AIR LIQUIDE

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Two major successes in extreme cryogenics for scientific research

press release

Contacts:

Group Corporate Communications
Corinne Estrade-Bordry
+ 33 (0)1 40 62 51 31
Garance Bertrand
+ 33 (0)1 40 62 59 62

Investor Relations
Virginia Jeanson
+33 (0)1 40 62 57 37
Annie Fournier
+33 (0)1 40 62 57 18

Air Liquide Technologies of the Future
Dominique Lecocq
+ 33 (4) 76 43 64 97

The research of the **ITER** project and its related project **JT-60SA** on fusion aims to develop know-how in this new source of energy to meet the challenge of increasing energy needs. **Air Liquide will provide extreme cryogenic systems for these two major projects.** The total value of these equipment sales contracts will reach **over €100 million.**

Based near Marseille, in **France, the ITER project** plans the creation of an **experimental reactor** intended to illustrate the scientific and technical feasibility of fusion. This process generates little waste and eliminates any risk of reactor runaway. To obtain the very powerful electromagnetic fields necessary to confine fusion, **superconducting magnets** must be used, which only work at **extremely low temperatures.**

For this project, Air Liquide will provide the **biggest centralised refrigeration system ever built**. This cryogenic equipment is essential for maintaining an extremely cold temperature for the **10,000 tonnes of superconducting magnets** used on the **Tokamak***. This sophisticated scientific instrument confines the plasma that makes it possible to achieve the conditions necessary for controlled fusion.
This closed circuit refrigeration system is based on the properties of liquefied helium, whose temperature is close to the lowest possible temperature 0 K, or **- 273°C,** called **"absolute zero".** Between the end of **2015** and the beginning of **2017, Air Liquide will install three refrigerators for a global cooling capacity of 75 kW** at 4.5 K, or **- 269 °C.**

The purpose of the **JT-60SA project,** a Tokamak-style infrastructure, based in Naka in **Japan,** is to support the ITER project's research activities on fusion by working on the capacity to **control and maintain the plasma** for several hours. JT-60SA is led by the Japanese Atomic Energy Agency (JAEA) in collaboration with the French organisation CEA. For this project, **Air Liquide will commission, in 2015, a helium refrigeration system,** intended to cool the Tokamak.

François Darchis, Senior Vice-President and a member of Air Liquide's Executive Committee, commented: ***"We would like to thank ITER Organisation and the Alternative Energies and Atomic Energy Commission in France for their trust on these two ambitious projects. After the CERN's LHC and Kstar in Korea, these projects once again prove our capacity to meet major scientific challenges by supplying very high tech systems. This means Air Liquide is involved in significant international scientific projects that will shape our future and contribute to the development of tomorrow's energy solutions."***

Air Liquide and scientific cryogenics

Air Liquide has unique expertise in the field of low temperatures and recognised know-how in the design, production, and installation of high-capacity gas liquefaction and refrigeration systems (the CERN's LHC in Switzerland, for example).

Air Liquide has also supplied cryogenic equipment for the biggest fusion projects of the last 25 years (Tore Supra, JET, SST-1, and KSTAR).

ITER and the Tokamak*

Based in Saint-Paul-lez-Durance, in the South of France, this project centres around the Tokamak (toroidal magnetic confinement chamber). Using electromagnetic fields, this sophisticated scientific instrument will make it possible to generate plasma to create the conditions necessary for the controlled fusion of atoms. This fusion generates the same type of energy as the sun, which, eventually, will be recovered in the form of electrical energy. ITER will test the fundamental technologies to initiate the next stage, called "DEMO": a demonstration fusion reactor capable of producing energy for commercial purposes.

About JT-60SA

Based in Naka, in Japan, the trials of JT-60SA (which stands for "Japan Tokamak 60 Super Advanced") are part of one of the three projects that will be carried out in Japan as part of the Broader Approach Agreement, under the joint supervision of Europe and Japan, thereby contributing to the construction phase of the ITER project in Europe.

This Tokamak was designed to optimise plasma configurations for the ITER and DEMO projects. This project is led in Japan by the Japanese Atomic Energy Agency (JAEA), which is collaborating with the Commission for Atomic Energy and alternative energies (CEA in France) for the improvement of Tokamak.