

Europe has manufactured the most high-tech magnet in history!

The world's most sophisticated superconducting magnet is made in Europe. It is 14 m high, 9 m wide and weighs 110 tonnes—as much as Boeing 747! This is the first of the 18 Toroidal Field (TF) coils that will operate in ITER, the biggest fusion machine that will demonstrate the feasibility of this energy source for the future. The coils will create a powerful magnetic cage that will entrap the fusion fuel which is expected to reach 150 million °C. When powered with 68 000 A, the ITER TF coils will generate a magnetic field that will reach 11.8 Tesla—about 1 million times stronger than the magnetic field of the Earth!

Europe will manufacture nine of them, plus one spare. The other nine will be fabricated in Japan. Fusion for Energy (F4E), the EU organisation managing Europe's contribution to ITER, together with ASG Superconductors, Iberdrola Ingeniería y Construcción, Elytt Energy, CNIM, SIMIC and the ICAS consortium, have been collaborating for the production of these impressive magnets. At least 600 people from 26 companies have been involved in their production. ITER has given Europe's industry a one-of-a kind opportunity to improve their manufacturing standards through learning by doing. As a consequence, the companies have extended their know-how, employed and trained workforces, and have identified potential markets offering them a commercial edge in the field of superconductivity.

This achievement results from various contracts starting with the production of a 20 km conductor for the TF coils, involving ICAS, the [Italian Consortium for Applied Superconductivity](#) consisting of ENEA, Criotec Impianti Srl and TRATOS Cavi spa. 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 improved our production technologies and use them in different applications.”*

[ASG](#), [Iberdrola Ingeniería y Construcción](#) and [Elytt](#), have used parts of this conductor to manufacture Europe's first TF coil magnet. A vast new facility, which used to be the site of a washing machines factory, has been constructed and has become a hub of expertise by retraining its original workforce and installing state of the art equipment.

Stefano Pittaluga, ASG Superconductors, *stated that “thanks to ITER, and our company's leadership in fusion magnet technology, we now see new possibilities of growth in the energy sector. We are ready to this knowledge in new industrial applications.”* And in fact ASG has contributed to some of the most advanced magnetic resonance imaging (MRI) equipment used in healthcare to study the human brain.

Andrés Felipe, Project Manager of Iberdrola Ingeniería y Construcción, explained that *“by being part of ITER, a project which will test the energy of the future, we have been given the opportunity to demonstrate our know-how and in return acquire further expertise in engineering.”*

For Aitor Echeandia, CEO of Elytt, the commercial benefits have been concrete. *“Because of our involvement in the manufacturing of ITER magnets, our SME has acquired further competences in superconducting technologies for fusion and particle accelerators.”*

[SIMIC](#) and [CNIM](#) have been involved in the production of the 70 [radial plates](#) of the magnet, the metallic structures that support the insulated conductor in their grooves before the structures are laser welded, wrapped with insulating material, and impregnated. Both companies have upgraded their facilities, employed people and trained them to deliver their share of components respecting a tight schedule.

Marianna Ginola, SIMIC Commercial Manager, explained that *“we have managed to grow as a company and improve both in terms of project management and in technical aspects.”* According to Philippe Lazare, CEO of CNIM Industrial Systems Division, *“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.”*

The first magnet has been completed and will be transferred to SIMIC to perform a series of [tests](#). Then, it will be inserted into a massive case, welded, impregnated by resin and machined using the most advanced technologies, special tooling and one of the largest machines in Europe. Each TF coil will weigh over 300 T and will be transported via sea from SIMIC to the site of the ITER project, Cadarache, France.

For Alessandro Bonito-Oliva, F4E Manager for Magnets, and his team, this has been an accomplishment of significant importance. *“Thanks to our determination and the excellent collaboration between F4E and its partners we have completed the core of Europe’s first Toroidal Field coil. This is the result of the good cooperation between the different parties of this one-of-a kind project and clear proof that when Europe wants to be a pioneer-Europe can!”* he stated.

Since 2008, F4E has signed contracts reaching a value of approximately 5 billion EUR with various European companies and R&D organisations. Research in the field of fusion has successfully generated many scientific breakthroughs of high relevance to this project. Small and big economic operators have seen in ITER a range of business opportunities and benefits. They have increased their turnover, created jobs and gained confidence in an international business context.

Background

To view how the TF coils are being manufactured click [here](#).

To view how SIMIC has produced its radial plates click [here](#).

To view how CMIM has produced its radial plates click [here](#).

Fusion for Energy

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.



<http://www.fusionforenergy.europa.eu>



<http://www.youtube.com/user/fusionforenergy>



<http://twitter.com/fusionforenergy>



<http://www.flickr.com/photos/fusionforenergy>

ITER

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 significant amount of fusion power (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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