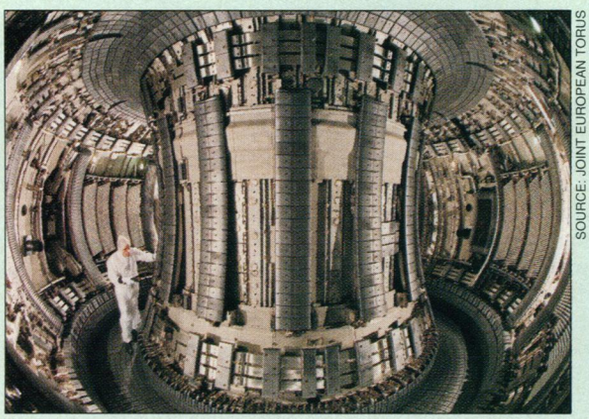
Europeans Launch Effort to Extend JET

ABINGDON, ENGLAND—Time is running out on the Joint European Torus (JET), the world's biggest fusion reactor, located in this town near Oxford. But scientists are hoping its value to the proposed International Thermonuclear Energy Reactor (ITER), combined with the historic difficulty of killing off big international science projects once they're up and running, will convince its sponsors to extend JET's life at least 3 years beyond its scheduled closure in 1996.

JET's supporters argue that the machine could provide a unique test bed for crucial aspects of ITER's design. "JET is the nearest thing we'll get to ITER," says plasma physicist Malcolm Haines of Imperial College, London. JET has just resumed experiments after a 2-year hiatus, and scientists hope to sustain that momentum. "We are pretty confident," says JET's director, Martin Keilhacker, about the likelihood the lab's European masters will approve the proposed extension.



SOURCE: JOINT EUROPEAN TORUS

In the groove. Workers inspect JET's interior before experiments resumed last month.

Before they do, three key questions must be answered. The first is scientific—whether the newly reconfigured reactor will perform as expected. The second is financial—whether the 14 nations that fund JET will come up with the money to sustain it. The third is political—whether the lab's British employees will accept a proposed solution to a long-running labor dispute.

JET, commissioned in June 1983, receives about a fourth of the $400 million a year Europe devotes to fusion research (*Science*, 14 December 1990, p. 1500). The high point of its career came on 9 November 1991, when a tritium-deuterium plasma produced 1.7 megawatts of fusion power for almost 1 second. The event marked the first time a significant amount of fusion power had been generated in a magnetic confinement device.

The tritium experiment, which left the torus radioactively contaminated, was timed to take place just before the reactor was shut down for major modifications. The scientific argument for keeping the machine running depends on these modifications doing what they are intended to do. The most important alteration was installing a device to remove impurities (mainly atoms of beryllium and carbon) that can be scraped off the walls of the reactor by hot plasmas, causing catastrophic losses of temperature and plasma density.

The device, called a pumped diverter, consists of four magnetic coils that guide the unwanted particles toward target plates along a channel at the base of the reactor before pumping them out of the tokamak. The current plan for ITER calls for a diverter working on similar principles. In June the JET team plans to present its first results at a conference in Montpellier, France.

If those results show that the diverter is doing its job in siphoning off impurities, Keilhacker says JET will be well-positioned to be the world's best test bed for ITER, which will be more than twice the size. It can also serve as an important site for studies of other aspects of fusion power, notably tritium-deuterium plasmas and the physics of steady-state tokamak current drivers.

Haines agrees. "The [product of] pulse length, plasma temperature, and density at JET are closer than anyone else to ITER," he says. The crucial factor, he adds, is the length of pulse: In 1991 JET achieved a 1-minute pulse, two or three times longer than at any other major facility.

But the hurdles in JET's path are not only scientific ones. The lab must also win over the JET council, containing representatives of research bodies in the 14 member nations (including Sweden and Switzerland, which are not members of the European Union). The plan will then go to the European Council of Ministers, the EU's main decision-making body. The funds would come from the European R&D Framework budget, which has been approved through 1998.

Beyond that, the European Parliament in Strasbourg, France, with its power to block EU research programs, would have to approve extra spending. Members of the JET council would not comment on the chances of such support, but the Parliament has already cut its 5-year budget for fusion research from $1.1 billion to $960 million, not all of which goes to JET. The results of European elections in June, involving Green parties and others that oppose fusion power, add uncertainty to the equation.

The European Parliament, a key player in the economic arena, has already played a crucial role in the effort to solve JET's political problem, which has a distinctly British cast. The dispute arose from differences in salaries and conditions among the project's 480 scientists and technicians, half of whom work for the British Atomic Energy Authority (UKAEA), the other half for JET's sponsors. Unhappiness about the disparity has led to a series of strikes, the latest in September last year. JET's chiefs are now confident that a new offer of a lump-sum payment will solve the problem. "This will be a compromise," said Keilhacker. "It won't satisfy all British staff, but hopefully it will be accepted as a final settlement." The scientists' union, the Institution of Professionals, Managers and Specialists, is not satisfied, but acknowledges that most employees consider it to be their best offer.

The union is still fighting the UKAEA over another part of the labor package that would give an extra allowance to experienced staff members. Earlier this year, the budgetary and energy committees approved an offer of $2 million to be distributed as a lump sum among the British staff according to length of service. "It's a token," said the union's John Billard. "In no way can it be described as redressing the imbalance in treatment over the years." UKAEA officials say their hands are tied by Britain's policy of restricting pay raises for public employees, but Billard says that further strikes "could not be ruled out."

Although they remain optimistic about an extension, JET scientists are proceeding cautiously, on the assumption that the facility will shut down in 1996. The planned program will end with a new round of tritium experiments. "We want to end on a high note," Keilhacker says. A tritium-handling plant is nearing completion, and JET officials have begun talking to neighboring farmers about the nature of radioactive releases in anticipation of any opposition from local environmental groups.

–Michael Cross

Michael Cross is a freelance journalist based in London.