Department for Business, Energy & Industrial Strategy

Euratom Exit Factsheet
Research and Development

June 2018

Nuclear Research and Development (R&D)

Civil Nuclear R&D can be split into two areas: fission and fusion.

Fission R&D encompasses a wide array of technical areas and projects relating to existing nuclear energy provision. The main focus remains on enhanced safety, waste management and decommissioning. In addition, there are strands relating to the next generation of reactors: Gen IV and other advanced nuclear technologies including small modular reactors.

Fusion R&D seeks to harness nuclear fusion – a process that occurs naturally in the sun and other stars – to develop a new source of clean, safe and virtually inexhaustible energy. The UK is recognised as a world leader in the development of fusion technology and associated disciplines.

The UK carries out nuclear research in both areas through a combination of domestic, EU, and international funding. A significant proportion of funding for nuclear R&D in the UK comes from the EU through participation in the Euratom Research and Training (R&T) Programme. The UK funds nuclear research domestically through the Engineering and Physical Sciences Research Council (EPSRC)[1].

The Euratom Research and Training Programme

The Euratom R&T Programme was established by the Euratom Treaty to coordinate collaboration on nuclear research for the members of Euratom and has an annual budget of around £130m per year.

The programme runs on a fixed term of 5 years plus an additional 2 years, in order to align with the EU's Horizon 2020 programme. As part of the Euratom R&T Programme the UK receives around £65m per year in funding for nuclear research activities.

The European Consortium for the Development of Fusion Energy (EUROfusion)[2] manages and funds fusion research activities on behalf of the Euratom R&T Programme. There is no equivalent delegated central spending consortium for fission funding. The Euratom R&T Programme also funds the nuclear research activities of the EU's Joint Research Centre (JRC).

It is a UK priority to seek a close association to the Euratom Research and Training Programme as part of our future relationship with the EU, as stated in a Written Ministerial Statement made by the Department for Business, Energy and Industrial Strategy on 11th January 2018. The UK's aim is for this association to ensure maximum continuity of UK-EU co-operation on nuclear research.

[1] www.epsrc.ac.uk
[2] www.euro-fusion.org

On 22 May, the UK presented to the EU its vision for the future UK-EU partnership on science and innovation[3], including continued access to the Euratom Research and Training Programme.

The Prime Minister reiterated this aim in her Jodrell Bank speech on 21 May, stating that the UK would like the option to fully associate with the excellence-based European science and innovation programmes, including the Euratom Research and Training Programme, and would be willing to make an appropriate financial contribution.

Fission R&D

EU funded nuclear fission research in the UK is through involvement in collaborative research programmes run under the Indirect Actions budget of the Euratom R&T Programme. In addition to supporting research on nuclear safety, waste management and decommissioning, the Euratom Work Programme 2018[4] places emphasis on research for decommissioning of nuclear installations, promotion of innovation, education and training. Regular participants and large beneficiaries of the programme include the University of Manchester, the National Nuclear Laboratory and the Department of Health.

The EU fission projects with current UK engagement align with the UK's Nuclear R&D priorities as identified by the Nuclear Innovation and Research Advisory Board (NIRAB) relating to future fuels, 21st Century nuclear manufacture, reactor design (including safety) and recycling fuel for future reactors.

Fusion R&D

As part of the Euratom R&T Programme, the UK participates in two large fusion experiments: The Joint European Torus (JET) and the International Thermonuclear Experimental Reactor (ITER)

JET is currently the world's most advanced experimental fusion reactor, hosted in the UK at the UK Atomic Energy Authority's (UKAEA) Culham Centre for Fusion Energy (CCFE) in Oxfordshire.

UKAEA have a contract with the EU Commission to operate JET on behalf of Euratom. Under the terms of this contract the EU provides 87.5% of the JET operating costs, with the UK providing the remaining 12.5%. In June 2017, the UK government committed to underwrite the UK's fair share of funding for the JET project until the end of 2020[5], subject to the EU extending the JET operating contract beyond 2018.

ITER is an international project aiming to demonstrate net energy production from a fusion reaction for the first time. Its members are the EU, China, India, Japan, South Korea, Russia, and the United States. ITER is being built in the South of France and construction is expected to complete in 2025.

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[3] www.gov.uk/government/publications/framework-for-the-uk-eu-partnership-science-research-andinnovation
[4] http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/euratom/h2020-wp1820-euratomen.pdf
[5] www.gov.uk/government/news/government-commits-to-continue-funding-its-share-of-europes-flagship-uk-based-nuclear-fusion-research-facility

The total cost of ITER construction is estimated at around €20 billion. Under the terms of the ITER agreement the EU provides 45.5% of these costs, with other ITER members each providing around 9% of the costs. The EU contribution to ITER is coordinated through the European Joint Undertaking known as Fusion for Energy (F4E).

The UK owns a smaller experimental fusion reactor, MAST-U. MAST-U is based at the CCFE and is due to begin operations in 2018. The CCFE also has centres for emerging robotics and advanced materials technologies related to fusion.

Safeguards and R&D

R&D activities that involve qualifying nuclear equipment, facilities, or material are subject to inspection under the Euratom safeguards regime. The Nuclear Safeguards Bill will put in place appropriate powers to ensure a suitable domestic nuclear safeguards regime can be established when Euratom arrangements no longer apply to the UK. This regime should provide the international community with sufficient confidence to enable the continuation of international collaborative nuclear research activities using qualifying nuclear materials, facilities or equipment.

An example of experimental work that requires the use of qualifying nuclear materials, facilities or equipment would be improving the safety of long-term storage of spent nuclear fuel, which requires the use of spent nuclear fuel – defined as a type of 'qualifying nuclear material'.

Key terms

Term	Meaning
Fission	The splitting of a large fissionable isotope (i.e. Uranium-235) into smaller atoms and particles releasing significant quantities of energy. This is generally done by bombarding a fissionable material with neutrons.
Fusion	The forming of an isotope (i.e. He-4) from smaller isotopes (i.e. deuterium (H-2)) releasing significant quantities of energy. This is typically done by heating the suitable isotopes into a plasma controlled by very strong magnets.
SMR	Small Modular Reactors (SMRs) are small scale nuclear fission reactors, typically designed to be brought to and taken from site fully constructed (or at least self-contained).
Gen IV	The next generation of nuclear reactor with improved safety margins and fuel efficiency.
JET	Joint European Torus, a tokamak design thermonuclear fusion reactor, with a torus ("ring") shaped reactor chamber.
Plasma	An ionized gas, typically achieved by superheating a gas.
JRC	European joint research centre, a scientific research hub for Europe, which is split into 7 specialist areas (called institutes), over 6 sites throughout Europe.
Indirect Actions Budget	Portion of the Euratom R&T budget which is dedicated to funding research projects throughout Europe, with a heavy emphasis on collaboration.
Direct Actions Budget	Portion of the Euratom R&T budget which funds the nuclear activities within the JRC.