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Fusion power

Nuclear ambitions

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A step towards commercial fusion power. Perhaps

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THIS week, an international project to build a nuclear-fusion reactor came a step closer to reality when politicians agreed it should be constructed in France rather than in Japan, the other country lobbying to host it. The estimated cost is $12 billion, making it one of the most expensive scientific projects around—comparable financially with the International Space Station. It is scheduled to run for 30 years, which is handy since, for the past half century, fusion advocates have claimed that achieving commercial nuclear fusion is 30 years away.

The International Thermonuclear Experimental Reactor (ITER), as the project is known, is intended to be the final proving step before a commercial fusion reactor is built. It would demonstrate that power can be generated using the energy released when two light atomic nuclei are brought together to make a heavier one—a process similar to the one that powers the sun and other stars.

Advocates of fusion point to its alleged advantages over other forms of power generation. It is efficient, so only small quantities of fuel are needed. Unlike existing nuclear reactors, which produce nasty long-lived radioactive waste, the radioactive processes involved with fusion are relatively short-lived and the waste products benign. Unlike fossil-fuel plants, there are no carbon-dioxide emissions. And the principal fuel, a heavy isotope of hydrogen called deuterium, is present in ordinary water, of which there is no shortage.

The challenges of achieving fusion should not be underestimated. A large volume of gas must be heated to a temperature above that found at the centre of the sun. At the same time, that gas must be prevented from touching the walls of the reactor by confining it in a powerful magnetic field known as a magnetic bottle. The energy released in fusion is carried mostly by neutrons, a type of subatomic particle that has no electric charge and hence cannot be confined by the magnetic bottle. Ensuring that the reactor wall can cope with being bombarded by these neutrons presents a further challenge.

The costs involved are immense. The budget for ITER involves spending $5 billion on construction, $5 billion on operating costs over 20 years and more than $1 billion on decommissioning. Yet the reason why taxpayers should spend such sums is unclear. The world is not short of energy. Climate change can be addressed without recourse to generating power from fusion since there are already many alternatives to fossil-fuel power plants. And $12 billion could buy an awful lot of research into those alternatives.

Part of the reason why commercial fusion reactors have always been 30 years away is that increasing the size of the reactors to something big enough to be a power plant proved harder than foreseen. But fusion aficionados also blame a lack of urgency for the slow progress, claiming that at least 15 years have been lost because of delays in decision-making and what they regard as inadequate funding.

There is some truth in this argument. ITER is a joint project between America, most of the European Union, Japan, China, Russia and South Korea. For the past 18 months, work was at a standstill while the member states wrangled over where to site the reactor in what was generally recognised as a proxy for the debate over the war in Iraq. America was thought to support the placing of ITER in Japan in return for Japan's support in that war. Meanwhile, the Russians and Chinese were supporting France which, like them, opposed the American-led invasion. That France was eventually chosen owes much to the fact that the European Union promised to support a suitable Japanese candidate as the next director general of ITER.

Like the International Space Station, ITER had its origins in the superpower politics of the 1980s that brought the cold war to its end as Russia and the West groped around for things they could collaborate on. Like the International Space Station, therefore, ITER is at bottom a political animal. And, like the International Space Station, the scientific reasons for developing it are almost non-existent. They cannot justify the price.