Impact of Fusion Research on the Region

Wendelstein 7-X

Thomas Klinger

Max-Planck-Institut für Plasmaphysik, Greifswald
What is fusion Research?

Nuclear fusion of hydrogen, a sustainable energy source! The sun on earth

the right magnetic field

Deuterium & Tritium

- \( p + p \rightarrow D + e^+ + \nu \)
- \( D + p \rightarrow ^3\text{He} + \gamma \)
- \(^3\text{He} + ^3\text{He} \rightarrow ^4\text{He} + 2p \)
Two big projects

Tokamak (1951 Sacharov and Tamm)

Тороидальная камера в магнитных катушках

“toroidal chamber in magnet coils“

Stellarator (1951 Spitzer)

Stella = the star

„the star machine“

ITER in Cadarache - pulsed operation

Wendelstein 7-X in Greifswald operation
Wendelstein 7-X – the idea

Optimised magnetic field:

• theory
• high performance computers
• modular coil concept

The key component:

• superconducting magnet coils - 270°C
• 50 non-planar coils
• 20 planar coils
Impact on the region - now

IPP is one of the bigger employers in the region

- 550 employees
- 300 highly qualified engineers and scientists
- 20 Mio€ salaries p.a.
- 20 Mio€ running costs p.a.

Many contracts awarded in Mecklenburg-Vorpommern

- European tender action
- 45 Mio€ total
- 600 companies (service, construction, components)

Cooperation with local universities and other entities

- Ernst-Moritz-Arndt University (physics, higher education, economy)
- Universities of Technology in Stralsund and Neubrandenburg
Impact on the region - future

Wendelstein 7-X will be a leading fusion research facilites

- completion of the device assembly in mid 2014
- the biggest optimised superconducting stellarator worldwide
- the most modern fusion device in Europe
- highest priority in the EURATOM program

Key partners in Europe and overseas

- Spain CIEMAT stellarator physics
- France CEA steady-state operation
- Poland associations diagnostics and heating
- Germany FZJ plasma-wall interaction
- USA Princeton stellarator physics
- Japan NIFS stellarator physics

Scientific team with ~50% international participation envisaged
Impact on the region - Poland

Collaboration contracts (EURATOM) with polish research institutions

- Warsaw University of Technology  
  Warsaw
- Soltan Institute for Nuclear Studies  
  Warsaw
- Institute for Plasma Physics and Laser Microfusion  
  Warsaw
- Henryk Niewodniczanski Institute of Nuclear Physics  
  Kraków
- Szczecin University of Technology  
  Szczecin
- Akademia Morska  
  Szczecin
- Wrocław Technical University  
  Wrocław
- Opole University  
  Opole

Strong contributions to Wendelstein 7-X construction
Wendelstein 7-X construction

(c) 2009 IPP, Stellarator Theory Division
Wendelstein 7-X construction
Visit of Wendelstein 7-X

Please gather at 14:50 right after the coffee break