RACE is the UKAEA’s centre for “Remote Applications in Challenging Environments”

RACE was created in 2015 in order to exploit the capabilities developed for the JET remote handling system.

Our purpose built facility at Culham was opened in 2016 and houses our multi-disciplinary engineering team and a work hall designed to accommodate large scale mock-ups.
Building on JET fusion technology

- >30,000 hours of operational experience
- 8 shutdown programmes, including the replacement of the entire “first wall”, using over 350 separate remote handling tools and replacing over 7,000 components over 18 months.
Planned procurement in FY20-21 For JET Programme

- Stillages for Boom Extension and VTS (diagram shows Stillage supporting Boom Extension).
  - Approx value £25k per stillage. 2 off required.

- Boom Control cubicle, similar to photo. Approx value £40k

- Boom Interface Control Cubicle, similar to photo. Approx value £30k

- Boom Simulator production units –
  - Approx value £1.5k each

- BIC Test Bench
  Approx value £20k.

- Data Acquisition System hardware, approx value £10k.

Further information available from:
Chris.Dabreo@UKAEA.uk
Planned procurement in FY20-21
Mascot Manipulator Related

Planned Procurements for Mascot – total value in FY20-21 approx £734,000

Mascot Locale Station
- Actuators
  - Safety Encoder
  - Brushless DC Motor
- Drive Systems
  - Gears
  - Capstans and Tendons

Remote Cubicle
- Motor DC Bus PSU
- Power Tools PSU
- Servo Drives
- Safety PLC
- Control System Software Controller (PLC)
- Control System I/O
- Auxiliary PSUs (i.e. for Brakes, Potentiometers)

Remote Manipulator
- Actuators
- Potentiometers
- Brushless DC Motor
- Thermistor
- Resolver
- Gearbox
- Drive System
- Gears
- Capstans and Tendons

Further information available from: Sam.Eniade@ukaea.uk
ESS Facility
Future Procurements

Procurements through 2020:

- Pit & PIE Cell Lids
- Electrical Installation
- Control Room Infrastructure
- Fabricated Assemblies, Tooling & Stillages, Lifting Adaptors
- Safety System
The primary objective of the WPRM Project (in FP-8) is to deliver a feasible, integrated concept design for the Remote Maintenance system for DEMO that, with an acceptable confidence level, can be shown to meet the requirements of the DEMO Plant.

In FP-9 the project will deliver a baseline conceptual design of an integrated maintenance system for DEMO. The design will be demonstrated as technically feasible, with technology choices shown to be viable, resulting in a licensable architecture.
AWP20 Procurement Tasks

Industrial (consultancy) Tasks
- Seismic mitigation strategies for DEMO RM Systems
- Blanket transporter dynamic modelling
- TARM dynamic modelling
- Contamination control strategy development (ex vessel)

Hardware Procurement Tasks
- Intermodular service connection joint development
- Proof of Principle development for small-bore optics
- In-bore position sensory unit R&D
- Supply and testing of proof of principle Post Weld Heat Treatment (PWHT) tooling
The STEP project objective is to design a commercially viable, compact fusion reactor, collaborating with partners to build a UK prototype by 2040.

The Plant Lifecycle (product) work package is to provide confidence that the proposed Concept and Prototype Reactor’s Plant lifecycle is Safe, Affordable, Available and Technically Credible.

All aspects of the STEP plant lifecycle, is defined as:

“Construct, Assemble, Commission, Operate, Maintain, Manage Waste and Decommission”
STEP Procurement Tasks FY20

Construction Studies
• Identification of Construction Standards, Regulations and Classification of Structures & Buildings
• Building cost drivers (e.g. height v excavation)
• Options for Logistics and Transport to Site
• Lessons learned from other large infrastructure projects

Maintenance Studies
• Transfer solutions
• Contamination control solutions
• Storage, disposal, and waste management
• Refurbishment and maintenance solutions

RAMI – Initial Model for Availability Studies

Waste Management and Decommissioning Studies
• Preferred Waste Handling and Decommissioning Strategy for STEP
• Prototype Integrated Waste Strategy Document for SPR
• Development of Isotope Separation Technology
NNUF2 - Overview

- £3M EPSRC funding received for a portable reusable facility for cold testing and hot deployments
- Available to academics & industrial users

- 3 year Project duration
- Partners are UoB, UoM, NNL
- Large range of kit & mock environments available to hire

ISO Container 1: Control Room

ISO 2: Flexible Toolkit
Robot arms, UAV, UGV, sensors

ISO 3: Collapsible, modular bagging & decontamination Station.

Arrive at location → Setup Control Room → Setup Toolkit → Setup ISO 3 → Perform Work → Return to UKAEA

Uses:
- Demo End Uses
- Hire kit

Mock-ups
UAV/UGV Tests
Training

Cold Test facility @ UKAEA housing mock-ups
NNUF2 – Procurements FY 20/21

Contact: nnuf-hr@race.ukaea.uk

- Collapsible, modular bagging & decontamination Station ~£200k.
- Cold Test facility ~ £350k
- 2 x Haptics
- 2 x arms
- Walking Bots
- 2 x Haptics
- Barrel Store
- Glovebox
- Mock up Rigs
- Pipe Wall
- Control Room ~ £120k
ITER Robotics Test Facility (IRTF) Programme

- RACE is hosting ITER Organisation Remote Handling Cold Test Facility, which is called ITER Robotics Test Facility (IRTF)

- IRTF is an off-site programme of mock-up trials, driven by the need to provide feedback to the component designers during the design phase, hosted at RACE.
  - When maintenance operations are perceived to be new (due to evolving radiation maps) or hazardous for remote handling, then **physical mock-up trials** are recommended to ensure the ITER components are maintainable remotely.

- There are now 4 completed projects, 9 active projects and many more projects in the pipeline that require strong support from supply chain
Supply chain requirement

- Large structure fabrication
- Precision machining
- Machinery design specialist
- Non-destructive testing specialist
- Robot automation
- Electrical systems design and manufacture

Flange bolting tool

Test Blanket Module mock-up

Port plug bolting mock-up

Super bolt Drive system

Upper Port plug mock-up
- 12 m high
- 45 tonnes
Questions
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