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## Fusion power gets slammed

**But supporters say arguments about reactor costs are old hat.**

**Mark Peplow**

Fusion reactors are an expensive dream that will never provide economical energy.

That's the controversial position of a nuclear physicist who once worked on the Manhattan Project to build the first nuclear bomb. And it makes bleak reading for scientists involved with the ITER project.

ITER, meaning 'the way' in Latin, is an experimental fusion reactor that will be built in southern France (see '[France wins fusion project](#)'). Its proponents hope that it will lead the way for reactors that generate electricity without releasing greenhouse gases.

But the projected costs of building and maintaining a plant, let alone getting it to work, are simply too high for fusion ever to become a viable power source, according to William Parkins, formerly chief scientist with the California-based technology company Rockwell International and author of an article in this week's *Science*<sup>1</sup>.

Parkins died of cancer in October 2005, but his manuscript is being championed by editor-in-chief Donald Kennedy. "I really liked the piece," says Kennedy, "although I'm sure it will annoy people."

It has. "It's complete rubbish from beginning to end," says Ian Cook, manager of the fusion materials programme at the UK Atomic Energy Authority in Oxfordshire. "He knows nothing about what's happened in the past 15 years."

### Star power

Fission reactors, which capture the energy released when radioactive atoms fall apart, have been with us for more than half a century. But power from fusion - the melding of atoms as happens inside the stars - has eluded scientists. Scientists have made fusion happen, but not in a way that can be harnessed to generate useful electricity.

ITER aims to do just that. But Parkins wrote that the energetic neutrons produced in the fusion reaction will gradually degrade the walls of the reactor itself. All design studies have indicated that the vessel will need periodic replacement, which would drive up costs. The large size of the reactor makes it virtually impossible to stop air leaking into the reaction chamber, causing further expensive problems.

**“ It's time to sell fusion for physics, not power. ”**

William Parkins, former chief scientist, Rockwell International.

The reaction would also produce so much heat that even our most advanced cooling systems would struggle to cope. The 'blanket' of material that transfers heat away from the reactor would have to be so large that this alone would cost more than a conventional nuclear fission plant, Parkins calculated.

ITER currently commands a budget of around US\$5.5 billion, making it one of the more expensive scientific projects ever conceived. "It's time to sell fusion for physics, not power," wrote Parkins.

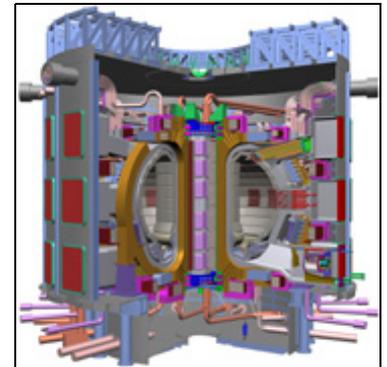
"I find his argument pretty convincing," says Kennedy. "There are grave engineering doubts about whether ITER can produce a cost-competitive fusion source."

### Out dated?

But other scientists damn the conclusions. "I'm surprised this has been published again," says David Ward, a physicist at the UK Atomic Energy Authority who has researched the economics of fusion energy. "This all came out in the early 90s and was rebutted back then."

Cook and Ward agree that some components of a fusion reactor would have to be replaced periodically, but insist that this has been factored into all the latest cost analyses. They add that Parkins's bill for the heat-removing blanket overestimates both its size and the material's cost.

Ward says that current estimates of the cost of fusion electricity are between 5 and 10 cents per kilowatt-hour. The US Department of



ITER: arguments fly over cost of fusion reactors.

*Credit: ITER consortium*

Energy predicts that US electricity will average just under 10 cents per kilowatt-hour this year. "I think fusion could compete with coal today in Europe," says Ward, because of the economic costs produced by emissions regulations.

"I don't think fusion scientists will even be angry, because it's just so out of date and wrong," Ward adds.

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## References

1. Parkins W. E., *et al.* *Science*, **311** . 1380 (2006).

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