UK Atomic Energy Authority

ESS Active Cells

ESS Active Cells: Installation, Commissioning and Testing

Dr William Blyth **14/04/2026**

RACE

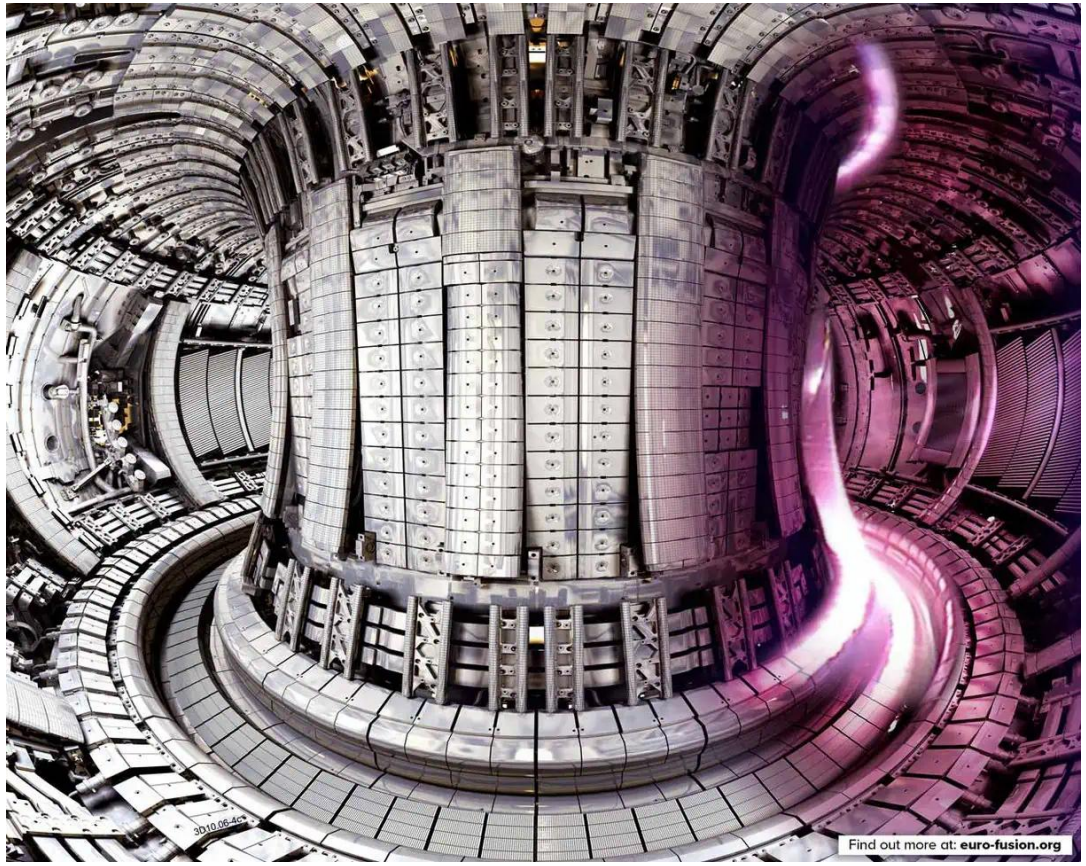
Agenda

- Background
  - The United Kingdom Atomic Energy Authority (UKAEA)
  - European Spallation Source (ESS)
- UKAEA's contribution - the ESS Active Cells
- Installation
- Testing and Commissioning Strategy / Progress

UKAEA

UK Atomic Energy Authority

The United Kingdom Atomic Energy Authority (UKAEA) is the UK's national organisation responsible for fusion research and enabling fusion energy.



RACE

RACE

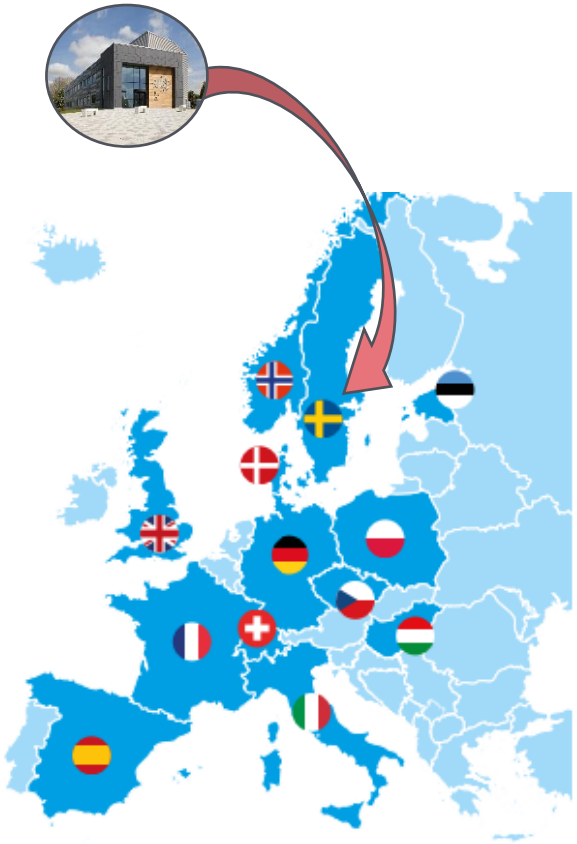
UK Atomic Energy Authority

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

It leads the way in robotics for fusion, nuclear decommissioning, space exploration, and big science work.

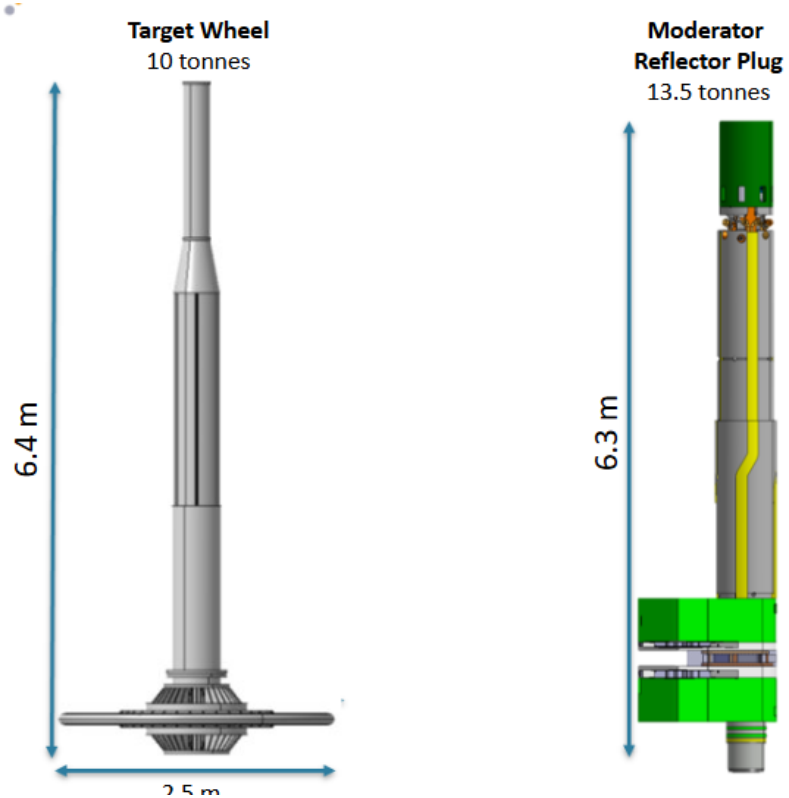
What is the European Spallation Source?

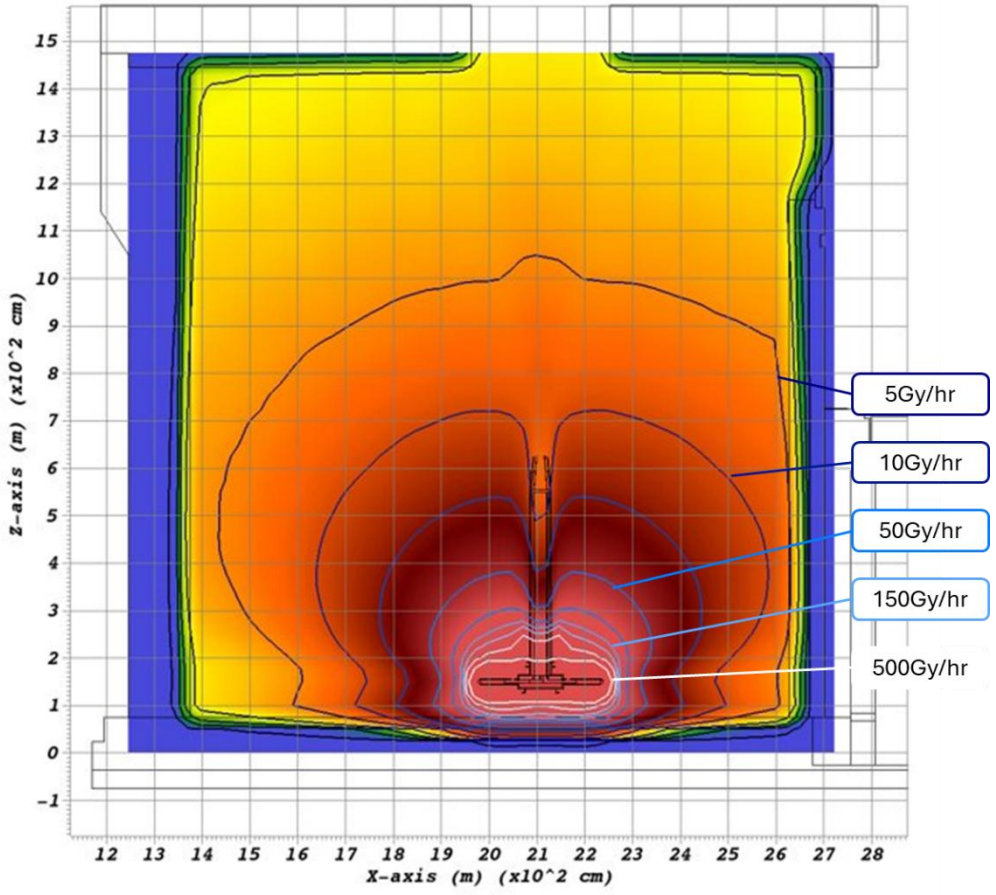
- A big-science research facility being constructed Lund, Sweden (data management & software centre in Copenhagen).
- Will be the world's most powerful accelerator-based neutron source.
- Electromagnetic fields accelerate protons along a 602.5m linear accelerator.
- A new pulse of protons is generated 14 times a second.
- Funded by 13 European countries, the facility is built with contributions from more than 40 research institutes.
- UK contribution is 10% of €1.843 Billion (c£165m). [2018]
- Scope for UK includes the Active Cells (RACE) and instruments (STFC).



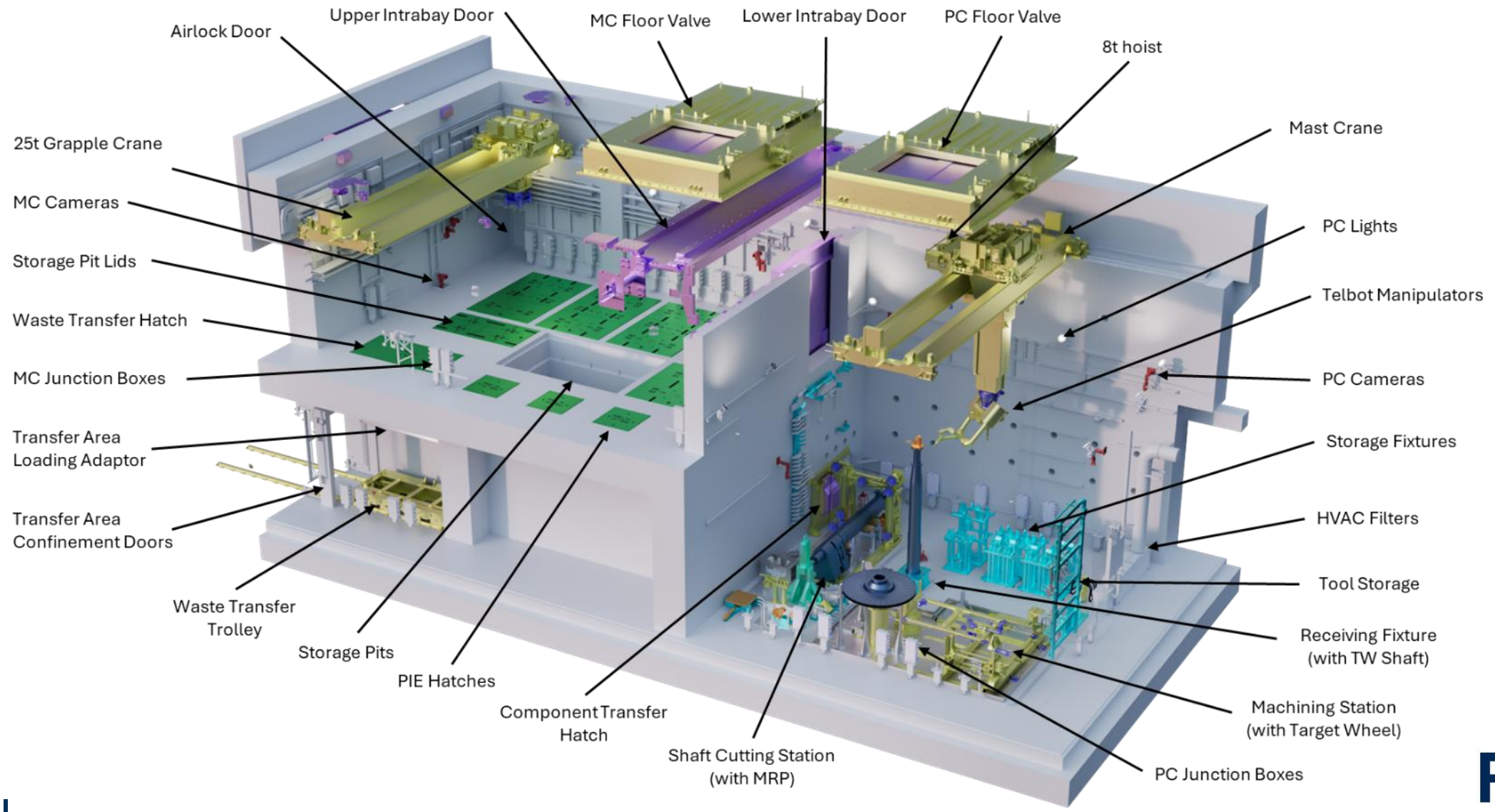
Component Activation

Main Components





The Active Cells – Cross Section



UKAEA's Contribution – The Active Cells

Radioactive Waste Processing Facility for the European Spallation Source

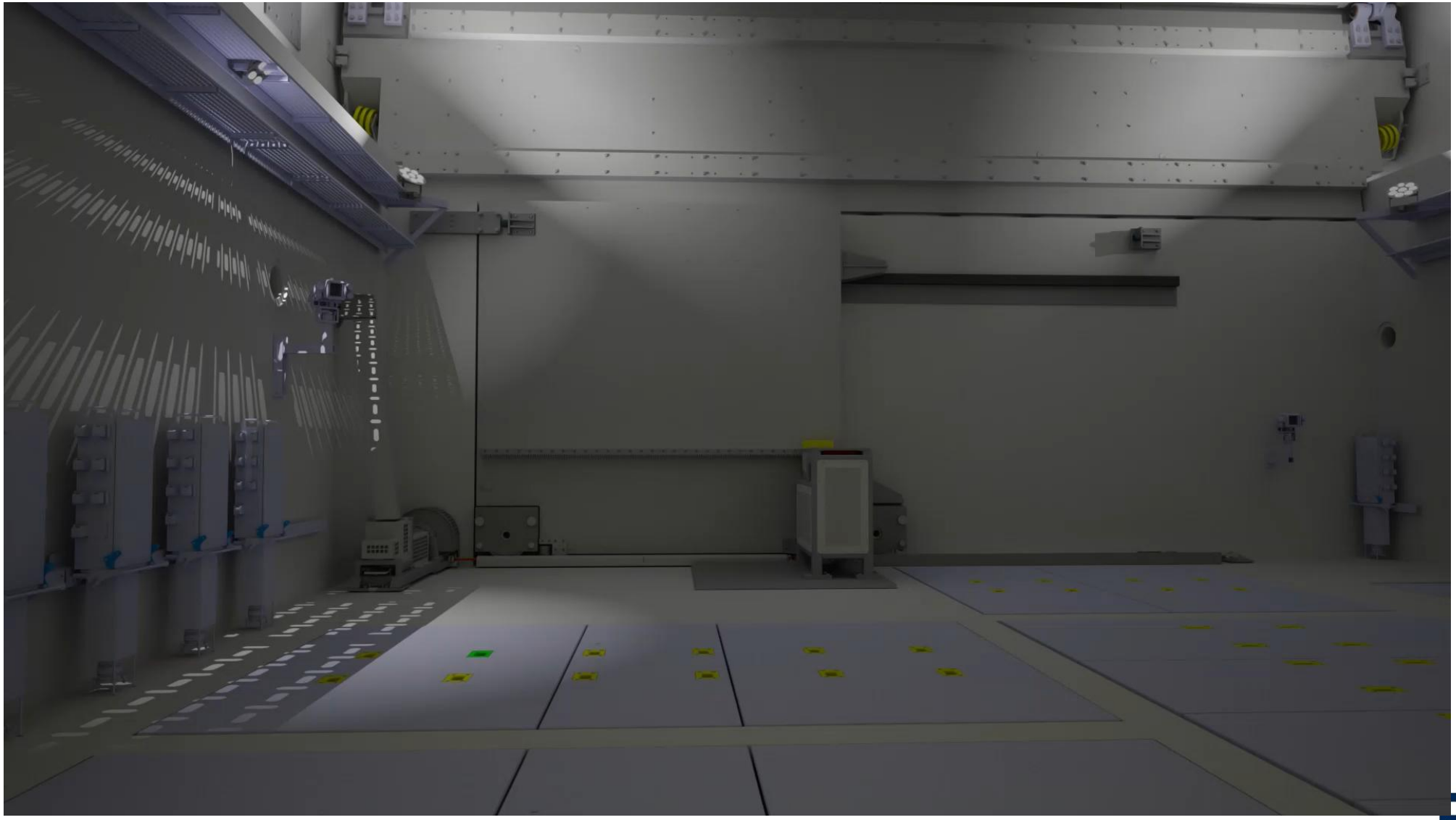
Technical challenges

- Fully remote size reduction and handling
- High radiation dose and contamination
- Personnel safety
- Multi-discipline integration

Project challenges

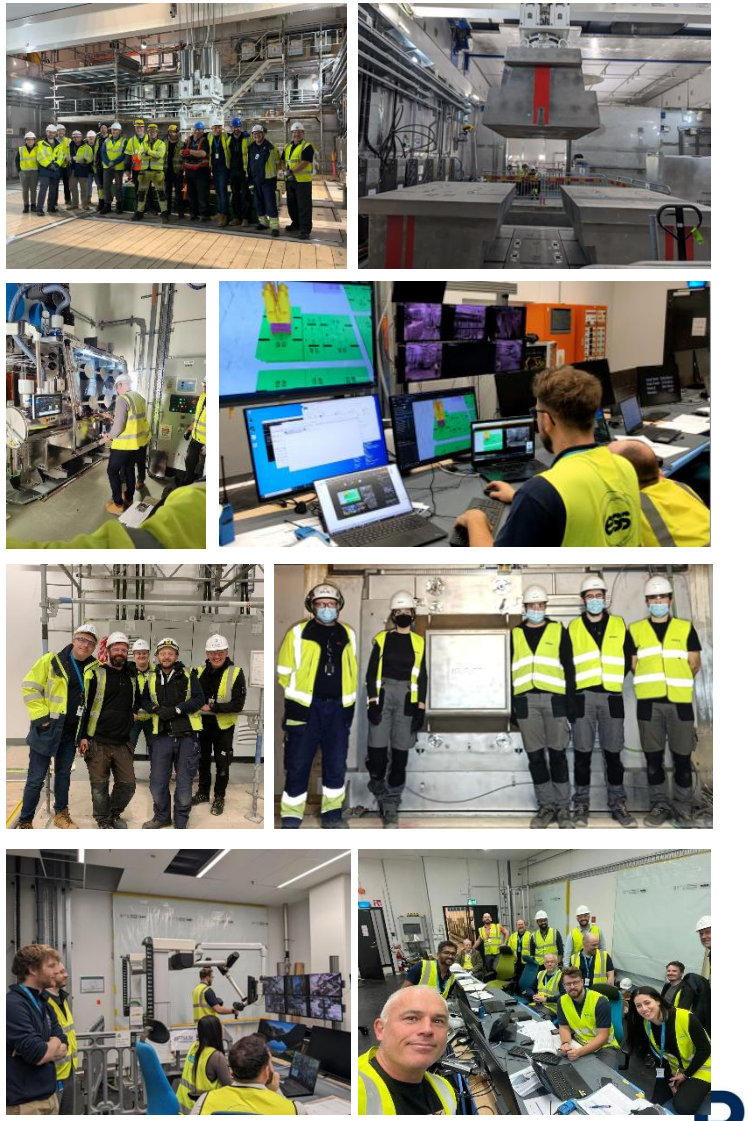
- Complex organisational structure
- Many organisations involved
- Many interfaces to manage
- Mission critical facility
- Concurrent design

ESS Active Cells Facility in One Minute



Scale of Installation, Commissioning and Testing Challenge

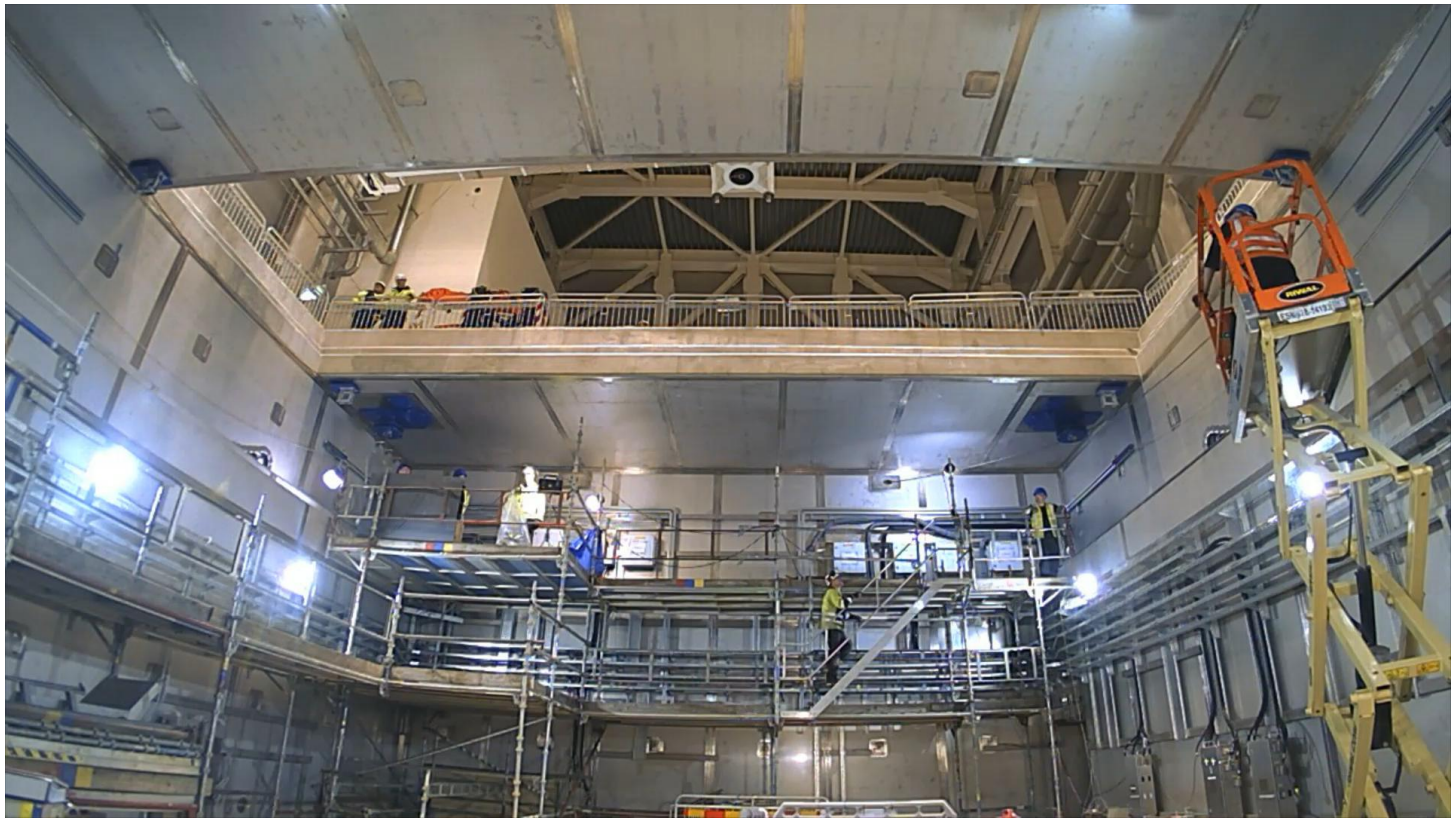
- Cross-disciplinary team
  - Over 15 different disciplines
- Over 450 team members / contributors
- Over 350 sub-contractors (plus many more sub-sub-contractors)
- Over £30 million spent in the supply chain
- Over 70,000 electrical terminations
- Over 70 km of electrical cabling
- Over 700 tonnes of equipment installed
- And an equivalent amount of paperwork



Early Installation Works

Crane Rail Installation – in-cell (left) | site context (right)

Major System Installation



Grapple Crane Installation

Shaft Cutting Station

Storage Pit Lid Installation

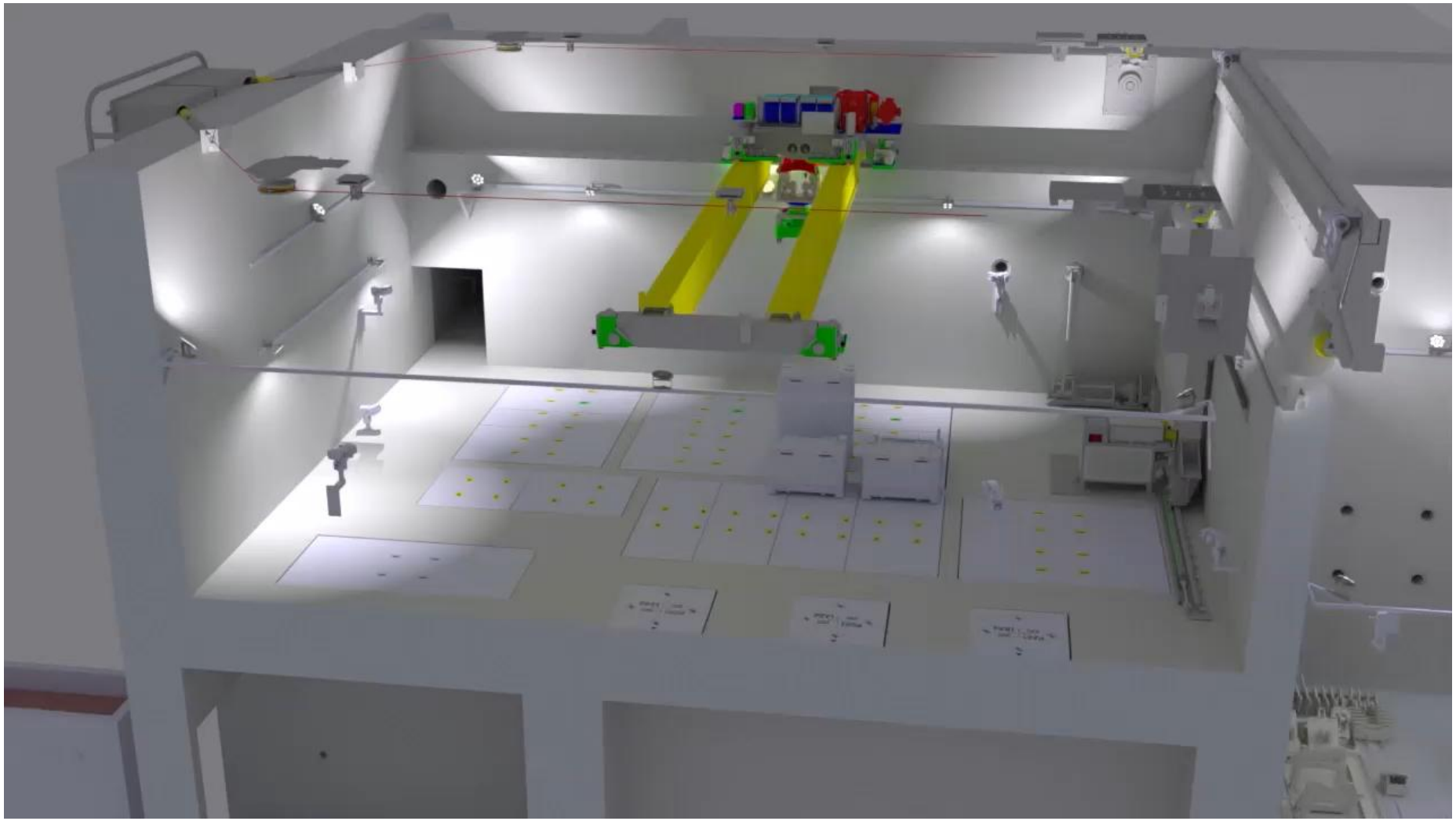
Commissioning & Testing Strategy

Progressive assurance / sequential de-risking

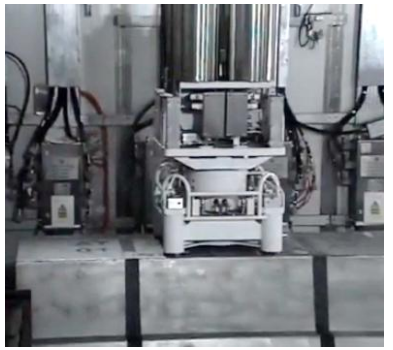
1. Risk Identification
   - HAZOPs, Interface definition, FMECAs, etc.
2. Simulations / Test Rigs
3. Sub-System Factory Testing
4. Installation (including quality assurance)
5. Sub-System Site Testing
6. Integrated Testing
7. System handover

Manipulator Factory Trials

Bringing it all together



Integrated Testing Progress



Integrated Control System Testing (left) and RHS Grapple (right)

Additional Material – YouTube

Inside The $3BN Mega-Lab That Will Change The World

548K views • 2 days ago

The B1M

13 nations are building something amazing in the south of Sweden. To try...

New 4K

Matching chapter 19:24 ESS' Surroundings

UKAEA & ESS: Engineering the Future of Remote Waste Processing

625 views • 3 months ago

UKAEAofficial

We're thrilled to present an exclusive look at the cutting-edge development of the Hot Cells at the European Spallation Source ...

ESS explained via a guided tour through the facility under construction.

5.5K views • 3 years ago

European Spallation Source

Explaining ESS via a virtual tour through the facility. September 2022. With subtitles. Narrator: Jo Lewis, ESS.

4K