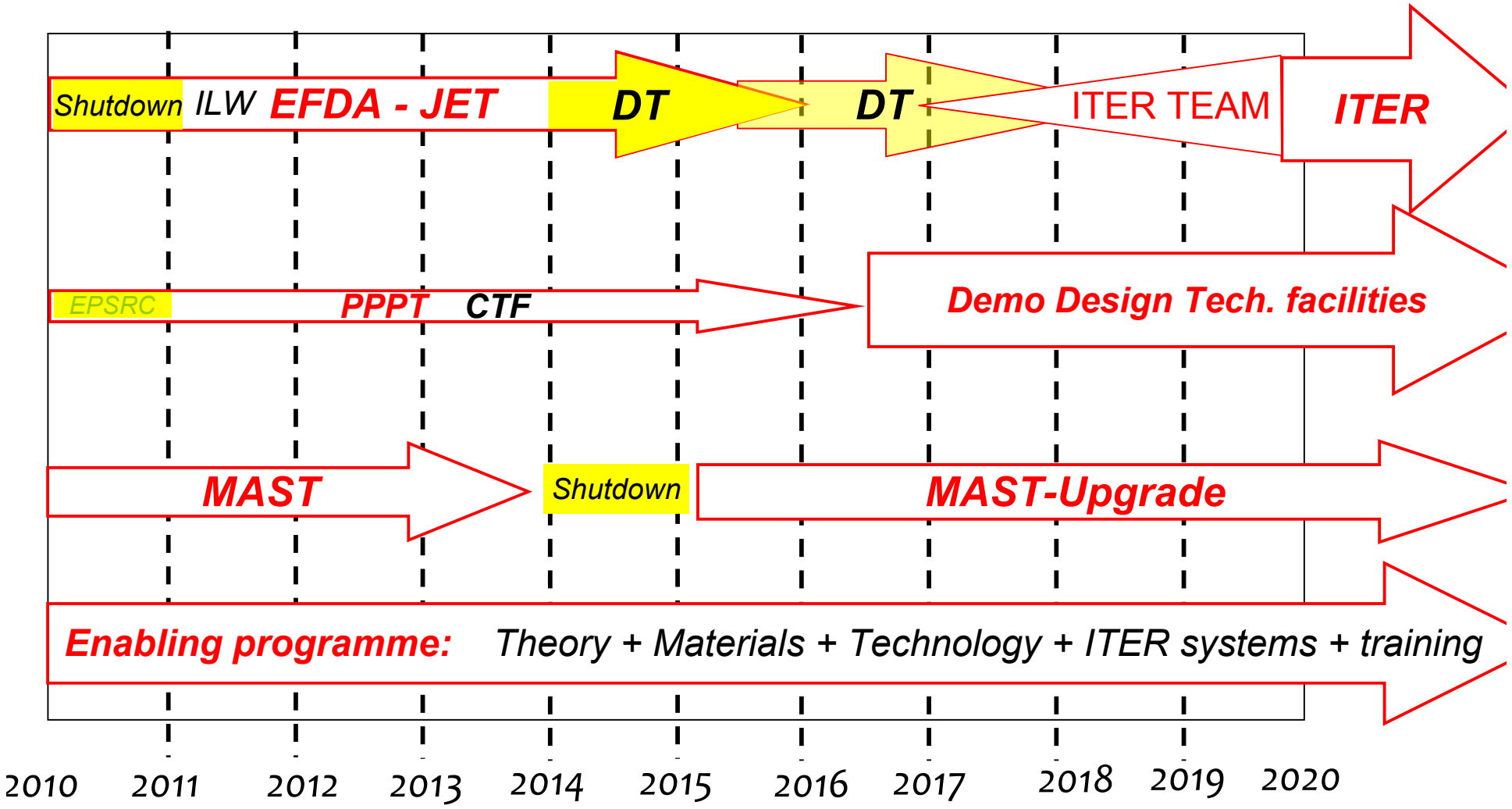
CCFE
CULHAM CENTRE FOR FUSION ENERGY

Fast Track to Fusion -- UK “View”.

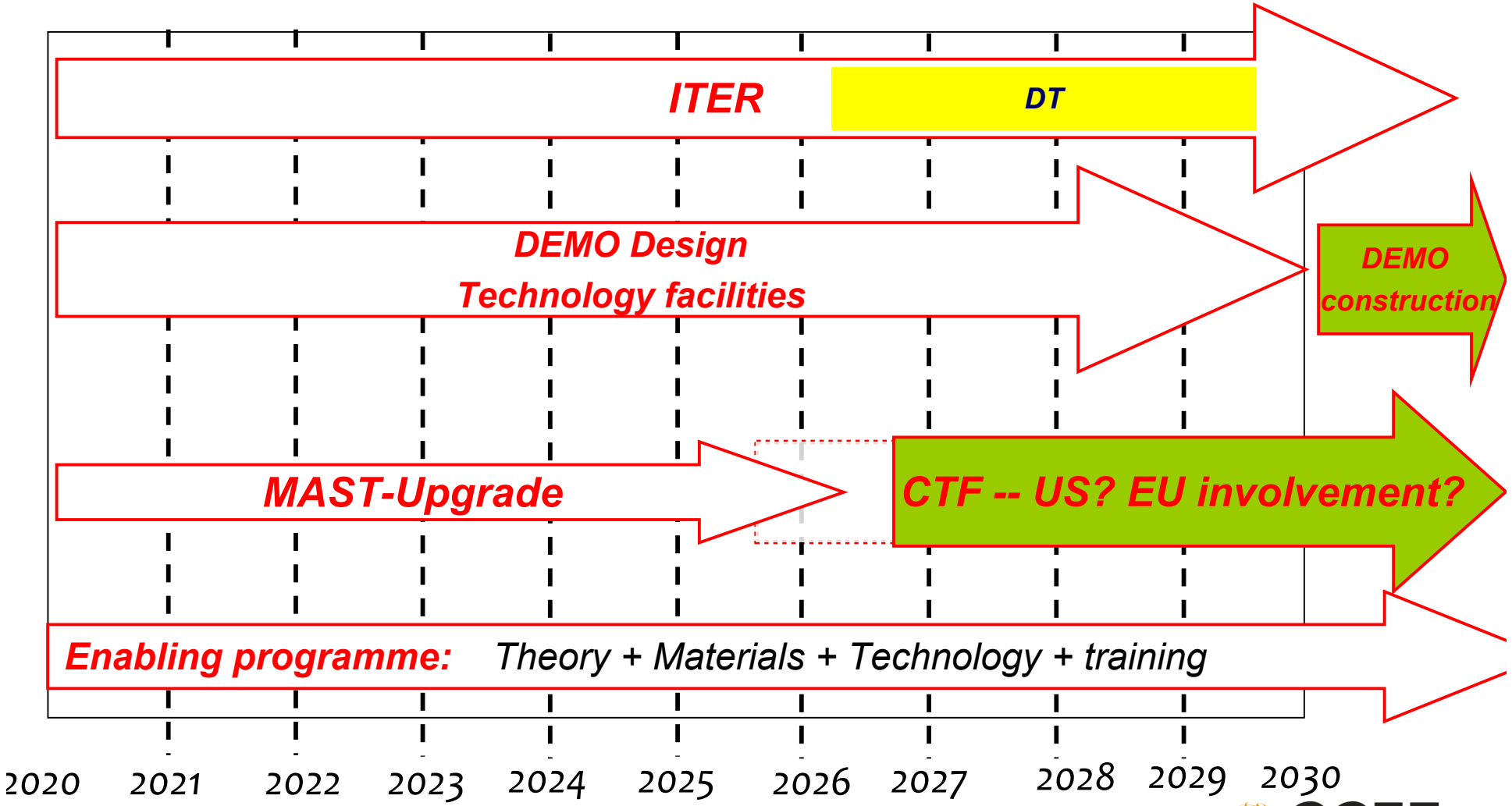


CCFE
CULHAM CENTRE FOR FUSION ENERGY

10 Year Timeline for CCFE



2020s for CCFE



CCFE
CULHAM CENTRE FOR FUSION ENERGY

1st Objective -- Construct ITER

- Needs little comment -- CCFE is making its expertise available to F4E in key areas of R&D
  - Heating, NBI linked with Padua, ICRH CYCLE (with ERM, CEA, IPP, Torino)
  - Diagnostics - e.g. LIDAR consortium
  - Remote handling, neutronics, activation etc.

- Expands CCFE capability in key technologies for future technology focus.

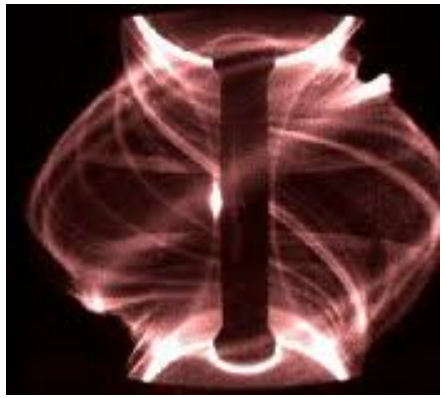
United Kingdom Atomic Energy Authority

CCFE
CULHAM CENTRE FOR FUSION ENERGY

2nd Objective -- Secure ITER Operation

- Develop the high performance integrated scenarios for ITER on MAST, AUG, JET. Goal should be to prepare ITER to **exceed baseline expectations.**
  - Has to be done in DT before ITER.
  - Has to be done with ITER like wall.

- Focus on reducing threats to ITER operation. *e.g.*
  - ELMs, Disruptions: underlying physics and mitigation MAST, AUG and JET. (CCFE + York)
  - ILW limits -- melt etc.
  - Licensing Tritium retention.



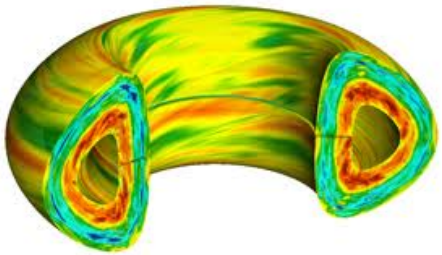
United Kingdom Atomic Energy Authority

CCFE
CULHAM CENTRE FOR FUSION ENERGY

2nd Objective -- secure ITER continued

- Strengthen predictive capability: **No reason why we can't have true predictive capability by ITER operation.**
  - Integrated modelling MAST and JET.
  - turbulent transport - rotation. MAST and JET. New diagnostics
  - Multi-scale model development (e.g. TRINITY). MAST and JET
  - Pedestal and LH transition model -- DT influence.
  - Fast particles, HAGIS etc. MAST and JET

(UK universities involved: *Oxford, Warwick, York, Imperial ….)*



United Kingdom Atomic Energy Authority

CCFE
CULHAM CENTRE FOR FUSION ENERGY

3rd Objective -- Prepare Generation ITER

- Train cadre of experienced machine experimentalists on JET.
  - high current DT experience. Make tokamak's sing.
  - position for leading roles in ITER operations.
  - EU Integrated ITER team.

- UK training ~ 12 PhDs in fusion per year at CCFE with UK universities.

  another ~5-10 in UK universities.

United Kingdom Atomic Energy Authority

CCFE
CULHAM CENTRE FOR FUSION ENERGY

4th Objective -- Power plant development

- **MAST-U**pgrade. Key goal concept improvement for DEMO and CTF
  - -- optimize aspect ratio for DEMO. A=?
  - -- Develop Super-X - long legged divertors -- essential for DEMO.
  - -- Fast ion physics.

- Integrated design for DEMO. Expanding present effort.
- Materials development. (*CCFE + Oxford)*
  - -- structural, plasma facing and breeding.
- Neutronics development, activation etc.
- High heat flux technology.
- Technology testing, heating NBI etc. remote handling

PPPT participation

United Kingdom Atomic Energy Authority

Grow industrial partnerships.

CCFE
CULHAM CENTRE FOR FUSION ENERGY