



UKAEA

Fusion: Powering the Future?

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**To lead the delivery of
sustainable fusion energy
and maximise scientific and
economic benefit**



Why fusion?

Fusion has little or no environmental impact

Fusion does not produce any 'long-lived' radioactive waste

There is no risk of critical safety events e.g. 'meltdown'

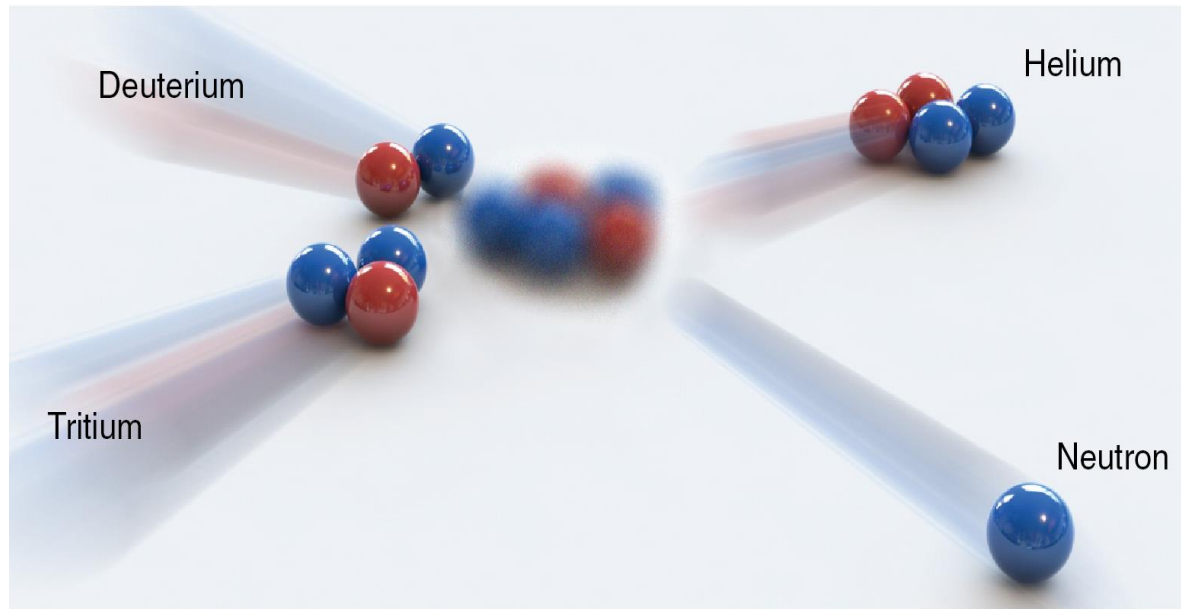
The fuels are abundant

Deuterium is freely available in



Fusion ...

...occurs when two light nuclei are forced together, producing a larger nucleus and a neutron.



The combined mass of the two small nuclei is greater than the mass of the nucleus they produce

The extra mass is changed into energy :

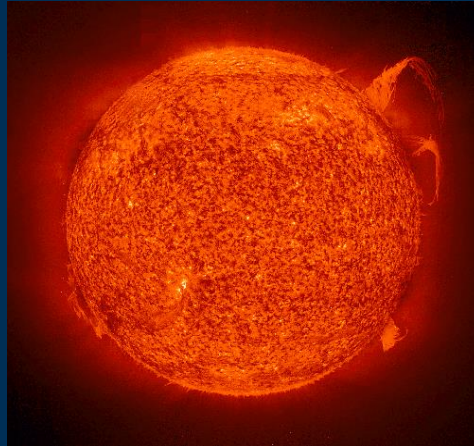
$$E = mc^2$$

But fusion is really hard ...

Like charges repel

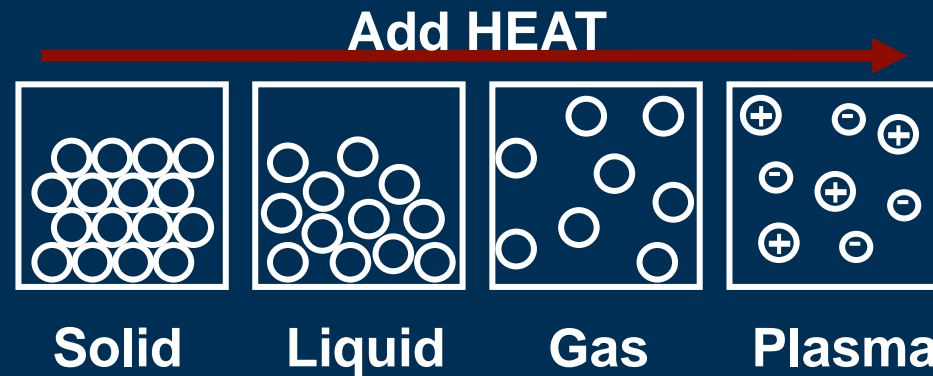
We need a
balance of :

- Density
- Temperature
- Confinement

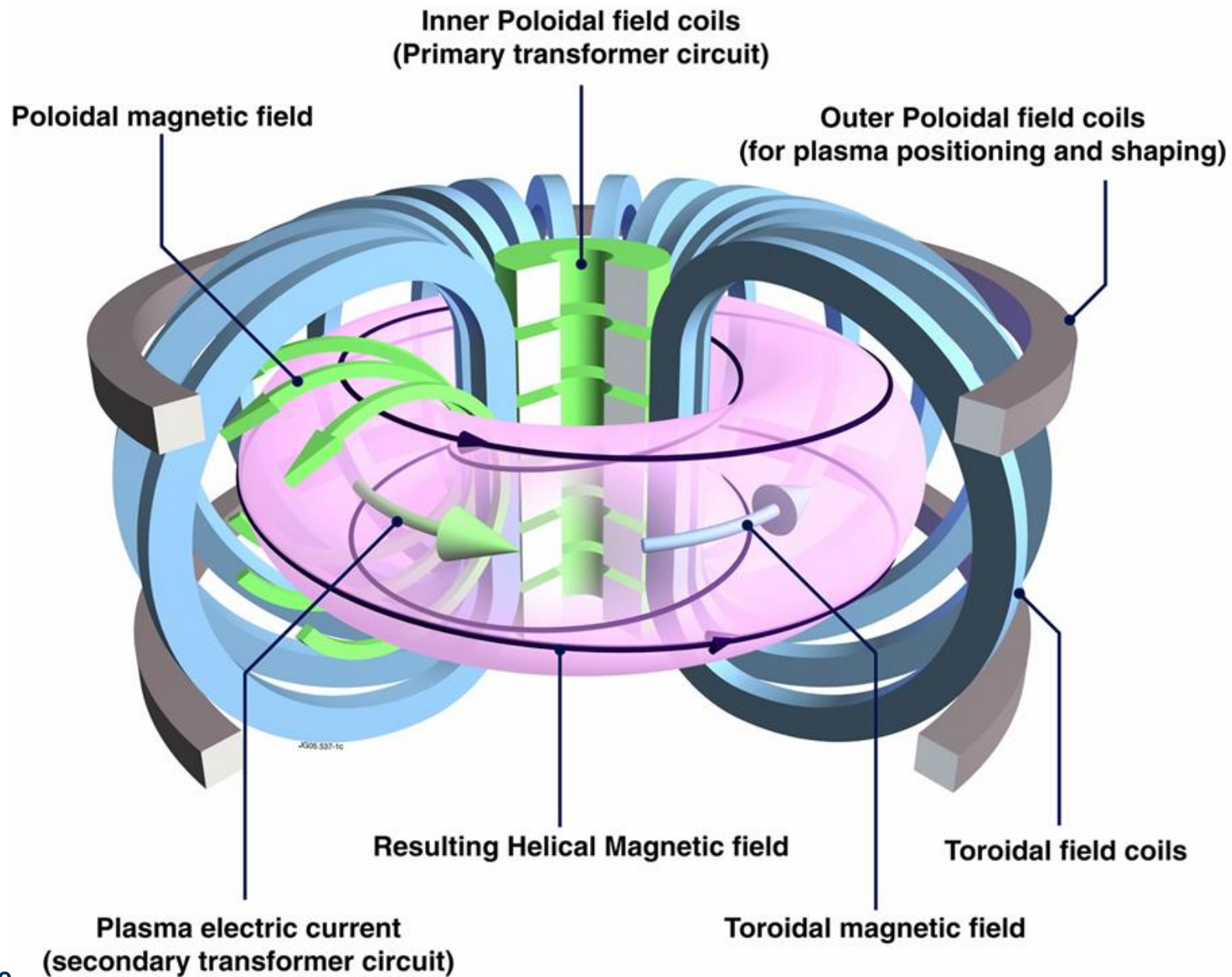


Centre of the sun = 15
million °C

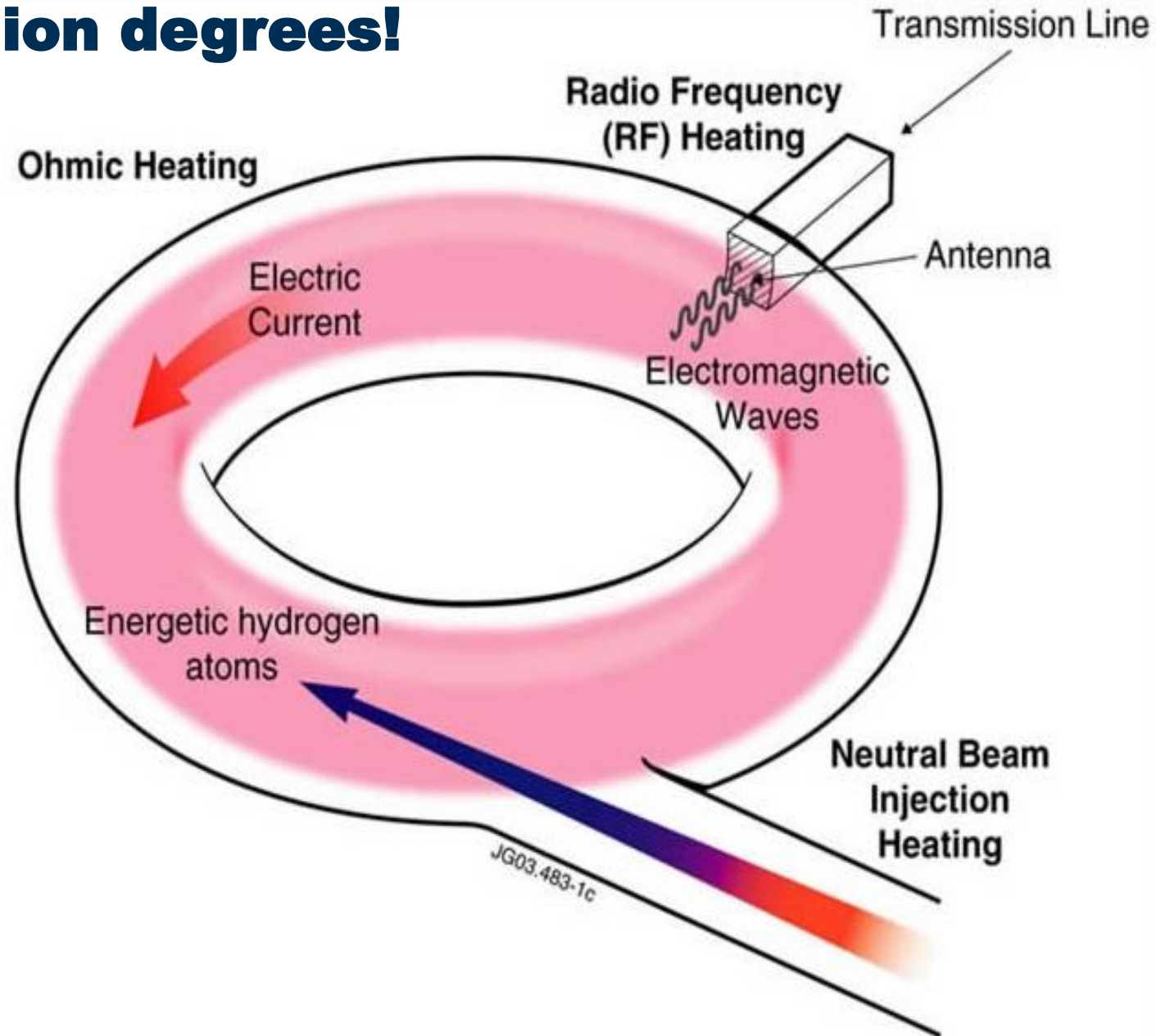
We need in excess of
150 million °C



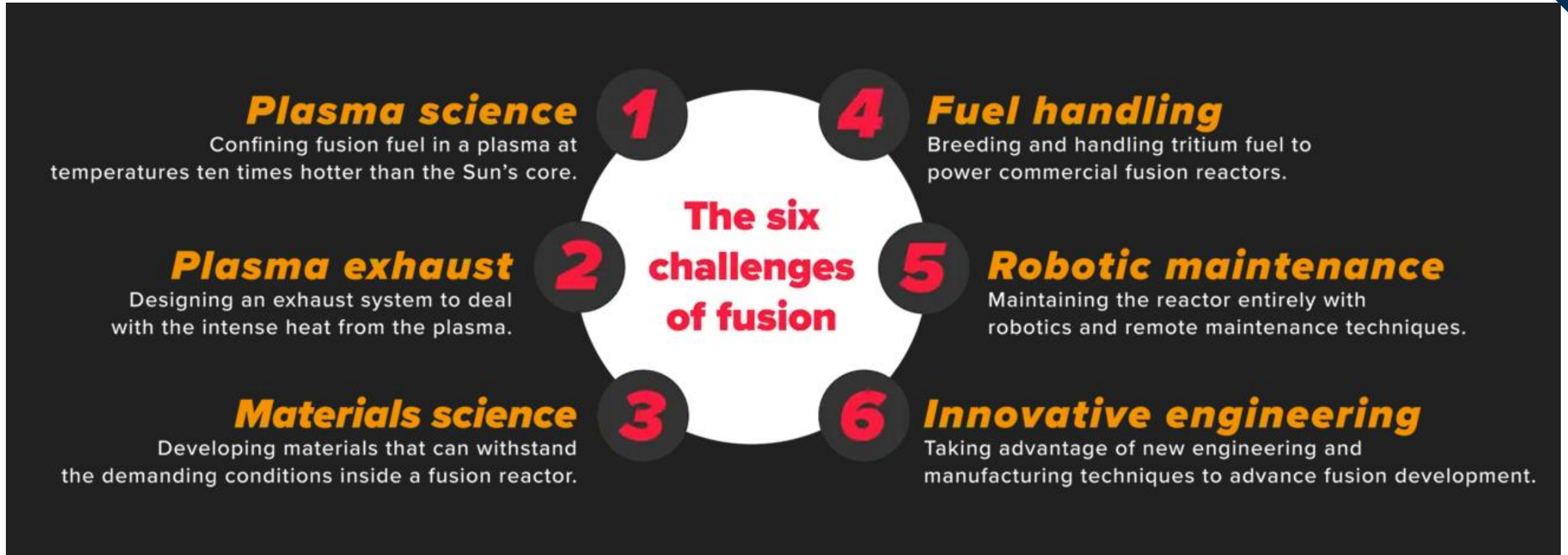
The tokamak ...



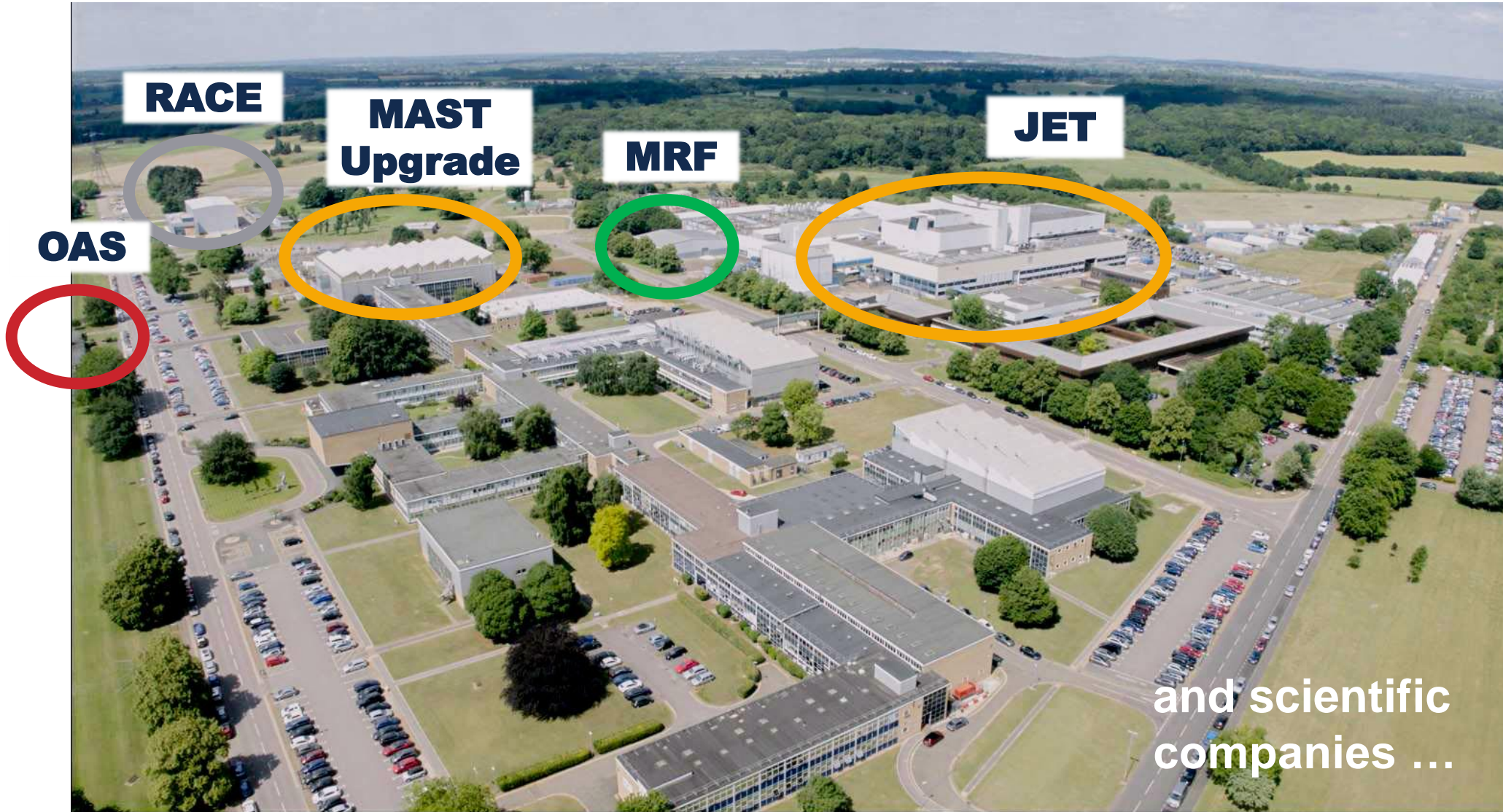
Heating the Tokamak up to 150 million degrees!



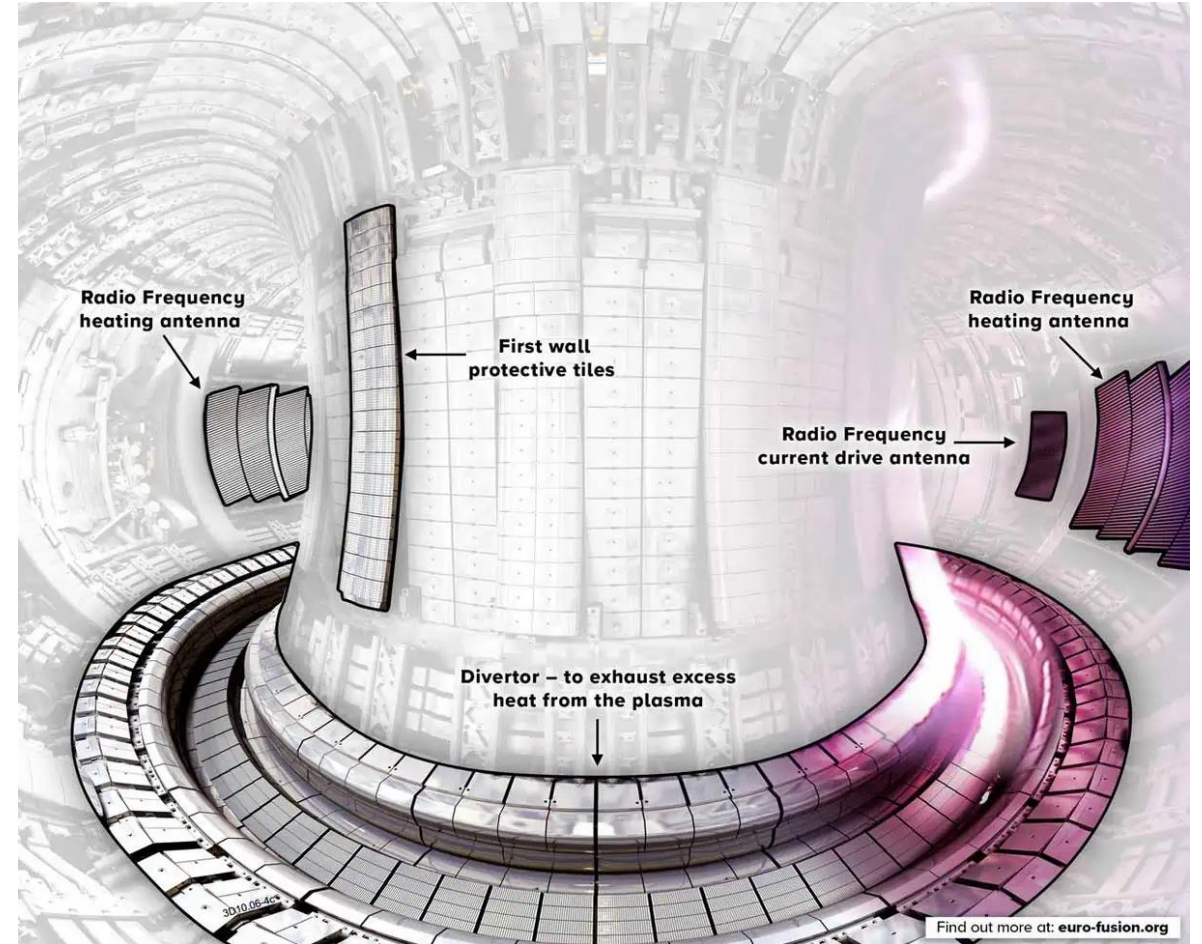
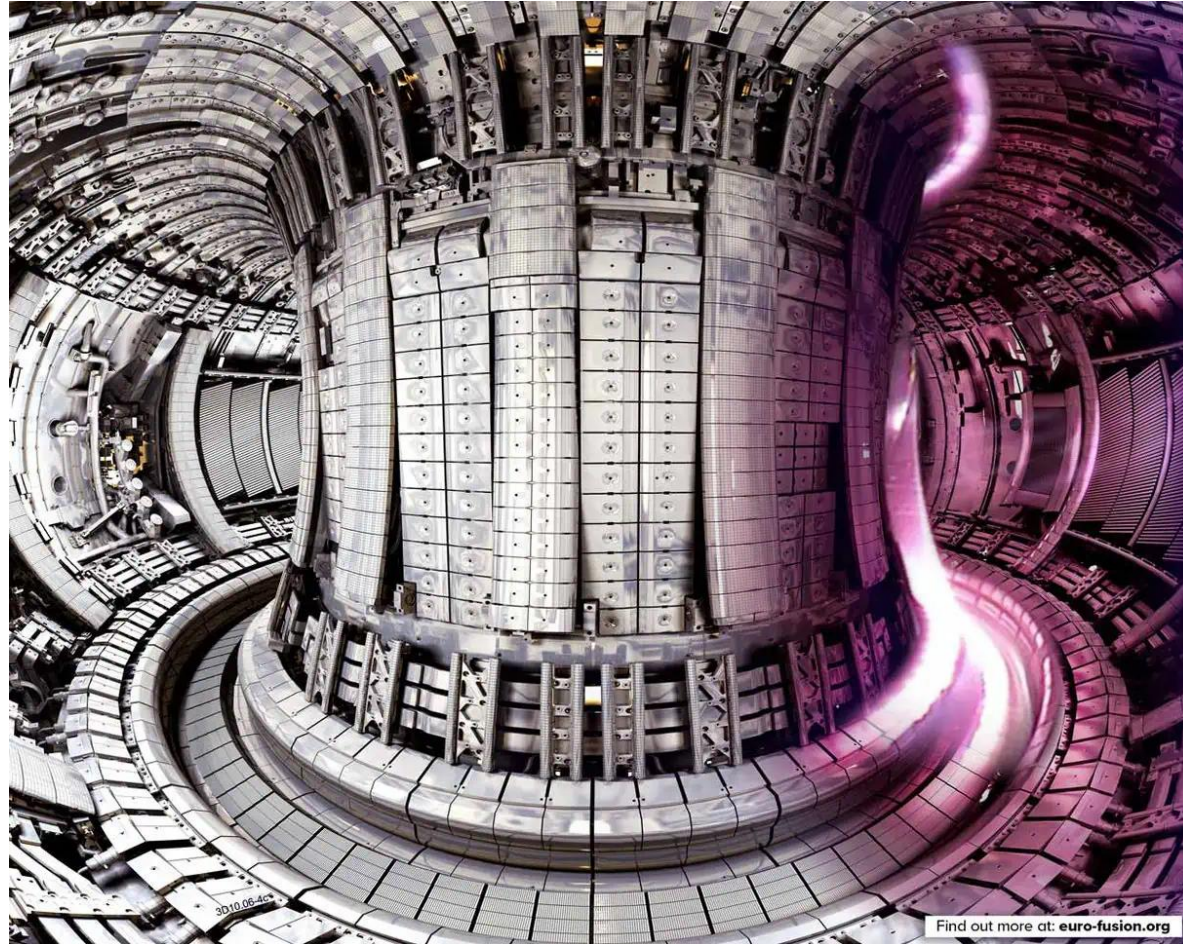
Research Challenges



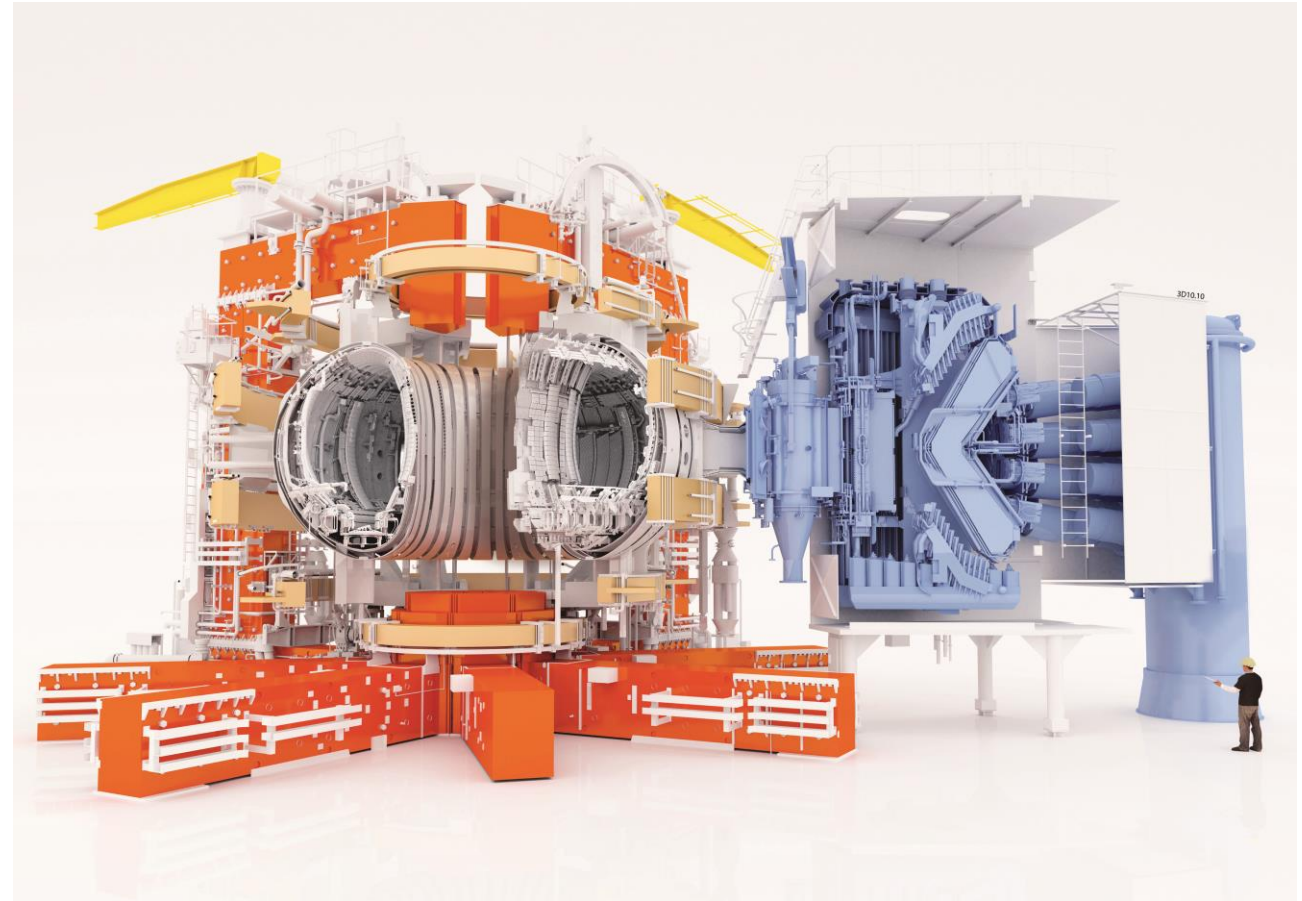
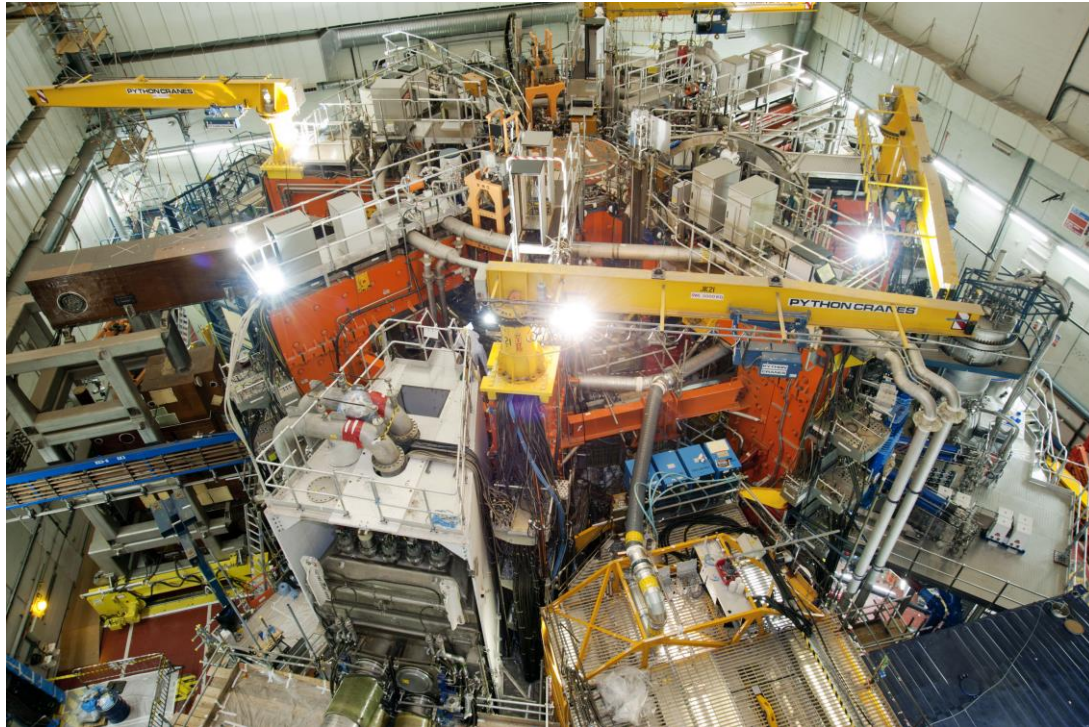
Culham Campus



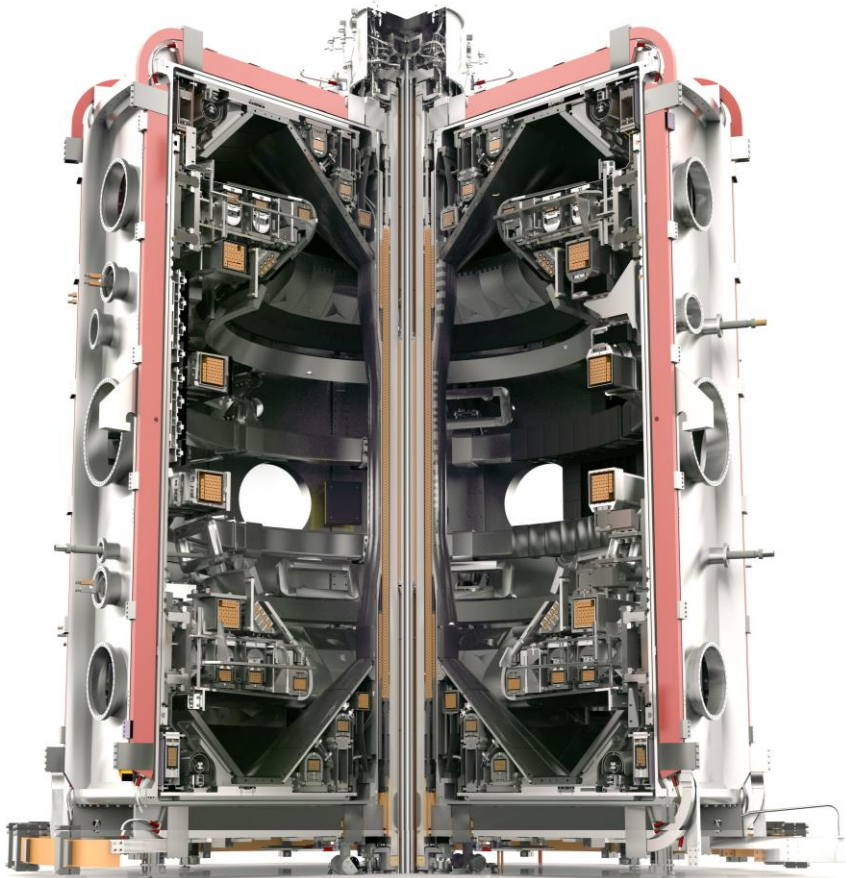
JET – Joint European Torus



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MAST Upgrade



Mega Amp Spherical Tokamak

Investigating tokamak physics at a more compact scale.

Present upgrade will improve understanding of exhaust physics in this configuration.

RACE

RACE - **R**emote **A**pplications in **C**hallenging **E**nvironments is now fully operational.

It is offering robotics expertise and facilities to fusion projects and to wider industrial partners (e.g. deep sea exploration, space, fission etc.) – tapping into a world wide remote applications market worth billions.

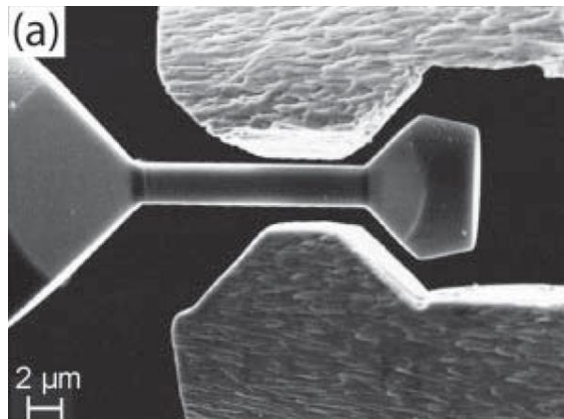




Universities

UKAEA

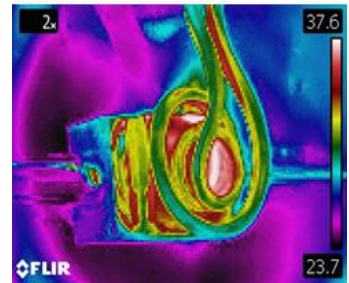
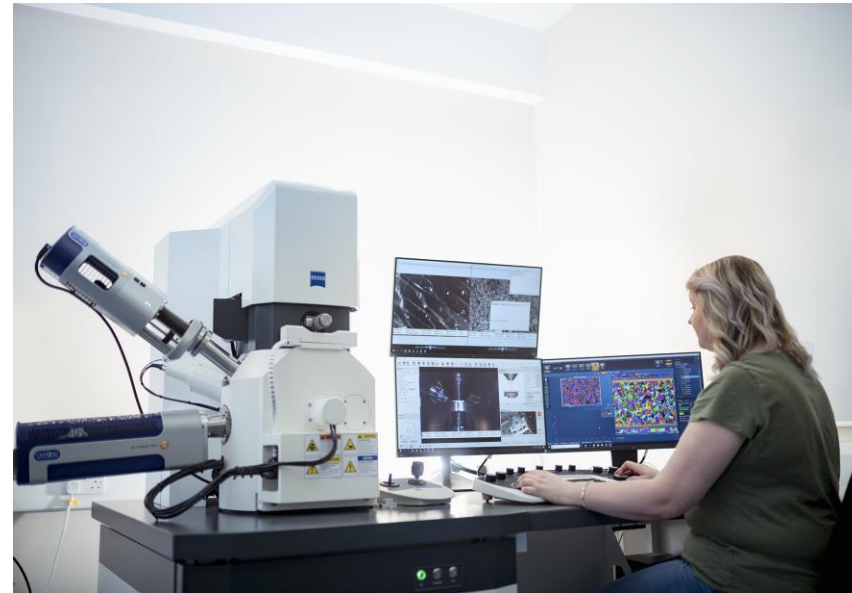
Sellafield



Processing and analysis of radioactive material and undertaking micromechanical testing of fusion and fission material samples – with UK universities and other labs.

FTF and H3AT

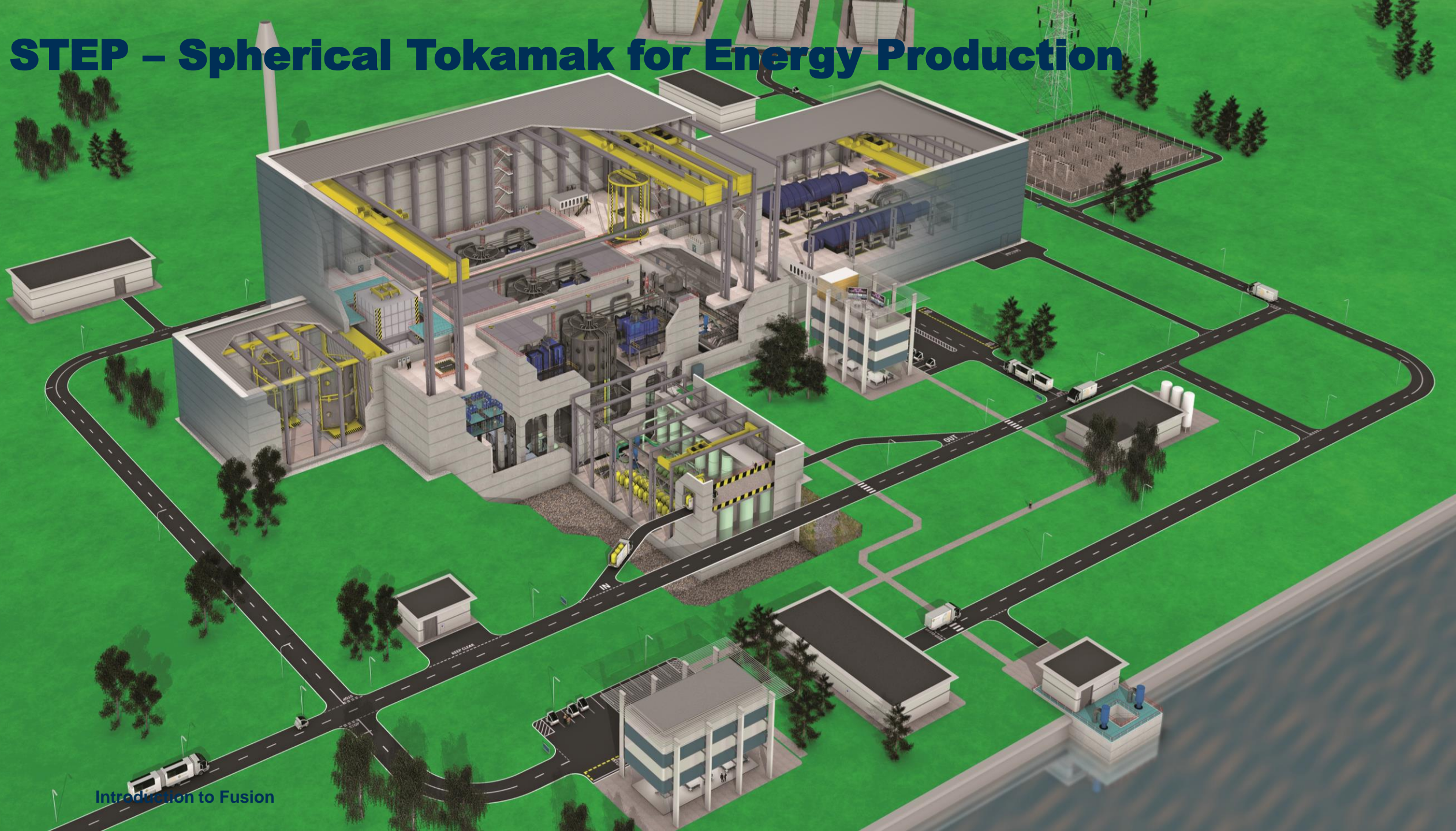
The Fusion Technology Facilities and the Hydrogen-3 Advanced Technology centre will be unique in the world, and will support UK industry to target £1Bn fusion income by 2025.



Fusion is now in the 'delivery era'



STEP – Spherical Tokamak for Energy Production



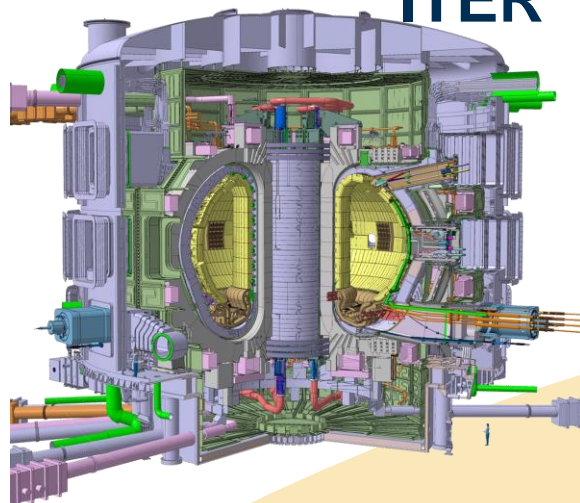
2020

2030

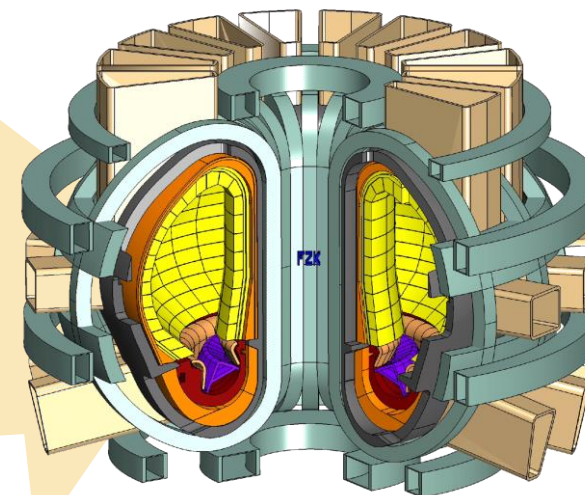
2040

2050

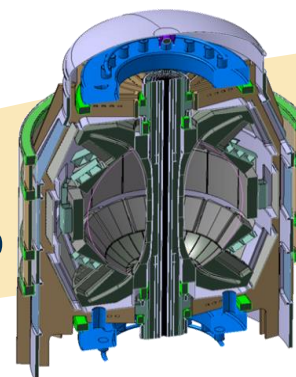
ITER



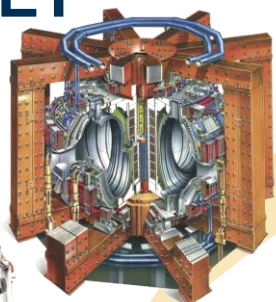
DEMO



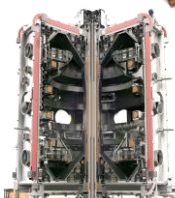
STEP



JET



MAST-U



How to find out more...

On the web:

- www.ccfe.ukaea.uk
- www.euro-fusion.org

By email: Communications@ukaea.uk

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Any Questions ?