

## Clearing the seven obstacles on the road to fusion power

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## Clearing the seven obstacles on the road to fusion power.

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Fusion holds the promise of unlimited, zero-CO<sub>2</sub>, clean and safe energy, with fuel available everywhere, to everyone. For this reason, everybody wants it: Europe, Japan, the USA, Russia, China, India, and S-Korea have powerful fusion development programmes and work closely together in the joint worldwide fusion project ITER. **ITER, under construction in Cadarache (France) will demonstrate 10-fold power multiplication at the 500 MW level.**

But, fusion energy has one big drawback: it is exceedingly difficult to achieve. In the reactor, the hot fuel plasma must be confined by magnetic fields and kept stable at the burn temperature of 150 Million C, and the turbulence in this plasma must be controlled. That done, the material walls of the reactor must be engineered to exhaust the huge power and particle fluxes that are generated. On the materials front, the challenges concern neutron-hard materials, superconducting magnets and the fuel cycle. Finally, ITER is probably the most complex device ever built by mankind, and realising a 75% uptime may prove the ultimate challenge.

This talk identifies 7 (seven) major scientific and technological obstacles that stand between us and commercial fusion power. Each of them could have been predicted in the 1960's, and most were. Decades of research have overcome 4 of the obstacles, ITER should bring this to 6 out of 7 while the 7<sup>th</sup> (neutron hard materials) is being dealt with in a parallel development. Thus, the path is cleared to a demonstration power plant (DEMO).

