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Update on UKAEA's activities at Culham

BACKGROUND

CSC combines world-class publicly funded research into fusion power; commercial technology organisations and Culham Innovation Centre, to create a powerhouse of high technology innovation and enterprise in South Oxfordshire. CSC is an established part of the southern Oxfordshire cluster of education, science and technology, now known as Science Vale, and has established a broad high technology business base. The UKAEA is a partner in Science Vale and as such is committed to working together with the other partners, including the Oxfordshire authorities and Local Enterprise Partnership (LEP), to help to promote and develop the Science Vale area as an internationally recognised location for enterprise and innovation in science and technology.

EMPLOYMENT

The CSC forms a key part of Science Vale and the Knowledge Spine and is one of the largest employment centres in the County (covering approximately 80 hectares). Employment levels at CSC have been stable and in excess of 2,000 for many years and, in recent years, with a growing community of commercial science and technology enterprises and the broadening of the UKAEA's portfolio, have started to rise. CSC currently supports over 2,400 jobs and has policy support for 50% growth in the South Oxfordshire Core Strategy under policy CSEM3 (and in the emerging Local Plan, under proposed policy STRAT8).

The growth seen at CSC builds on its stature as the world's leading fusion energy research centre. These are the words of the (former) science minister Sam Gyimah MP on a speech at Culham in October 2018.

*"There are a number of sectors where Britain is poised to lead the world. **Firstly in the sector of fusion technology.** This is the safest, cleanest more sustainable form of energy and no-one in the world has the expertise that we have here".*

The present Science Minister, Chris Skidmore MP, visited in January 2019 and said

“The work of UKAEA here at Culham will help make British fusion power a reality – this kind of national endeavour is a great example of the vision we need to pursue to deliver the 2.4% R&D target.”

for more information see <https://www.gov.uk/government/news/fusion-an-example-of-government-science-ambitions-says-minister>

For planning purposes, the UKAEA is assuming that, notwithstanding the eventual closure of JET (which is still some years away), the broadening and burgeoning range of UKAEA technology, materials and engineering work will maintain historic levels of employment in nuclear fusion-related activity and that the growth will come from commercial occupiers, either new occupiers or the expansion of existing organisations.

JET, EURATOM and BREXIT

JET remains the largest European fusion device and is expected to operate until well into the next decade, running alongside MAST-U, the UK’s leading fusion experiment. JET and MAST-U will also make a major contribution to the development of ITER. UKAEA, with MAST, MRF, MDF, RACE and other projects will continue to make a major contribution, internationally, to the development and realisation of fusion energy in ways which are expected to grow and develop activity at CSC.

Funding for the operation of JET **until the end of 2020** was been secured in March 2019, **irrespective of the uncertainty around the UK’s future relationship with Europe** - see <https://www.gov.uk/government/news/future-of-jet-secured-with-new-european-contract>

From 2021 onwards, it is expected that a close “association” between the UK and Euratom (the EU programme that funds JET) will enable JET to continue operating to 2024 at least. An extension to the existing planning arrangements will be sought this year.

In a personal letter to all UKAEA staff members in March, Science Minister Chris Skidmore stated :

“UKAEA’s wider work, has a bright future post-Brexit. UKAEA is the best place in the world for fusion research, and I am going to make sure this only becomes even more true over the next few years.”

On a future association with Euratom, he also wrote :

“You will of course know that the Government’s preferred outcome through all of this activity is to seek an association to the Euratom Research and Training Programme, through which continuity across all collaborative nuclear research activities, including JET and ITER would be secured. But please be reassured that the Government has put in place robust contingency plans, developed in full consultation with UKAEA, should this not prove realistic.”

In the Spring Statement of 13 March 2019, the Chancellor added:

“...I will guarantee our commitment to the UK’s funding for the JET nuclear fusion reactor, whatever happens with Brexit...”

NUCLEAR SECTOR DEAL AND INDUSTRIAL STRATEGY

In addition, CSC is well positioned to be a hub for innovative engineering companies who wish to collocate with this leading national laboratory, which will be one of the centres for the delivery of economic growth anticipated from the **Nuclear Sector Deal** made as part of the **Industrial Strategy** White Paper. Indeed, this development will contribute directly to three themes of the Industrial Strategy Challenge Fund – Clean & Flexible Energy, Robotics & AI and Driverless Vehicles, as well as playing a key role in the Nuclear Sector Deal:

“The government and the sector also recognise there is a huge opportunity from nuclear fusion technologies to build on the UK’s existing scientific strengths in that area and ensure UK expertise leads the way in pioneering research that has genuine global impact. Therefore, the government is providing £86 million to set up a national fusion technology platform at the UK Atomic Energy Authority’s Science Centre at Culham in Oxfordshire. The new investment will reinforce the UK’s world-leading fusion R&D capability, underline our commitment to international collaboration and allow UK firms to compete for up to £1 billion of international contracts for fusion technologies, including for the International Thermonuclear Experimental Reactor (ITER), which will continue efforts to develop a clean, safe and virtually limitless energy source. The government is also exploring with UKAEA the scope for further developing the Culham site as a hub for advanced nuclear technologies.”

(UK Government Nuclear Sector Deal, June 2018)

PUBLIC INVESTMENT

Recent investment in UKAEA include:

- £15M for the establishment of the Remote Applications in Challenging Environments (RACE) programme and facilities. Funded partly from the Oxford City Deal, this has already resulted in 150 jobs locally and has helped UK industry win contracts worth over £160m to supply remote handling equipment to facilities such as ITER in France and the European Spallation Source in Sweden. It has also helped to accelerate the growth of local SMEs including Oxbotica, a world class spin-out from Oxford University. In addition to the key support the RACE programmes and facilities provides to international fusion.
<https://www.gov.uk/government/news/race-to-host-10m-iter-test-facility>

RACE is also becoming a key part of the drive towards AV. In the last 12 months RACE has secured an additional £20m of funding, largely collaborative R&D with academia and industry.

<https://www.gov.uk/government/news/ukaea-robotics-role-in-oxfordshire-science-and-innovation-audit> and
<https://www.gov.uk/government/news/race-driven-to-support-driverless-cars>

Expansion of RACE has been so rapid, an extension to the existing building has been funded by BEIS and is currently proceeding through the local planning process

- The establishment of the new Materials Research facility (MRF) as part of the £15m National Nuclear Users Forum partnership involving three Government laboratories, four university and a range of key industrial partners. Further investments of £10m to extend the facility over the coming years are planned. The UK Atomic Energy Authority already has an extant planning permission in this regard.
<https://www.gov.uk/government/news/breaking-ground-for-new-materials-facility>
- The upgrade of the UK fusion facility MAST, with a £57m investment over 7 years. MAST Upgrade will commence operations later in 2019 and is planned to run until early 2030's.
<https://www.gov.uk/government/news/21-million-investment-for-mast-upgrade>

MAST-U will further explore the science of more compact and efficient fusion devices but will also investigate innovative solutions to one of fusion's biggest technology challenges – exhausting high heat loads from the fusion fuel mixture. This is directly related to the design of future fusion power stations.

- The Government funded £12m Oxfordshire Advanced Skills (OAS) facility, which, eventually, will deliver over 160 advanced engineering apprenticeships a year for UKAEA, STFC and other high tech companies in Oxfordshire. Permission Ref. P17/S4193/FUL marks phase 2 of this project, opening with 96 apprentices in September 2019.
- New publicly (OXLEP) funded facilities alongside RACE (above) to house the growing cluster of Connected Autonomous Vehicle businesses and activity that is building around RACE
<https://www.gov.uk/government/news/winners-of-51-million-government-competition-to-develop-world-leading-self-driving-car-testing-infrastructure-unveiled>
- Substantial further Government investment (£86M) will enable the construction and operation of two new facilities at Culham – the H3AT tritium research centre and FTF testing facilities. Due to be open in 2021, these will both enable UKAEA to work even more closely with UK industry, with an aspiration to secure a further €1bn of contracts from ITER (building on the €0.5bn already secured).
<https://www.gov.uk/government/news/86-million-boost-for-uk-nuclear-fusion-programme>
and <https://www.gov.uk/government/news/ukaea-launches-national-fusion-technology-platform> .

Underpinning all this, the Government has:

Reinforced the importance of the work that UKAEA carries out at Culham Science Centre.
<https://www.gov.uk/government/news/uk-role-in-fusion-following-eu-exit>

- Committed to contributing continued funding for the operation of JET, the major European fusion facility at CSC
<https://www.gov.uk/government/news/government-commits-to-continue-funding-its-share-of-europes-flagship-uk-based-nuclear-fusion-research-facility>
- Announced recently that it is backing new commercial development at CSC
<https://www.businessinnovationmag.co.uk/booming-business-at-culham-means-expansion-for-science-centre/>

COMMERCIALISATION

To further build on the UK's clear lead in developing fusion a viable energy source, UK Government (in the 2018 Autumn statement) announced an initial £20M (with a further £200m¹ under discussion) for UKAEA to undertake the design of the UK's own compact fusion powerplant design – STEP (Spherical Tokamak for Energy Production). This will necessitate further close collaboration with UK industry and academia and has the potential to accelerate ground-breaking work on the development and commercialisation of fusion technologies. This will maintain UK leadership in nuclear fusion; and to support the Government's Clean Growth Grand Challenge.

STEP design activities will be undertaken by UKAEA at Culham and with the UK industrial supply chain and academic community. The STEP device itself would not be located at Culham, but elsewhere in the UK at a suitable nuclear licensed site.

SUMMARY

Recent extra Government investment in UKAEA (£86M for H3AT and FTF, initial £20M for STEP and £10M for OAS) clearly demonstrates a strong commitment to UKAEA and Culham from Government and a genuine belief in fusion – as a viable energy source in the next 30 years. These new facilities will continue to play an important role in delivering fusion for decades to come.

Recruitment is at all time high – UKAEA made 350 new job offers in 2018 and both the graduate and apprenticeship schemes are increasing in scale.

The Culham site is also home to ~50 hi-tech companies employing over 800 highly skilled staff. Occupancy is at 98% - demonstrating a clear need for new buildings for UKAEA to use and/or let to tenants. UKAEA has outline planning permission for new buildings totalling 9000 square metres and has now received approval for Government to work with commercial partners to further develop the site.

Government interest and investment in UKAEA and Culham is at unprecedented high levels not seen in decades. Far from a site winding down, Culham is expanding and has a long term future in meeting the real challenges of putting fusion on the grid in the future, as well as building a fusion technology / advanced engineering cluster in support of that ambition.



Prof Ian Chapman, FInstP
CEO, UKAEA

¹ The business case for a further £200M has been approved by the BEIS Investment Committee and signed off by ministers and is now being discussed with Treasury