

ITER: next step for fusion energy

For almost a half century fusion research has been trying to create a sustainable star on earth, but signs now suggest that fusion will not *always* be a "future" energy source. This is how Dr. Ned Sauthoff, Principal Research Physicist at the Princeton Plasma Physics Laboratory and Head of the US ITER Project began his talk on 20 April to the Princeton University Sigma Xi Chapter on "ITER" The International Thermonuclear Experimental Reactor." ITER's goal, he said, is to establish a self-sustaining plasma to generate heat (but not electricity). It is a worldwide endeavor, he added. India, China, and South Korea, in particular, see fusion as important in meeting their future energy needs. Moreover, ITER is an experiment not only in magnetically-confined fusion energy but also in international cooperation.

Sauthoff went on to indicate the three ways to confine a plasma for the purposes of nuclear fusion: gravity (in stars), inertia, and magnetic fields, the approach used by ITER. Research with a large number of "tokamaks" since 1960 has established that the torus is the optimum geometric arrangement for the magnetic fields. The goal is to produce energy from the fusion of the nuclei of deuterium (hydrogen-2) and tritium (hydrogen-3), with the latter produced by the collision of 4.1 MeV neutrons from deuterium-tritium fusion with lithium.

The ITER consortium, with the addition of India, now boasts seven members. In addition to the other two Asian nations listed above, the other members are Japan, Russia, the European Union, and the United States. The ITER project began with discussions among Ronald Reagan, Mikhail Gorbachev, and François Mitterand as a joint project among their countries -- the United States, Soviet Union, and European Union, Sauthoff stated, but inability to decide on a design center site wound down activity by 1988, at which time the U.S. Congress withdrew.

Meanwhile, by 2002 Canada as well as Japan had signed on, and U.S. plasma physicists revised their outlook on burning plasmas, leading to the decision of the U.S. to rejoin the ITER consortium in 2003. This decision, he said, was made with the intent of significant (more than 10%) commitment. Korea and China also joined. After Canada withdrew for economic reasons after proposing a site, the consortium was deadlocked for many years between a site proposed by Japan and one proposed by the European Union in France, with the latter recently winning out.