ITER nuclear fusion reactor to be built in Southern France

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The Six Parties of the International Thermonuclear Experimental Reactor (ITER) consortium have reached a decision in their negotiations, specifying the location of the world's first energy-producing fusion reactor in Cadarache, in Southern France. The €10 billion project will generate multiple research opportunities for the Plasma Physics Research Centre at the Ecole Polytechnique Fédérale de Lausanne (EPFL).

ITER's future location in Cadarache will be doubly beneficial to EPFL. In its role as a National Centre of Competence, The Plasma Physics Research Centre (CRPP) is fully integrated with the nuclear fusion research programs within the Euratom-Swiss Confederation framework. CRPP will thus be called upon to participate in various specialized, high technology facets of the reactor's construction.

This level of participation will confirm and solidify CRPP's reputation in the plasma physics community. Minh Quang Tran, director of the Centre, also holds a position as president of the European Fusion Development Agreement, the organization that coordinates all fusion-related technology as well as all work involving the JET (Joint European Torus), a intermediate-generation tokamak-type experimental fusion reactor.

"The synergies that will develop in this research environment will reinforce the links between EPFL and the main European centers of fusion research excellence, in their common quest for a new and promising means of safe, efficient and sufficient energy production," notes Tran. As a key player in this international involvement, Switzerland also stands to benefit in a larger sense from industrial spin-offs that will result from the project.

An enormous energy potential

Nuclear fusion represents a practically unlimited source of energy. Under extremely high pressures and temperatures, light atoms – isotopes of hydrogen, such as deuterium and tritium—come together, or fuse, producing enormous amounts of energy. A prime example is the Sun, where huge gravitational pressure allows fusion to take place at about 10 million degrees Celsius. At the gravitational pressure we experience on Earth, higher temperatures are required to generate fusion, and to date only tokamak-type reactors are capable of reaching the 100 million-degree-Celsius threshold where energy can be produced.

In the last several years, considerable technological progress has been made in fusion research, leading to high expectations for the ITER. With this reactor, studies done at the CRPP and elsewhere on the feasibility and functioning of a nuclear fusion-based centre of electricity production can be brought to a successful conclusion, and the groundwork can be laid for the first prototype commercial fusion reactor. Up to this point energy-producing nuclear reactors have used fission, not fusion, to generate energy. Fusion reactors have important advantages; power stations will be inherently safe because "meltdown" or "runaway reactions" cannot occur, and these reactors do not generate long-lasting radioactive waste. Fusion reactors don't emit greenhouse gases, and the basic fuels – hydrogen and lithium – are abundant and available everywhere.

The energy production of ITER will be unprecedented: a single gram of deuterium fused with one and a half grams of tritium will produce ten million times as much energy as a gram of oil. The successful launch of these new technologies in the ITER reactor will set the stage for the successful use of fusion as an inexhaustible and sustainable energy source.

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