



# Europe and Japan with the elbow-with-elbow to accommodate engine ITER

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## The competition for the machine installation of with thermonuclear fusion is announced tight.

A mast, planted in the pine forest of Provence, play-ground of wild boars. It marks the site, selected after a survey campaign, where the experimental engine with thermonuclear fusion ITER will be perhaps built. If it makes think of the pole of a flag card-indexed on a conquered top of high fight, it does not announce yet the victory of the European candidature for this world project.

Japan is him also in string and the competition is tight. So much so that the partners of the project (Europe, Japan, the United States, Russia, China, South Korea, Canada), which must slice on December 20 in Washington, could, for lack of a consensus, to defer their decision at the beginning of 2004. In the balance, the geopolitical stakes will weigh as heavy, if not more, as the scientific criteria or the respective geographical assets.

The site of Cadarache (Rhône delta) proposed by Europeans extends on 180 hectares, with the confluence of the Durance and the Verdon. It is next to the center of Commissariat à l'Énergie Atomique (ECA), where 4 300 researchers and engineers work. Among them, three hundred specialists - from of which about fifty foreign experts - thermonuclear fusion, who come to supra establish a new record in the engine with Tore fusion, a precursor of ITER.

This nuclear complex, created at the beginning of the years 1960, is today one of the most significant development Europeans and research centers in the energy sector. It has a strong potential (more than 2 000 people) in the field of fission, as well as technological platforms dedicated to alternative energies, biology and microbiology. More still than the Mediterranean framework of life, it is the presence of this scientific community which constitutes the major asset of the candidature of Cadarache.

A Rokkasho-Walled ("the village of Rokkasho"), with 10 000 km from there, where Japan hopes also to accommodate ITER, the decoration is very different. All in the north of Honshu, the largest island of the archipelago, is the Japanese site, framed by two lakes, close to the harbour installations of Mutsu Ogawara, on the West coast of the Pacific Ocean.

It made rather cold there when breath wind of north: in winter, the average temperature is of - 3 degrees and it fall 1,50 m from snow per month. *"It is not the North Pole, it is rather like Sweden"*, defends Satoru Ohtake, director of fusion nuclear to the ministry for education, the culture, the sports, sciences and technology, conscious that the quality of life will be able to play a role in the division of the candidates. Area of lakes, of pastures and forests, the region, known for the breeding and the culture of *the nagai imo*, a sweet potato, has also ski pistes.

The site had a presentiment of to accommodate ITER is to 70 km of Aomori, the capital of the area: a town of 300 000 inhabitants, at seventy minutes of flight of Tokyo, that the money of the nuclear power equipped with modern installations. Arranged in the beginning to store fuel reserves at the time of the oil crises, the sector of Rokkasho deals from now on largely with the nuclear power. It that unload, from there France and from Great Britain, the boats charged with highly radioactive waste resulting from the reprocessing of worn fuel which join a site of open provisional storage in 1995.

Rokkasho also shelters the greatest final storage of waste of low radioactivity. Moreover, the site lodges a factory of uranium enrichment and, especially, a reprocessing plant is there in final phase of construction. An about sixty French experts of Cogema are installed on the spot.

Whereas Europeans agreed here are a few weeks on the candidature of Cadarache, at the end of a long iron arm with the Spaniards, who defended Vandellos (Catalonia), Japan decided in May 2002 in favour of Rokkasho-Walled. This choice answers the recommendations of Association for the promotion of nuclear fusion, where sit of the members of Parliament of the democratic liberal Party to capacity (PLD), directed by the former Prime Minister Yoshiro Mori. At the time, the Minister for education and sciences had marked his preference for the site of Naka, close to the nuclear installations of Tokaimura, in the prefecture of Ibaraki, near of Tokyo and principal research center on nuclear fusion.

## **AMERICA IN REFEREE**

It is in Naka, to several hundred kilometers of Rokkasho-Walled, that the engine with Japanese fusion is, the JT60, one of largest Tokamak of the world in activity with the European JET. Many results were obtained in this machine. In addition to the research center of Naka, under direct supervision of Jaeri (the ECA Nipponese), other experiments are carried out in the area of Nagoya (engine LHD of the Tokamak type) and with Tsukuba, close to Tokyo, but also on fusion by laser, in the universities of Osaka (Gekko-12) and of Kyushu (Triam-1M). On the whole the community of the Japanese physicists who work on this topic counts approximately a thousand of researchers.

Like Europe, Japan thus believes in its chances. *"the two parts are today with the elbow-with-elbow"*, entrusts a close relation of the file. In the current state of the discussions, Europe can count on the support of Russia and China, while Japan profits from the declared support of South Korea, but also of the preference of the United States, even if the latter did not post it publicly. The next days will give place to an intense diplomatic battle, in which the attitude of the Americans will be determining.

Will the candidature of Cadarache pay the price of the position taken by France in the Iraqi conflict? Will the United States make on the contrary ITER a pledge of reconciliation? Can one also imagine that the reduction by France of the debt of Iraq and the possible participation of Paris, Moscow and Berlin with the rebuilding of the country can also intervene in the negotiations? With which compensations, in this case, for Japan? Does America go, on this file as on others, to play the chart of Asia or that of Europe?

The choice should not in any case be done on financial criteria. Each of the two candidates was committed, if it carries it, financing 48 % of the cost of the construction (4,7 billion euros) of ITER.

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## **A new record for Torus Supra**

To obtain good reactions of fusion, it is necessary to satisfy three conditions. To have a gas mixture (plasma) rather dense, to heat it to at least 100 this and degree million, during a sufficiently long time. No machine currently reaches that point. All are specialized in one or two of these parameters. In October 1997, the Joint European Torus (JET) of Culham (Great Britain) thus produced 16 megawatts (MW) of power fusion, but during one second only. Torus Supra, the French machine, installed in Cadarache (Rhône delta) to test various techniques for the engines with fusion of tomorrow, allowed, at the beginning of December, to preserve and protect - one says to isolate - during more than six minutes (4 min 25 S in 2002) a plasma which received 3 MW of heating. With ITER, the physicists want almost all. The temperature, density and power of fusion (500 MW during 400 S). It is even planned, when ITER is perfectly operational, to make function the engine over very long periods, but in degraded mode (200 MW).

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