

# Europe to equip the biggest cryoplant in the world

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A major technological deal has been reached between Fusion for Energy, the EU organisation responsible for Europe's contribution to ITER, and Air Liquide, gas technology global leader, in order to equip the world's biggest cryoplant that will cool down the ITER machine to temperatures as low as -269° C. The works will be completed in five years and the budget foreseen is in the range of 65 million EUR. The contract covers the engineering, procurement, installation and testing of the facility and auxiliary systems.

Professor Henrik Bindslev, Director of Fusion for Energy, explained that "thanks to ITER, the frontiers of science and technology are pushed further and Europe's industry is becoming more competitive. To be part of the biggest international energy project means being confident enough to put your expertise to the test and brave enough to take it a step further". Cristiano Tortelli, Vice-President, Global Air Liquide E&C Solutions, commented: "Our participation to ITER is driven by technological innovation, underpinned by the recognition our of expertise and in line with our commitment to invest in tomorrow's energy mix."

## What is the function of the cryoplant?

Think of the cryoplant as ITER's massive fridge that will produce and distribute the cooling power in the machine through different networks. The most advanced cryogenic technologies will be deployed to generate extremely low temperatures needed for the ITER magnets, thermal shields and cryopumps. For example, the magnets will be cooled with super critical [helium](#) to reach a superconducting state at 4,5 K, close to absolute zero, in order to confine the hot plasma.

## What is the European contribution to ITER's cryoplant?

Europe will provide the Liquid Nitrogen Plant and auxiliary systems that will cool down, process,

store, transfer and recover the cryogenic fluids of the machine. Two nitrogen refrigerators will be manufactured along with two 80 K helium loop boxes, warm and cold helium storage tanks, dryers, heaters and the helium purification system. The high performance requirements will be underpinned by high safety standards and a sophisticated operational system.

## What are the main elements of the Liquid Nitrogen Plant and auxiliary systems?

Two nitrogen refrigerators with a cooling power of 1 200 kW at 80K will cool down ITER's Liquid Helium Plant and the 80K helium loop boxes. In addition, they will supply the purification system, quench tanks, heaters and dryers with nitrogen in liquid or gaseous form. The two 80K helium loops will cool down the thermal shields of the cryostat, vacuum vessel, and regenerate the cryopumps. It is estimated that 8 kg of helium per second will be processed. A [helium purification system](#) is planned to recover and clean helium gas from any impurities. The largest components are two quench tanks that each weigh 160 tonnes and measure 37m by 4.4 m.

Provided by ITER

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