Besonderheiten im Wärmemarkt
Specialities of the heating market

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Erneuerbare Wärme für die Energiewende
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Final energy demand by sectors, Germany 2015
Total demand: 8877 PJ

Heating & Cooling: 56%
- Space heating: 27%
- Domestic hot water: 5%
- Other process heat: 22%
- Cooling for climatisation: 0%
- Other process cooling: 2%
- Mechanical energy: 39%
- ICT: 2%
- Lighting: 3%

Source: BMWi 2017

Renewable Heating & Cooling
European Technology Platform

Fraunhofer ISE
Space heating fuels for different countries

- Space heating fuel mix per country differs a lot from country to country
- Natural gas is dominating, if sufficiently available (at low costs)
- Basic heat supply is provided by oil
- Electricity is used, if sufficiently available from renewable energy sources (hydro)
- Renewable energy sources are mainly biomass (wood)
- District heating plays only in few countries a significant role as distribution technology, in most buildings globally, heat is generated on-site

Source: IEA 2009
Challenges of decarbonizing the heating sector

Heat demand today: 100%

Heat demand reduction target: 50%  
⇒ Is this realistic? Today’s efficiency rate is not sufficient.

Remaining 50% of today’s heat demand shall be covered by RES  
⇒ The contribution of direct heat generation and heat generated by RES electricity is unclear

Infrastructure question: What is the optimal heating infrastructure? What will be the share of centralized (district heating) and decentralized (per building) heat generation/supply? To which share will the decentralized generation be based on gas (biogas, methane) or on electricity?
### Renewable energy sources for heating

#### Biomass

**APPLICATIONS**
- Small burners
- District heating & cooling and process heat
  - Heat only or combined heat and power
- Use of
  - Solid biomass
  - Bio fuels / bio gas

**APPLICATIONS**
- Small burners
  - Pellets stove
  - Wood chip boiler
  - Log wood stove/boiler
- District heating & cooling and process heat
  - Pellets boiler
  - Wood chips boiler
  - Waste & agricultural feedstock boiler
- Use of
  - Solid biomass
  - Bio fuels / bio gas

### Solar thermal

**APPLICATIONS**
- Domestic hot water & space heating
  - One/two/multi family homes
  - Hotels, hospitals, residential homes,…
  - District heating
  - Multifunctional façades
  - PV-Thermal (PV-T) hybrid collectors

**PROCESS heat**
- Low up to 100°C
- Medium up to 250°C
- Solar assisted cooling and refrigeration
Development of heat demand by RES in Germany
Biomass dominates the renewable heating sector

Quelle: Erneuerbare Energien im Jahr 2014, BMWi

* inkl. biogenem Anteil des Abfalls, ab 2013 inkl. Klärschlamm
** inkl. Biodieselverbrauch in der Landwirtschaft
*** Biogas, Biomethan, Klär- und Deponiegas

Quelle: Erneuerbare Energien im Jahr 2014, BMWi
Biomass dominates the renewable heating sector

Quelle: Aebiom: EuropeAn Bioenergy Outlook 2014
Renewable energy sources for heating

Geothermal

TECHNOLOGIES and APPLICATIONS

Shallow GT
- Geothermal HP
- Underground thermal storage

Applications
- DHW, space heating & cooling
- process heat

Deep GT (>400m)
- Direct heat use
- Comb heat & power

Applications
- District heating
- Agriculture and industrial processes
- Balneology
- Cooling

Cross Cutting Technologies

APPLICATIONS

DHC
- District heating
- District cooling
- DH&C with seasonal storage

TE Storage
- Water storage
- PCM
- Thermo chemical
- Underground storage (UTES)

Hybrid systems heat pumps
- Innovative system design
- Ground, water and air heat pumps

HP = Heat pump, GSHP = Ground source HP, EGS = Enhanced geothermal systems, DHW = Domestic hot water, GT = Geothermal, UTES = Underground Thermal Energy Storage
RHC-Platform provided a Vision, Strategy and Roadmap for renewable heating technologies

Download: www.rhc-platform.org

Strategic Research Priorities of Solar thermal, Biomass, Geothermal and Cross-cutting ➔ Strategic Research & Innovation Agenda

Technology Roadmaps of Solar thermal, Biomass, Geothermal and Cross-cutting ➔ Common Implementation Roadmap
Special characteristics of the heating market
Why the heating sector is more difficult to be decarbonized than electricity

The heating market

- is **heterogeneous and complex** in regards to owners and operators of heating systems, types of heating technologies and size of heating systems, as well as types and size of heated buildings and objects

- is **strongly dependent on international fossil energy prices**, depending on the specific heating fuel mix of the country, influences competitiveness of renewable energy sources significantly

- is **increasingly connected with the electricity market**, therefore, sustainable solutions require systemic solutions including heating and electricity

- **will depend on the progress in building energy efficiency**
due to significant heat demand reduction by nearly zero energy buildings, however, the level of remaining heat demand is unclear
Conclusions

- Main barriers for heating market development are
  - Competitiveness (price for fossil fuels are often low or subsidized)
  - Complexity of heating systems / concerns on reliability of renewable technologies
  - Integration of electric-heating-(cooling) system must be developed

- High uncertainty on the future energy supply of heat
  - To which level will heat demand be reduced?
  - What can be the share of (renewable) electricity in the heating market?
  - What will be the role of centralized heating infrastructure (district heating)?

- Energy efficiency must be strengthened AND renewable energy sources must be deployed systematically
  - Technological development of efficiency and RES must be accelerated to increase efficiency and reduce costs

- Energy system (electricity – heating – cooling – transport) must be optimized as a whole, since heating is increasingly linked to electricity
Thanks for your attention!

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