



UK Atomic
Energy
Authority



RACE is the UKAEA's centre for

Remote Applications in Challenging Environments



How we work with technology end users

At RACE, we design, build and operate robotics for extreme industrial environments, working towards our goal: bringing fusion energy to the grid.

RACE has specialist skills in robotics and remote maintenance systems that make it possible to carry out tasks in challenging environments where people cannot work.

We lead remote handling work for the world's foremost fusion energy projects and collaborate on some of the most prominent engineering challenges of our generation.



Performing remote operations

RACE's remote handling expertise stemmed from the need to design and operate remote handling equipment for the maintenance

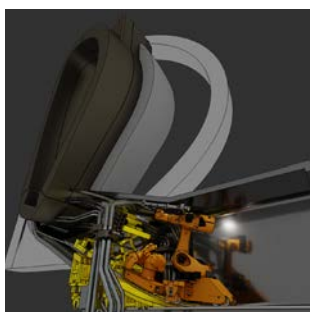
of the Joint European Torus (JET). Now, with over 30,000 hours of in-vessel operational experience, the RACE team provides training for remote handling teams in the UK, Sweden and Japan.



Remote operation trials

Our team has demonstrated and evaluated remote handling techniques and equipment using physical mock-ups for remote operations

at JET, ITER, STEP and Europe's DEMO. By hosting the ITER Robotics Test Facility, we have reduced risk in ITER's planned interventions to ensure that this prominent international fusion research machine can be maintained over its operational lifetime.



Design for remote maintenance

RACE plays a key role in international efforts to create a commercially viable fusion powerplant, including the UK's STEP and Europe's

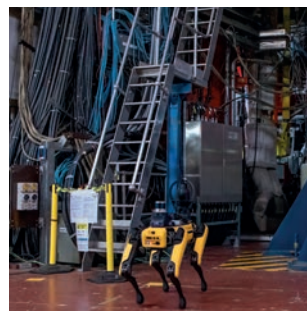
DEMO fusion machines. In these projects, our engineers help define the remote handling requirements and incorporate them in the design of the plants themselves to ensure the plants can be operated and maintained.



Design, integrate, deliver

Beyond fusion, RACE supports international science projects such as the European Spallation Source (ESS), a neutron source being

constructed in Sweden. RACE leads the delivery of the site's Active Cells Facility – the world's largest windowless hot cell – designing, specifying and commissioning the facility that will process irradiated waste.



Research and Development

Our team contributes to world-leading applied research in remote handling for decommissioning in nuclear fission and fusion through

several collaborative programmes. The £12M LongOps project advanced remote handling technologies for decommissioning at JET, Sellafield and Fukushima Daiichi. As a founding member of the Robotics and Artificial Intelligence Collaboration (RAICo), we are deploying robotic technologies and digital supporting infrastructure for faster, safer and more cost-effective decommissioning.

How we work with academia and the supply chain

Sharing expertise

A unique and highly experienced team of engineers who specialise in fusion robotics engineering and operations to provide advice.

Access to facilities

RACE's state-of-the-art work hall in Culham is equipped with robot platforms, sensors and other test facilities that are available for collaborative projects.

Access to data, software, and digital models

We have a collection of valuable data and models that represent the unique challenges of fusion and related environments.

Support for experiments and deployments

We can provide advice, equipment and expert operators for experiments. We can also facilitate deployment trials in real or representative environments.

Lectures and talks

Our subject matter experts can give lectures to universities and research organisations and support workshops at conferences.

PhDs, secondments and placements

We fund PhDs and offer researchers the opportunity to work alongside the RACE team on real-life projects.

Contract opportunities

Through our projects we provide contract opportunities suitable for SMEs and large companies. Information about key upcoming opportunities can be found at race.ukaea.uk/collaborate/contracts.



To learn more, please download our publication 'Robotics Challenges for Fusion Energy'.



Fusion powerplant maintenance conditions

Fusion powerplants will be maintained using remote handling equipment and autonomous robots due to the extreme environment inside the vessel.



High radiation

Dose rates may be 3 kGy per hour at the start of maintenance



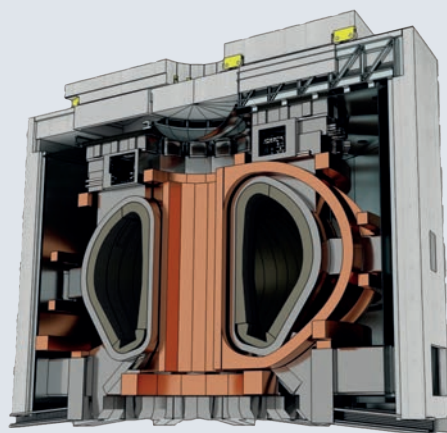
Extreme temperatures

During maintenance components may be as hot as 500 K



Limited access

Maintenance ports are long, narrow and congested



Vacuum pressures

Maintenance may need to be performed at vacuum pressure



Magnetic fields

Residual magnetic fields are expected to be around 40 mT



Hazardous materials

Components may contain hazardous materials like lithium and beryllium

The UK Atomic Energy Authority's mission is to lead the delivery of sustainable fusion energy and maximise scientific and economic benefit



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Find out more
www.gov.uk/ukaea

Collaborate with us

Through close collaborations with our partners, we are delivering world-changing robotics to bring fusion energy closer to reality.

Have a project we should be working on together? Get in touch.

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