EUROfusion

Press release

Strictly embargoed until 13:00hrs CET / 12:00hrs GMT on February 09, 2022

European researchers achieve fusion energy record

- **Landmark results from EUROfusion scientists and engineers at world-leading Joint European Torus (JET) facility in Oxford, UK**
- **Record-breaking 59 megajoules of sustained fusion energy demonstrates potential of fusion**
- **Results fully in line with predictions, strengthening the case for ITER**
- **Fusion energy can provide a safe, efficient and low-carbon energy supply**

Record results announced today are the clearest demonstration in a quarter of a century of the potential for fusion energy to deliver safe and sustainable low-carbon energy.

Researchers from the EUROfusion consortium – 4,800 experts, students and staff from across Europe, co-funded by the European Commission – used the Joint European Torus (JET) device to release a record 59 megajoules of sustained fusion energy.

This achievement on JET, the largest and most powerful operational tokamak in the world at the UK Atomic Energy Authority (UKAEA) site in Oxford, more than doubles the previous fusion energy record of 21.7 megajoules set there in 1997. It comes as part of a dedicated experimental campaign designed by EUROfusion to test over two decades' worth of advances in fusion and optimally prepare for the start of the international ITER project.

The record and the scientific data from these crucial experiments are a major boost for ITER, the larger and more advanced version of JET. ITER is a fusion research project based in the south of France. Supported by seven members – China, the European Union, India, Japan, South Korea, Russia and the USA – ITER aims to demonstrate the scientific and technological feasibility of fusion energy.

As pressures mount to address the effects of climate change through decarbonising energy production, this success is a major step forward on fusion's roadmap as a safe, efficient, low carbon means of tackling the global energy crisis.

Dr Bernard Bigot, Director General of ITER, said:

> "A sustained pulse of deuterium-tritium fusion at this power level – nearly industrial scale – delivers a resounding confirmation to all of those involved in the global fusion quest. For the ITER Project, the JET results are a strong confidence builder that we are on the right track as we move forward toward demonstrating full fusion power."

Prof Tony Donné, EUROfusion Programme Manager (CEO), said:

> “This achievement is the result of years-long preparation by the EUROfusion team of researchers across Europe. The record, and more importantly the things we’ve learned about fusion under these conditions and how it fully confirms our predictions, show that we are on the right path to a future world of fusion energy. If we can maintain fusion for five seconds, we can do it for five minutes and then five hours as we scale up our operations in future machines.
>
> “This is a big moment for every one of us and the entire fusion community. Crucially, the operational experience we’ve gained under realistic conditions gives us great confidence for the next stage of experiments at ITER and Europe’s demonstration power plant EU DEMO, which is being designed to put electricity on the grid.”

Prof Ian Chapman, UKAEA’s CEO, added:

> “These landmark results have taken us a huge step closer to conquering one of the biggest scientific and engineering challenges of them all. It is reward for over 20 years of research and experiments with our partners from across Europe.
>
> “It’s clear we must make significant changes to address the effects of climate change, and fusion offers so much potential. We’re building the knowledge and developing the new technology required to deliver a low-carbon, sustainable source of baseload energy that helps protect the planet for future generations. Our world needs fusion energy.”

Prof Volker Naulin, Head of the Fusion Science Department at EUROfusion, said:

> “As EUROfusion we designed this experimental campaign at JET to optimally prepare for the start of ITER by investigating the energetic processes that will come into play there and to prepare the next generation of fusion researchers. The experiments confirmed our predictions, motivating us in doing our best to ensure a timely success of ITER operation. The results are support for an early decision for a European DEMO power plant, as fusion is needed for long term decarbonisation of our energy supply”

Fusion energy's potential
Fusion, the process that powers stars like our sun, promises a near-limitless clean electricity source for the long term, using small amounts of fuel that can be sourced worldwide from inexpensive materials. The fusion process brings together atoms of light elements like hydrogen at high temperatures to form helium and release tremendous energy as heat. Fusion is inherently safe in that it cannot start a run-away process

---

JET of unique importance
The Joint European Torus (JET) fusion experiment – which can create plasmas reaching temperatures of 150 million degrees Celsius, 10 times hotter than the centre of the sun – is a vital test bed for ITER, one of the biggest collaborative science projects in history. JET can reach conditions similar to those in ITER and future fusion power plants, and is the only operational tokamak in the world that can use the same deuterium-tritium (D-T) fuel mix planned for those devices.

A European undertaking
JET was built and operated in Culham, UK, as a Joint Undertaking of the European Community since 1977. The facility has been operated by the UKAEA from 2000. The Euratom Research and Training programme has continuously contributed approx. 80% of the JET operation costs from 1977 until the end of 2021.

Megajoules and Megawatts explained
In its recent record-breaking experiment, JET produced a total of 59 Megajoules of heat energy from fusion over a five second period (the duration of the fusion experiment). During this experiment, JET averaged a fusion power (i.e., energy per second) of around 11 megawatts (megajoules per second).

The previous energy record from a fusion experiment, achieved by JET in 1997, was 22 megajoules of heat energy. The peak power of 16MW achieved briefly in 1997 has not been surpassed in recent experiments, as the focus has been on sustained fusion energy.

ENDS

Notes to editors

Resources

Check out our press pack for supporting information, images, footage, animations and infographics.

Press Event

Representatives from EUROfusion, UKAEA and ITER will discuss the results of JET's record-breaking experiments during a hybrid press event on Wednesday February 9th (13h CET / 12h GMT) at UKAEA's site in Culham, UK.

Speakers: **George Freeman MP**, Minister for Science, Research and Innovation, UK
HE João Vale de Almeida, European Union Ambassador to the UK
Prof Tony Donné, Programme Manager (CEO) of EUROfusion
Prof Ian Chapman, CEO of UK Atomic Energy Authority (UKAEA)
Dr Tim Luce, ITER Chief Scientist

The press conference will be livestreamed. Media on-site will have the opportunity to ask questions directly. Viewers can send in questions by contacting media-inquiries@euro-fusion.org before the event. Questions not answered live will be forwarded to our spokespeople.

- To attend in person, contact UKAEA Media Manager Stuart White, stuart.white@ukaea.org
- To follow the livestream, go here

Contact

For media enquiries, further information and interview requests, please contact:

EUROfusion - European consortium of national fusion research institutes
Gieljan de Vries - gieljan.devries@euro-fusion.org or +31 6 1104 5527

United Kingdom - UK Atomic Energy Authority (UKAEA)
Stuart White - stuart.white@ukaea.uk or 07368 622510

Media contacts by EUROfusion member:

Austria - Austrian Academy of Sciences, Vienna
Lätitia Unger - laetitia.unger@oeaw.ac.at, +43-1-51581-2675

Belgium - Ecole Royale Militaire / Koninklijke Militaire School, Plasma Physics Laboratory, Brussels
Jeff Ongena - j.ongena@fz-juelich.de

Croatia - Ruđer Bošković Institute, Zagreb
Petra Buljevic - petra.buljevic@irb.hr or +385 1 457 1269

Czech Republic - Academy of Sciences of the Czech Republic, Institute of Plasma Physics, Prague
Lucie Krusova - krusova@ipp.cas.cz, +420 721 831 814

Denmark, DTU, Plasma Physics and Fusion Energy, Lyngby
Søren Bang Korsholm - sbko@fysik.dtu.dk or +45 20 64 55 61

Estonia - University of Tartu, Institute of Physics
Piret Ehrenpreis - piret.ehrenpreis@ut.ee

Finland - VTT Technical Research Centre of Finland, Espoo
Markus Airila - markus.airila@vtt.fi or +358403508669
Liisa Hertz - liisa.hertz@vtt.fi or +358503766613

France - Commissariat à l'énergie atomique et aux énergies alternatives, CEA, Cadarache
CEA Press Office - presse@cea.fr
Sylvie Gibert - sylvie.gibert@cea.fr or +33442252584

Germany - Max Planck Institute of Plasma Physics, IPP, Garching and Greifswald
Frank Fleschner - frank.fleschner@ipp.mpg.de or +49 8932994123

Germany - Forschungszentrum Jülich, FZJ
Olaf Neubauer - o.neubauer@fz-juelich.de or +49 2461/61-4659
Regine Panknin - r.panknin@fz-juelich.de or 49 2461/61-9054

Hungary - Centre for Energy Research, Budapest
Tamás Szabolics - szabolics.tamas@ek-cer.hu

Ireland - Dublin City University, National Centre for Plasma Science and Technology
Thomas Kelly - thomas.m.kelly@dcu.ie

Italy - Consorzio RFX
Maria Teresa Orlando - mariateresa.orlando@igi.cnr.it

Netherlands - DIFFER, Dutch Institute for Fundamental Energy Research, Utrecht
Anouck Vrouwe - a.vrouwe@differ.nl or +31403334755

Poland - Institute of Plasma Physics and Laser Microfusion, Warsaw
Ewa Nowacka - ewa.nowacka@ifpilm.pl or +48 22 6381005 70

Portugal - Universidade de Lisboa, Instituto Superior Técnico, IPFN
Goncalo Figueira - goncalo.figueira@tecnico.ulisboa.pt or +351 218 419 375

Slovakia - Comenius University, Department of Experimental Physics, Bratislava
Alicia Marin-Roldan - Alicia.MarinRoldan@fmph.uniba.sk - or +0034-913466578

Slovenia - JSI Jožef Stefan Institute, Ljubljana
Petra Jenus - petra.jenus@ijs.si or +0038614773784

Spain - Laboratorio Nacional de Fusión, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Madrid
Isabel García Cortés - isabel.garcia-cortes@ciemat.es or +34 91 346 6515

Sweden - Vetenskapsrådet, Stockholm
Christian Löwhagen - christian.lowhagen@chalmers.se or +46(0)31 772 21 57

Switzerland - École Polytechnique Federale de Lausanne EPFL, Swiss Plasma Center, Lausanne
Yves Martin - yves.martin@epfl.ch or +41 21 693 65 11

Ukraine - Kharkov Institute for Physics and Technology (KIPT), Kharkov
Sergii Pugach - pugach@kipt.kharkov.ua or +380573356843
Julia Kotsegub - kotsegub@kipt.kharkov.ua or +38 057 349 10 49

United Kingdom - UK Atomic Energy Authority (UKAEA)
Stuart White - stuart.white@ukaea.uk, 07368 622510

About Fusion

Fusion research aims to copy the process that powers the sun for a new large-scale source of low-carbon energy here on earth.

When light atoms fuse together to form heavier ones, a large amount of energy is released. To do this, a few grams of hydrogen fuels are heated to extreme temperatures, 10 times hotter than the centre of the sun, forming a plasma in which fusion reactions take place. A commercial fusion power station would use the energy produced by fusion reactions to generate electricity.

Fusion has huge potential as a low-carbon energy source. It is environmentally responsible and safe, using fuel that is abundant and sustainable. Pound for pound it releases nearly ten million times more energy than burning coal, oil or gas.

About EUROfusion

EUROfusion is a consortium of 30 research organisations, and behind them around 150 affiliated entities including universities and companies, from 25 European Union member states plus the United Kingdom, Switzerland and Ukraine. Together they work towards a facility that can deliver fusion electricity to the power grid in accordance with the European Research Roadmap to the Realisation of Fusion Energy.

The EUROfusion programme has two aims: preparing for ITER experiments and developing concepts for the future European demonstration fusion power plant EU DEMO. Another facet of the EUROfusion programme is to support diverse research projects in participating laboratories through the Enabling Research scheme.

For more information: https://www.euro-fusion.org/, LinkedIn, Twitter #road2fusion

About UKAEA

The UK Atomic Energy Authority (UKAEA) carries out fusion energy research on behalf of the UK Government. UKAEA oversees the UK's fusion programme, headed by the MAST Upgrade (Mega Amp Spherical Tokamak) experiment. It also hosts the world's largest fusion research facility, JET (Joint European Torus), which it operates for scientists from around Europe.

More information: https://www.gov.uk/ukaea. Social Media: @UKAEAofficial

About ITER

ITER—designed to demonstrate the scientific and technological feasibility of fusion power—will be the world's largest experimental fusion facility. ITER is also a first-of-a-kind global collaboration.

Europe is contributing almost half of the costs of its construction, while the other six Members to this joint international venture (China, India, Japan, the Republic of Korea, the Russian Federation and the USA), are contributing equally to the rest.

The ITER Project is under construction in Saint-Paul-lez-Durance, in the south of France.

For more information: http://www.iter.org/

About Euratom

The Euratom Research and Training Programme (2021-2025) is a nuclear research and training programme with an emphasis on the continuous improvement of nuclear safety, security and radiation protection and fusion energy research. It complements the achievement of Horizon Europe's objectives including in the context of the energy transition as well as contributing to the implementation of the European fusion roadmap.