RESEARCH FUNDING FOR HEAT UTILISATION OF WOOD-BIOMASS IN CONTRIBUTION TO THE TRANSFORMATION OF THE ENERGY SYSTEM AS WELL AS REGIONAL BIOENERGY CONCEPTS

German-Japanese Wood-Biomass Day,
4. - 8. November 2013, Tokyo und Morioka,
Dr. Steffen Daebeler

Gefördert durch:
Bundesministerium für Umwelt, Naturschutz
und Absatzförderung
aufgrund eines Beschlusses
des Deutschen Bundestages
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## Comparison of land use and final energy consumption

### 日独比較: 土地利用と最終エネルギー消費

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Japan</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>126 Mio.</td>
<td>80 Mio.</td>
</tr>
<tr>
<td>Total area [1,000 km²]</td>
<td>378 (100 %)</td>
<td>357 (100 %)</td>
</tr>
<tr>
<td>Forest land [1,000 km²]</td>
<td>251 (66.3 %)</td>
<td>108 (30.1 %)</td>
</tr>
<tr>
<td>Farm land [1,000 km²]</td>
<td>47 (12.4 %)</td>
<td>187 (52.4 %)</td>
</tr>
<tr>
<td>Settlement and traffic area [1,000 km²]</td>
<td>33 (8.6 %)</td>
<td>47 (13.3 %)</td>
</tr>
<tr>
<td>Water area [1,000 km²]</td>
<td>13 (3.5 %)</td>
<td>9 (2.4 %)</td>
</tr>
<tr>
<td>Other areas [1,000 km²]</td>
<td>35 (9.1 %)</td>
<td>6 (1.8 %)</td>
</tr>
<tr>
<td>Final energy consumption 2010 [PJ]</td>
<td>14,974</td>
<td>9,310</td>
</tr>
</tbody>
</table>

Sources: Japan Statistical Yearbook 2013 (www.stat.go.jp); www.umweltbundesamt-daten-zur-umwelt.de; www.ag-energiebilanzen.de

Primary energy consumption in Germany 2012
ドイツの一次エネルギー消費（2012年）
Total: 13,645 PJ = ~ 3,793 TWh

- Renewables 11.6%
- Natural gas 21.6%
- Nuclear power 8.0%
- Coal 12.2%
- Petroleum 33.1%
- Lignite 12.1%
- Other, incl. electricity imports/exports 1.4%

Quelle: AGEB (März 2013)
Share of renewable energies of final energy consumption in Germany 2012
ドイツの最終エネルギー消費における再エネ割合（2012年）

Fossil fuels and 87.4 % nuclear power

Renewable Energies (RE) 12.6 %
- Hydropower 0.8 %
- Wind energy 1.8 %
- Biomass 8.2 %
- Other RE 1.6 %

Total 2,496 TWh

Quelle: BMU, AGEE-Stat (Februar 2013) © FNR 2013
Development of renewable energies in Germany
Electricity-Heat-Fuel
ドイツの再エネ推移（電力、熱、燃料）

- Biogenic fuels, electricity
- Biogenic fuels, heat
- Geothermal energy
- Wind energy
- Biogenic motor fuels
- Solar thermal energy
- Photovoltaics
- Hydropower

GWh

- 350,000
- 300,000
- 250,000
- 200,000
- 150,000
- 100,000
- 50,000
- 0

Final energy consumption in Germany 2012
ドイツの最終エネルギー消費（2012年）

Total: 2,496 TWh
Share of renewable energies: 12.6 % (ca. 314.5 TWh), aim 2020: 18 %
Share of bioenergy: 8.2 % (ca. 204.7 TWh) or 65 % within RE

Source: BMU/AGEE Stat (Stand Feb. 2013)
German Integrated Energy and Climate Protection Programme (IEKP):

- **Aim 2020**: Share of renewable heat of 14 %

Provisions for biogenic heat production:
- **Renewable Energy Heat Act (EEWärmeG)**
- **Renewable Energy Sources Act (EEG)**
- **Combined Heat and Power Act (KWKG)**
- **Market Incentive Programme (MAP)**
- **R&D-Funding**
Heat supply from renewable energies in Germany 2012

- Biogenic solid fuels (industry) 18.4%
- Biogenic solid fuels (private households) 51.2%
- Biogenic gaseous fuels 7.8%
- Biogenic liquid fuels* 1.9%
- Geothermal energy 4.9%
- Solar thermal energy 4.2%
- 4.9% Biogenic solid fuels (CHP- and heating plants)
- 5.8% Biogenic fraction of waste
- 4.9% Geothermal energy
- 0.9% Sewage gas

Total 144.3 TWh

* incl. vegetable oil

Quelle: BMU, AGEE-Stat (Februar 2013)
Heat from biomass
バイオマスによる熱供給

Biogenic energy sources for heat production

- solid
  - Wood chips and logs
  - Pellets und briquettes
  - For example from:
    - Wood
    - Straw
    - Energy crops
    - Material from landscape conservation

- liquid
  - Vegetable oil

- gaseous
  - Biogas
  - Biomethane
  - Wood gas

Dr. Steffen Daebeler – German-Japanese Wood-Biomass Day 04. - 08.11.2013
Energetic Use of wood in Germany 2010

ドイツの木材のエネルギー利用（2010年）

- **22.6m solid m³**
  - CHP- and heating plant > 1 MW

- **33.9m solid m³**
  - in private households

- **7.2m solid m³**
  - CHP- and heating plant < 1 MW

- **4.7m solid m³**
  - Other

Total: **68.4m solid m³**

**CHP: Combined heat and power**

Quelle: Mantau / Holzrohstoffbilanz Deutschland 2012  © FNR 2012
Development of heat production from renewable energies in Germany

ドイツの再エネ由来の熱供給推移

![Graph showing the development of heat production from renewable energies in Germany.](image)

- **Biogenic solid fuels**
- **Biogenic liquid fuels**
- **Biogenic gaseous fuels**
- **Biogenic fraction of waste**
- **Solar thermal energy**
- **Geothermal energy**
- **Sewage gas**

**Share of biomass 91%**

*Quelle: BMU/AGEE-Stat (März 2012)*
### Research funding for heat production based on biomass

<table>
<thead>
<tr>
<th>Federal Ministry</th>
<th>Funding programme</th>
<th>Subsidies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMELV</strong></td>
<td>Renewable Resources</td>
<td>2013: 60 Mio. €</td>
</tr>
<tr>
<td></td>
<td>Special Fund „Energy and Climate Fund“</td>
<td>2013: 10.6 Mio. €</td>
</tr>
<tr>
<td><strong>BMU</strong></td>
<td>Optimisation of energetic utilisation of biomass</td>
<td>6 Mio. € / a</td>
</tr>
<tr>
<td><strong>BMBF</strong></td>
<td>BioProFi – Bioenergy – Process driven research and innovation</td>
<td>N.N.</td>
</tr>
<tr>
<td></td>
<td>BioEnergy 2021</td>
<td>N.N.</td>
</tr>
</tbody>
</table>
Agency for Renewable Resources e.V. (FNR)
再生可能資源専門エージェンシー(FNR)

Who we are: Central coordinating agency in the area of “Renewable Resources” in Germany

Founded: October 1993

Main office: Gülzow in Mecklenburg-Western Pomerania

Support: Federal Ministry of Food, Agriculture and Consumer Protection (BMELV)

Legal status: Registered association

Members: 70

Employees: 80
Tasks of FNR
FNRのタスク

R&D-Funding

Information / Consulting

Public relations

EU-Activities
Programme „Renewable Resources“
「再生可能資源」プログラム

- For the promotion of R&D-/demonstration projects
- Until today 2,496 funded projects at FP RR, 80 projects at ECF and 5 projects at BMU-Programme
- Actual 672 ongoing projects
- Marketable products and technologies in the fields of
  - Industrial Use
  - Bioenergy

Promotion policy objectives:

- Contribution to sustainable resource and energy provision
- Reduction of environmental impacts by resource protection and CO₂ reduction
- Improving the competitiveness of domestic agriculture and forestry

As of: August 2013
Research funding for heat production and utilisation
熱供給・利用への研究資金
Projects for heat production from different energy sources of biomass

**solid:** 75 projects
- examples:
  - Precipitators to reduce emissions
  - Demonstration projects for heating and thermal power stations
  - Combustion facilities for fuels from grain and straw
  - Production and quality assurance of woody fuels
  - Supply of alternative biofuels

**liquid:** 3 projects
- examples:
  - Use of vegetable oil in micro gas turbines

**gaseous:** 24 projects
- examples:
  - Wood gas plant in Senden
  - Wood gasification in fluidised bed reactors
  - Micro gas turbines with use of biogas
  - Use of surplus heat from Biogas-CHP systems

As of: August 2013
Example projects for heat production
„Low-Dust biomass combustion technology“

- Total costs: 472,275.55 €
- Funding amount: 188,910.22 € (Funding rate: 40 %)
- Project duration: 01.05.2008 – 30.04.2010
- Beneficiary: Viessmann Werke GmbH & Co. KG

- Wood pellet boiler with 10 – 25 kW nominal power
- Primary measures for reducing emissions
  - Optimisation of combustion chamber and adaption of the regulation concept
- At full load reduction of CO by 72 %, reduction of total dust by 66 % and reduction of particulate matter by 74 %
- At partial load CO-reduction > 90 %
- No need for expensive filter technologies
- Consideration of project results for serial production
Example projects for heat production
„Demonstration project wood gas plant Senden“

✓ Total investment: ca. 32 Mio. €
✓ Funding amount: ca. 6.6 Mio. €
✓ Beneficiary: SWU Energie GmbH

Highly efficient wood gasification power plant with motoric use of gas based on renewable resources
• Fuels: residual wood from forests, wood chips from forests (> 50 %), other solid biofuels planned
• Thermal input (after drying): 15 MW
• Heat production: ca. 7.5 MW, thereof saleable heat: ca. 6.4 MW
• Electricity production: ca. 4.5 MW
• Overall efficiency ca. 80 %
Effects of decentralised bioenergy supply
分散型バイオエネルギー供給の効果

Regional value creation

Security of energy supply

Imports of Energy

Public participation

Climate, environment and nature protection

Decentralised production of bioenergy

Energy potential

Farmer as energy manager

➢ Funding of Bioenergy-Regions and Bioenergy villages by FNR and BMELV
Bioenergy-Regions
Chances for rural areas
バイオエネルギーディエ地域

1. Stage of Funding (2009 – 2012):
   • Funding amount: 400,000.00 € per region,
   • i.a. building of network structures, public relations, feasibility studies.

2. Stage of Funding (2012 – 2015):
   • Funding amount: 330,000.00 € per region,
   • i.a. increase of value creation, increase of efficiency, transfer of knowledge and capabilities.

Quelle: http://www.bioenergie-regionen.de/bioenergie-regionen-2012-2015/
Award of Bioenergy villages in Germany
ドイツのバイオエネルギーヴィレッジ

• BMELV competition Bioenergy villages 2010 & 2012,
• Criteria:
  – Villages cover > 50 % of their energy demand from biomass,
  – On-site use of locally produced biomass,
  – Bioenergy plants are at least partially property of local heat customers or farmers,
  – Prize money of 10,000.00 € to continue their projects.

134 Bioenergy villages in Germany

➤ 42 Bioenergy villages on the way
  (regional bioenergy < 50 %)

➤ 92 Bioenergy villages

Source: http://www.wege-zum-bioenergiedorf.de/bioenergiedoerfer/
Example – Bioenergy village Oberrosphe
バイオエネルギーヴィレッジの事例

- Winner of BMELV-Competition
  Bioenergy villages 2012
- Cooperative organisation of energy production
- Supply for 50% of households and communal buildings
- Applied energy sources and technologies:
  - Wood chips: heating plant 850 kW_{th}
  - Maize silage+grain: biogas plant with 2 CHP plants
  - Local heating network of 7 km length

Source: http://www.orotainment.de/BEDO/2008_bioenergien310.html/
Outlook

• Wood biomass contributes already today decisively to renewable heat production
• Reaching the aims for renewable heat of EU and Germany further efforts are necessary (R&D, MIP, PR)
• Research funding for wood heat will be decisively in the future as well:
  ➢ Increase of efficiency
  ➢ Sustainable use of resources
  ➢ Compliance of limits for emissions
  ➢ Quality assurance and management of solid biofuels
Thank you for your attention!

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