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Nuclear fusion negotiations go critical

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The troubled negotiations over whether to build the world's largest nuclear fusion facility in France or Japan have finally come to a head.

On Monday, an unnamed European Union official was reported as saying that Japan would withdraw its bid in return for "compensation", probably a smaller, related project. However, an official at Japan's Science and Technology Ministry later said there was no truth in the remarks and that Japan still wanted the facility. "We do not understand why the EU suddenly said what they said. Maybe that's a negotiation technique."

The ambitious project, called ITER (International Thermonuclear Experimental Reactor), aims to lay the groundwork for using nuclear fusion as an inexhaustible and clean source of energy. It plans to create the technology that allows a fusion reactor to produce at least five times as much energy as is put in. ITER would take 10 years and cost about $5 billion.

But negotiations have been stalled since December 2003 because its six member parties cannot agree on where to locate the premier facility. The EU, China and Russia have lobbied for the French city of Cadarache, while the US, South Korea and Japan have supported the Japanese town of Rokkashomura.

On Tuesday at six-party talks in Vienna, Austria, the EU confirmed that it was prepared to forge ahead by itself. "Our basis for negotiations is to locate ITER at Cadarache and we hope to achieve that. We hope to get a result this evening," said European Commission spokesman Fabio Fabbi. But if the discussions in Vienna break down, "the alternative is to go ahead at Cadarache with the maximum number of partners", he said.

Fusion confusion

The sight of movement in the negotiations has stirred fusion scientists. "Everybody is running up and down the hallway saying, 'Is this rumour about France true?'" says Raymond Fonck, a physicist at the University of Wisconsin in Madison who has reviewed ITER for the US National Academy of Sciences.

"The fusion research community has been agnostic as to where the site is," he told **New Scientist**. "I think all of us would be happy just to have a decision."

It seems likely that either France or Japan will eventually lose out. Fusion scientists say the possible compensation could be a control centre that would remotely manage the main facility's experiments or, more likely, a materials test facility estimated to cost between $1 billion and $2 billion.

"There has to be a win-win situation," ITER's former deputy director Ronald Parker of the Massachusetts Institute of Technology recently told **New Scientist**. "A materials test facility would be the next desirable prize."

The International Fusion Materials Irradiation Facility would test how various materials stand up to bombardment by the high-energy neutrons produced in fusion reactions. Materials resistant to long-term stresses from the neutrons will be required to build fusion reactors.

ITER would work by heating isotopes of hydrogen to hundreds of millions of degrees, creating a plasma of charged particles. Confined by magnetic fields in a doughnut-shaped machine called a tokamak, the particles would collide and fuse, producing high-energy helium nuclei and neutrons.

The uncharged neutrons would escape the tokamak, generating heat that could be siphoned off for generating electricity. But the positively charged helium nuclei would be trapped by the magnetic fields and would help sustain fusion reactions.

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