Student Sessions at the CP3 Workshop

Shaping Students for a Sustainable Future

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Future Energy Demand

- Energy demand will grow from now 400 EJ to 1100 EJ in 2050, despite better efficiency!
  - 1 EJ is the amount of energy received by the Earth from the sun in 6 seconds
  - New technical sustainable solutions will be required

![Graph showing energy demand growth from 2000 to 2050](source: www.wgbu.de)
Sustainable Energy Systems

- Best and efficient use of energy
- CO$_2$ capture and sequestration
- Solar and energy efficient buildings
- More renewable energies:
  - Solar energy for electricity and heat
  - Wind
  - Biomass and biogas
  - Improved hydro (Tidal energy, …)
- More renewable energies →
  - Distributed power generation
  - Improved national and transnational grids
- We have to train the students
University of Applied Science Muc

- Offers courses in Sustainable Energy Systems
- Largest University of Applied Sciences in Bavaria
- ~14000 students
- 470 professors
- 26 bachelor, 26 master degree programs
- Department of electrical engineering and information technology:
  - Bachelor course “Renewable Energies”
  - An appropriate Master course (M.Sc.)
Cooperation Partners (non exhaustive)
Research and Development

- Electroluminescence and thermography of PV modules for error detection
- Long term behavior of PV systems
- Simulation of PV systems
- Round Robin Sensor test
- Energy meteorology: Identification of snow covered modules
- Grid problems coming from large PV installations
- Starting with biogas
Requirements for Students

- Good knowledge in Mathematics and Physics
- Ability and interest to solve technical problems
- „Feeling“ for technical data and dimensions
- „Certain“ manual skills
- „Enthusiasm“ for sustainable power supply
- Basic knowledge of English
- Social skills
Bachelor Course „Renewable Energies“

- 7 semesters - 3,5 years
- Basically „Electrical Engineering“
- However in basic studies:
  - Building Physics,
  - Sustainable product development
  - Biotechnology
- One semester (22 weeks) of work in industries, research labs, ...
- Soft Skills like communication and project
- Courses in English
Mentoring

- Lowering the number of students failing
- Ability to work in a team
- Organization of tutorials
- Transfer additional knowledge
  - Company presentations
  - Residential courses
- Improve motivation
- Excursions
Project: Desalination of Seawater

Goal: Prepare 1 l of drinking water as cheap as possible
# Jobs for Graduates (Bachelor)

<table>
<thead>
<tr>
<th>Company</th>
<th>Duties and Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting Engineers</td>
<td>Project management for Biomass Power Stations</td>
</tr>
<tr>
<td>Electric board</td>
<td>Maintenance of transformers</td>
</tr>
<tr>
<td>Electric board</td>
<td>Planning Offshore - wind parks</td>
</tr>
<tr>
<td>Manufacturer of PV modules</td>
<td>Sales and distribution</td>
</tr>
<tr>
<td>Consulting engineers</td>
<td>Large scale PV projects with engineering worldwide</td>
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Master Degree Program (M.Sc)

- Master of Science in Electrical Engineering
- For the best “Bachelors”
- 3 semesters - 1.5 years
- Focused on the “scientific side”
- Courses in advanced mathematics and general electrical engineering
- Courses in renewable energies
- Master thesis and project (300 h)
- Best Masters → PhD
# Jobs for Graduates (Master)

<table>
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<tr>
<th>Company</th>
<th>Duties and Functions</th>
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<tr>
<td>Research Center</td>
<td>Development of future energy systems</td>
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<tr>
<td>Electric board</td>
<td>Reliability of future grids</td>
</tr>
<tr>
<td>Research Center</td>
<td>Stability of future energy transmission</td>
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</tbody>
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Conclusion

- Sustainable energy supply is future-proof!
- There are many interesting challenges and future-proof jobs not only in the office, but outside at the customer
- Solar energy is available for the next 4,500,000,000 years