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The challenges of fusion

Editorial: March 2006

The new boss of the world's biggest fusion experiment cannot afford to fail

Kaname Ikeda will soon be a name on many physicists' lips. Though the outgoing Japanese ambassador to Croatia and former science administrator is not currently widely known, that will all change when he starts work later this month as director general of the International Thermonuclear Experimental Reactor (ITER). Set to be built at Cadarache near Marseille in southern France - assuming the ITER treaty is ratified - this €10bn facility is designed to show that fusion could be turned into a practical energy source.

To do so would be huge achievement. Fusion reactors could play a massive role in meeting the world's rapidly growing demand for energy. They promise to be environmentally friendly and relatively safe to operate, while the raw materials they need are plentiful. However, early progress in fusion research led plasma physicists to be over optimistic about this energy source, and a commercial fusion plant remains as far off in the future as it was back in the 1970s. Ikeda therefore has a tough job on his hands, as he readily admits in our interview with him (see p12; print version only). It will be no mean feat to build ITER on time and to budget, and Ikeda will have to draw heavily on his undoubted diplomatic skills to ensure that everyone involved in this complex international project gets on. ITER is hugely ambitious in engineering terms, with vast superconducting magnets needed to confine a deuterium-tritium plasma within a doughnut-shaped "tokamak" vessel.

Numerous technical challenges will have to be addressed to ensure ITER fulfils its goal of releasing more energy than it consumes. These include choosing which material to line the inner wall of the tokamak with, overcoming the accumulation of radioactive tritium on this surface, and controlling the properties of the plasma. Fortunately, such issues are being addressed at the recently upgraded Joint European Torus near Oxford (see "[Fusion: the way ahead](#)"). This information will be vital to give ITER - and Ikeda himself - a head start.

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