



## Announcement

### Seminar Energy Supply, Climate Change and Nuclear Fusion Research

Dr. Thomas Eich

#### Description

The German government has announced a planned transformation in its energy supply, the so called ‚Energiewende‘. Related frequent discussions in the German media reflect the importance of energy in our everyday life. Energy heats our homes and moves our cars. It is crucial for industry. Catch phrases like energy crisis or climate change are regularly appearing - in the news.

This seminar introduces the basics of energy supply in Germany and reports in detail about conventional energy sources such as coal, oil and nuclear, as well as alternatives such as wind, biomass and solar. The flow of energy starting from production in industrial power plants or through small scale local facilities towards its consumption for private households, transport and industry will be discussed.

Alternative energy is only rarely produced in the same region where it is consumed. It is also highly intermittent. Thus a large expansion of the German power grid and its international connectivity is necessary. This is one of the most difficult challenges within the foreseen turnaround of energy supply.

Particular emphasis will be placed on the extent to which nuclear-fusion based power plants can contribute to a future CO<sub>2</sub>-free energy supply in Germany and worldwide. Towards this end, the physical and technical basics of a nuclear fusion power plant will be presented. One focus will be current nuclear fusion experiments at the Max-Planck-Institute for Plasma Physics in Munich. A further focus will be the large nuclear fusion experiment ITER in France, a major international science project under construction by China, Europe, India, Japan, Russia, South Korea and the U.S., designed to demonstrate the production of 100's of megawatts of heat from the fusion process for periods of up to one hour.

#### Content

- Survey on energy supply and energy consumption in Germany and in the world
- The concept of the individual energy balance sheet for course attendees
- Survey on consumption of fossil energy forms worldwide: coal, gas, oil
- Climate history and radiative forcing, near term projection of global warming
- Natural cycles of CO<sub>2</sub> in the atmosphere, lithosphere and oceans
- The physics of the Greenhouse effect
- Energy transformation in Germany and necessity for a power grid extension due to the intermittency and localization of alternative energy such as wind and PV
- Current and future experiments in nuclear fusion research in Europe
- Concept of Nuclear Fusion power plants and potential of Fusion Energy

#### Prerequisites

#### Additional Information

The module is suitable for Bachelor and Master students. Each student has to give a presentation on one of the topics. Preparation, oral presentation, discussion and a separate written report are graded.

Seminar: 3 ECTS credits

Advanced seminar: 4 ECTS credits

**Date / Duration / Location**

tba

**Lecturer**

Dr. Thomas Eich, Max-Planck-Institut für Plasmaphysik, Garching