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Europe's superconducting magnet is ready to confine the energy of the Sun

This is the first of–a–kind magnet made in Europe and it will be part of ITER, the biggest international experiment in the history of mankind to test the potential of fusion energy—the power of the Sun and the stars which when replicated on Earth will help us enjoy limitless, safe, clean energy without greenhouse gas emissions.

ITER will use 18 of these magnets[1], known as Toroidal Field coils, to confine the super-hot plasma which will reach 150 million ° C. How? They will create a magnetic cage to keep the hot plasma away from the vessel of the machine. When powered with current (68 000 A) the magnetic field will reach up to 11.8 Tesla—about 250 000 times the magnetic field of the Earth! Each magnet measures 17 x 9 m and weighs 320 tonnes— as much as an Airbus A350. Europe's magnet will be the first of the 18 Toroidal Field coils to be delivered to ITER, and will also be the first EU component of such size to be handed over to the project. The EU has financed the works of this high-tech component, through Fusion for Energy (F4E), the organisation managing Europe's contribution to ITER, which has been collaborating with at least 40 companies, and more than 700 people, to produce the ten coils.

The main contractors are SIMIC, ASG Superconductors, CNIM, Iberdrola Ingeniería y Construcción, Elytt y and the ICAS consortium. The manufacturing of the ten European magnets unfolds in several factories.: Turin (Italy), where ICAS produced the conductor; La Spezia (Italy), where ASG Superconductors, in collaboration with Elytt Energy, and Iberdrola Ingeniería y Construcción, manufacture the inner-core of the magnets; Toulon (France), where CNIM produced the equipment to insert the conductor into the magnet; Marghera (Italy), where SIMIC produced similar equipment to insert the conductor into the magnet and in addition has been carrying out cold tests, and been inserting the magnet into its case. In mid- March, the coil will travel from Italy to France. It will arrive by boat at the port of Fos-sur-Mer (Marseille) and then it will be transported to the ITER site, Cadarache.

Thanks to involvement of the EU in ITER, European industry has a unique opportunity to collaborate in this groundbreaking international experiment with China, Japan, India, the Republic of Korea, Russia, US. As a consequence, companies get to improve their manufacturing standards, to employ and train workforces, and last but not least, to acquire industrial expertise in an emerging energy market with potential economic and environmental benefits.

Alessandro Bonito-Oliva, F4E Programme Manager for Magnets, elaborated on the importance of this significant milestone for Europe. "This achievement results from 12 years of work involving more than 700 people and at least 40 companies. Many factors have made this possible: vision in developing the best procurement strategy and interfaces among suppliers; competence in defining the correct technical solutions; cooperation between the different parties to tackle issues in manufacturing the most complex magnet to date; and last but not least, passion, perseverance and the full commitment of a highly qualified team. Without any of these elements, it would have been impossible to complete this long journey."

Marianna Ginola, SIMIC Commercial Manager, explained that "the completion of the first European Toroidal Field coil for ITER has been an important milestone for SIMIC. It has given us the opportunity to demonstrate our skills in complex manufacturing. Our staff has been working relentlessly to meet this objective and continues to do so for the remaining coils. We are proud to be part of the manufacturing supply chain of ITER, and to be involved in its final assembly through another contract."

For Davide Malacalza, Chairman of ASG Superconductors, "the completion of Europe's first ITER Toroidal Field coil is a significant milestone towards the energy of the future. Thanks to unique international projects research such as ITER, our know-how in magnet technology will have cost effective returns in the industrial and medical sectors as well."

[1] Out of the 18 ITER Toroidal Field coils, Europe is responsible for ten of them while Japan is for eight plus one spare.

Philippe Lazare, CEO of CNIM Industrial Systems, stated that “in order to manufacture our share of ITER components we had to upgrade our industrial facilities, establish new working methods and train new talent. In return, we have become a French reference in high-precision manufacturing for large components.”

For Aitor Echeandia, CEO of Elytt, there are clear benefits from their involvement in the fabrication of the ITER magnets. “Our SME has acquired further know-how in superconducting technologies for fusion and particle accelerators.”

Antonio della Corte, President of the ICAS consortium and Head of ENEA Superconducting Laboratory, explained that “our contribution to the superconducting conductor for the ITER magnets allowed us to develop new ideas which helped us improve our production technologies and transfer them in different applications.”

Background

Fusion for Energy (F4E) is the European Union’s organisation for Europe’s contribution to ITER.
One of the main tasks of F4E is to work together with European industry, SMEs and research organisations to develop and provide a wide range of high technology components together with engineering, maintenance and support services for the ITER project.
F4E supports fusion R&D initiatives through the Broader Approach Agreement signed with Japan and prepares for the construction of demonstration fusion reactors (DEMO).
F4E was created by a decision of the Council of the European Union as an independent legal entity and was established in April 2007 for a period of 35 years.
Its offices are in Barcelona, Spain.
https://www.fusionforenergy.europa.eu/

ITER is a first-of-a-kind global collaboration. It will be the world's largest experimental fusion facility and is designed to demonstrate the scientific and technological feasibility of fusion power. It is expected to produce a thermal output of 500 MW for about seven minutes. Fusion is the process which powers the sun and the stars. When light atomic nuclei fuse together form heavier ones, a large amount of energy is released. Fusion research is aimed at developing a safe, limitless and environmentally responsible energy source. Europe will contribute almost half of the costs of its construction, while the other six parties to this joint international venture (China, Japan, India, the Republic of Korea, the Russian Federation and the USA), will contribute equally to the rest.The site of the ITER project is in Cadarache, in the South of France.
http://www.iter.org

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