Fusion energy, Eni and UKAEA to build the world's largest and most advanced tritium fuel cycle facility

Eni and UKAEA launch a research and technological development collaboration for innovative solutions in the field of fusion energy.

Oxford, England and San Donato Milanese (Milan), Italy (Friday, 7th March 2025) – The United Kingdom Atomic Energy Authority (UKAEA), the UK's national organisation responsible for the research and delivery of sustainable fusion energy, and Eni, have entered into a collaboration agreement to jointly conduct research and development activities in the field of fusion energy. The collaboration primary starts with the construction of the world's largest and most advanced tritium fuel cycle facility, a vital fuel for future fusion power stations. The "UKAEA-Eni H3AT (pronounced 'heat') Tritium Loop Facility", located at Culham Campus will be complete in 2028.

Tritium recovery and re-use will play a fundamental role in the supply and generation of the fuel in future fusion power plants and will be crucial in making the technology increasingly efficient.

Fusion is a form of energy whereby the power of the Sun is replicated on Earth. The fusion process sees two hydrogen isotopes fuse together under intense heat and pressure to form a helium atom, releasing large amounts of emissions-free energy through a safe, cleaner and virtually inexhaustible process.
Fusion energy could be transformational to contribute to energy security and decarbonisation.

The "UKAEA-Eni H3AT Tritium Loop Facility" is designed to serve as a world-class facility providing industry and academia the opportunity to study how to process, store and recycle tritium.

UKAEA and Eni will collaborate to develop advanced technological solutions in fusion energy and related technologies, including skills transfer initiatives.

Eni will contribute to the H3AT project with its expertise in managing and developing large-scale projects, helping to de-risk its roadmap. This partnership combines UKAEA's extensive expertise in fusion research and development with Eni's established industrial-scale capabilities in plant engineering, commissioning, and operations.

UK Climate Minister, Kerry McCarthy, said: "*We are proud to be at the forefront of global innovation in clean energy fusion technologies, and this collaboration with Eni marks a significant step towards unlocking the potential of fusion energy, supporting our missions for economic growth, clean power and energy independence.*

The UKAEA-Eni H3AT Tritium Loop Facility will not only position the UK as a leader in the development of fusion fuel technologies but also accelerate progress towards a future of safe, sustainable, and abundant clean energy."

Professor Sir Ian Chapman, CEO of UKAEA, said: *"We are delighted to be working with Eni who have shown great commitment to fusion. We believe that fusion energy can contribute to a net zero future, including going beyond the decarbonisation of electricity.*

The H3AT demonstration plant will set a new benchmark as the largest and most advanced tritium fuel cycle facility in the world, paving the way for innovative offerings in fusion fuel and demonstrating the UK's leadership in this crucial area of research and development."

Claudio Descalzi, Eni CEO said**:** *"Fusion energy is meant to revolutionise the global energy transition path, accelerating the decarbonisation of our economic and industrial systems, helping to spread*

access to energy, and reducing energy dependency ties within a more equitable transition framework. Eni is strongly committed to various areas of research and development of this complex technology, in which it has always firmly believed. Today with our UK partners we are laying the foundations for further progress towards the goal of fusion which—if we consider its enormous scope of technological innovation—is increasingly concrete and not so far off in time. To continue this virtuous development, international system-level technological partnerships like this one are indispensable".

Eni supports a socially fair energy transition with the aim of promoting efficient and progressively more sustainable access to energy resources. Eni places innovation at the centre of its strategic vision and it has transformed the businesses by investing significantly in research, development, and the implementation of technologies to progressively decarbonising its energy mix and achieving carbon neutrality by 2050.

UKAEA's mission is to lead the delivery of sustainable fusion energy and maximise the scientific and economic benefit. It aims to solve the challenges of this new energy source, from design through to decommissioning with world-leading science and engineering. UKAEA enables partners to design, deliver, and operate commercial fusion power plants around the globe and fosters the creation of clusters that accelerate innovation and help drive economic growth.

- ENDS -

Digital assets to accompany the media release (**media pack**): click here for photos and videos UKAEA – https://ukaea.canto.global/v/UKAEAENIPressPack

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About the tritium fuel cycle facility H3AT

The UKAEA-Eni H3AT Tritium Loop Facility will serve as a critical and internationally significant resource, strengthening the UK's leadership in fusion energy and advancing future industrial capabilities.

Located at Culham Campus in Oxfordshire, UK, the facility aims to demonstrate a continuous, closed-loop tritium fuel cycle at pilot plant scale. This will help to de-risk and enhance confidence in tritium process plant designs for future fusion powerplants.

The H3AT Tritium Loop Facility holds a unique position in the global landscape in that it will have sufficient tritium inventory to be relevant to future power plants. Its flexible design ensures it can be utilised by different user communities, supporting diverse research and development needs.

H3AT will expand UK tritium skills capacity through designing, building and operating a first of a kind facility, and build capacity for the fusion workforce.

About UKAEA

UKAEA is the national organisation responsible for the research and delivery of sustainable fusion energy. It is an executive non-departmental public body, sponsored by the Department for Energy Security and Net Zero.

UKAEA runs the fusion machine MAST-Upgrade (Mega Amp Spherical Tokamak) and is delivering the transition of JET from plasma operations to repurposing and decommissioning. The insights gained from this process will contribute to the advancement of sustainable future fusion powerplants.

UKAEA is STEP's (Spherical Tokamak for Energy Production) fusion partner and will work alongside STEP's industry partners – one in engineering and one in construction – expected to be announced at the end of 2025/early 2026. STEP is a major technology and infrastructure programme that will demonstrate net energy from fusion, fuel self-sufficiency and a route to plant maintenance.

The STEP programme is being delivered by UK Industrial Fusion Solutions Ltd (UKIFS) a wholly owned subsidiary of UKAEA Group. UKIFS will lead STEP's integrated delivery team to design and build the prototype plant at West Burton site in Nottinghamshire, targeting first operations in 2040.

UKAEA is now engaging in Fusion Futures, a programme that aims to foster world-leading innovation whilst stimulating general industry capacity through international collaboration and the development of future fusion powerplants.

UKAEA also undertakes cutting edge work with research organisations and the industrial supply chain in a wide spectrum of areas, including robotics and materials.

About Eni

Eni is a global energy tech company operating in 61 Countries, with over 30.000 employees. Originally an oil & gas company, it has evolved into an integrated energy company, playing a key role in ensuring energy security and leading the energy transition. Eni's goal is to achieve carbon neutrality by 2050 through the decarbonization of its processes and of the products it sells to its customers. In line with this goal, Eni invests in the research and development of technologies that

can accelerate the transition to increasingly sustainable energy. Renewable energy sources, bio-refining, carbon capture and storage are only some examples of Eni's areas of activity and research. In addition, the company is exploring game-changing technologies such as fusion energy - a technology based on the physical processes that power stars and that could generate safe, virtually limitless energy with zero emissions.

Eni has been present in the United Kingdom since 1964 and is a key partner in the country's energy transition, where the Company is present thanks to activities that span across the entire energy value chain. In particular, Eni holds a prominent position in the UK's Carbon Capture and Storage (CCS) sector with the HyNet North West and Bacton CCS projects, and in offshore wind with its participation in Dogger Bank, Green Volt and Cenos projects. Eni also contributes to the country's energy security through the business combination between Eni UK and Ithaca Energy for upstream activities.

About fusion energy

When a mix of two forms of hydrogen (deuterium and tritium) is heated to form a controlled plasma at temperatures – 10 times hotter than the core of the Sun – they fuse together to create helium and release energy which can be harnessed to produce electricity. There is more than one way of achieving this. Magnetic confinement approach is to hold this hot plasma using strong magnets in a ring-shaped machine called a 'tokamak', and then to harness this heat to produce electricity in a similar way to existing power stations.