Euroscience Open Forum, ESOF 2006, July 15 – 19, in Munich

Symposium
Fusion research – taking the sun down to earth

Sunday, July 16th, 8:30 to 11:15
Forum am Deutschen Museum, Room "Galaxis"

Synopsis:
Fusion research has now advanced to a decisive point: With the international tokamak experiment, ITER, which is expected to start construction in 2007, the fusion programmes of Europe, Japan, the Russian Federation, the United States of America, China, and South-Korea are jointly oriented towards the first experimental reactor. ITER is intended to show that it is possible to gain energy from nuclear fusion reactions, as in the sun and other stars. For the first time a burning and net energy-producing fusion fire will be created. Alongside ITER, the reactor suitability of an alternative concept will be investigated with the Wendelstein 7-X facility, currently being built in Greifswald/Germany. – The scientific session will give information on: What is the current status of fusion research? What are the challenges still to be met on the way to a power plant? What will be the environmental properties of fusion? And how will fusion power stations fit into the future economy and into society as a whole?

Session contributors:

0. **Introduction**
(Prof. Dr. Alexander M. Bradshaw, Scientific Director of the Max Planck Institute for Plasma Physics, Garching/Greifswald, Germany)

1. **On the way to a burning fusion plasma – ITER and tokamak research in Europe**
(Dr. Jerome Pamela, EFDA Leader, Garching, Germany; till March 2006 head of the Joint European Torus, JET-EFDA, Culham Science Centre, Abingdon, United Kingdom)
On its way to a power plant fusion research is concentrating on two different types of experiment, the tokamak and the stellarator. Most of the devices in the world today are of the tokamak type, which is best investigated and comes closest to the ignition conditions. For example, the European tokamak JET (Joint European Torus) has already achieved the record generation of 16 megawatts of fusion power. JET together with other tokamak devices in Europe and world-wide pave the way for the first experimental reactor, ITER.

2. **The Wendelstein 7-X stellarator – an alternative concept**
(Prof. Dr. Thomas Klinger, Max Planck Institute for Plasma Physics, Greifswald Branch, Germany)
Fusion devices of the stellarator type may offer technical advantages for fusion power plants. They are suitable for continuous operation, whereas tokamaks without auxiliary equipment can only operate in pulsed mode. The world's largest and most advanced superconducting stellarator, Wendelstein 7-X, which is now being built in Greifswald/Germany, has the goal to demonstrate the reactor relevance of this alternative approach to fusion power.

3. **Key-technologies for fusion**
(Dr. Günter Janeschitz, Head of "Programme Nuclear Fusion", Research Centre Karlsruhe, Germany)
Within the framework of the European Fusion Programme numerous technical issues related to the development of a fusion power plant are addressed. These include superconducting magnetic field coils, technologies to heat the fusion fuel, tritium technology, exhaust of the thermal energy generated, and development of remotely replaceable components.

4. **Fusion reactor materials – challenge for the next decades**
(Dr. Nadine Baluc, Centre de Recherches en Physique des Plasmas, Ecole Polytechnique Federale de Lausanne, Switzerland)
The energetic particles emitted by the fusion reaction cause many effects on the surrounding structural materials of the reactor, for example degradation of the mechanical properties or radioactivation of the material. The goal of fusion materials research is to develop structural materials with improved properties with regard to irradiation, i.e. low-activation materials with good mechanical properties.

5. **Socio-economical aspects of fusion power plants**
(Dr. Thomas Hamacher, Max Planck Institute for Plasma Physics, Garching, Germany)
A major transition is expected in the energy supply system in the 21st century. The role which fusion might play in this transition, as well as the safety issues, environmental features and possible costs of fusion power, are discussed.