Heat sales potentials for bioenergy plants in Germany

UFZ EnergyDays 2018

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Leipzig, 24.09.2018

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AGENDA

- Background: Status quo of bioenergy in Germany
- BE20Plus: project objectives
- Modelling approach
- Results
- Conclusions

BACKGROUND BIOENERGY

Status Quo in the electricity and heat sector

- approx. 14,000 bioenergy plants (BEPs)

→ ca. 8,700 biogas plants

- Installed capacity: approx. 8 GW

→ ~ 4% total / ~ 9% RES

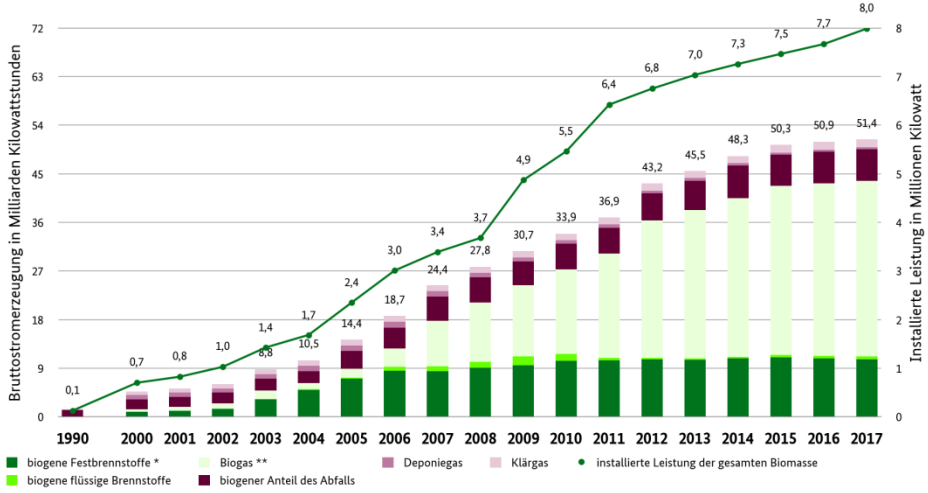
→ due to high capacity utilisation ~ 31% RES

- Heat provision: 148 TWh

Bundesministerium für Wirtschaft und Energie

AGEE Stat

Entwicklung der Stromerzeugung und der installierten Leistung von Biomasseanlagen in Deutschland



* ab 2010 inkl. Klärschlamm; ** inkl. Biomethan; BMWi auf Basis Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); Stand: Februar 2018; Angaben vorläufig

Source: BMWi 2018

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BACKGROUND BIOENERGY
Status Quo

- Majority of BEPs built between 2004 and 2014
- Amendments of the German Renewable Energy Sources Act (EEG) 2014 and 2017 resulted in decline of newly built BEPs and a long term loss of BEPs
- EEG funding ends between 2025 and 2035

→ Loss of app. 40 TWh_{el} renewable energy

→ Loss of app. 22 TWh_{th} renewable heat

→ Loss of flexibility options in the grid

→ Negative impacts on the agricultural, forestry and waste sector

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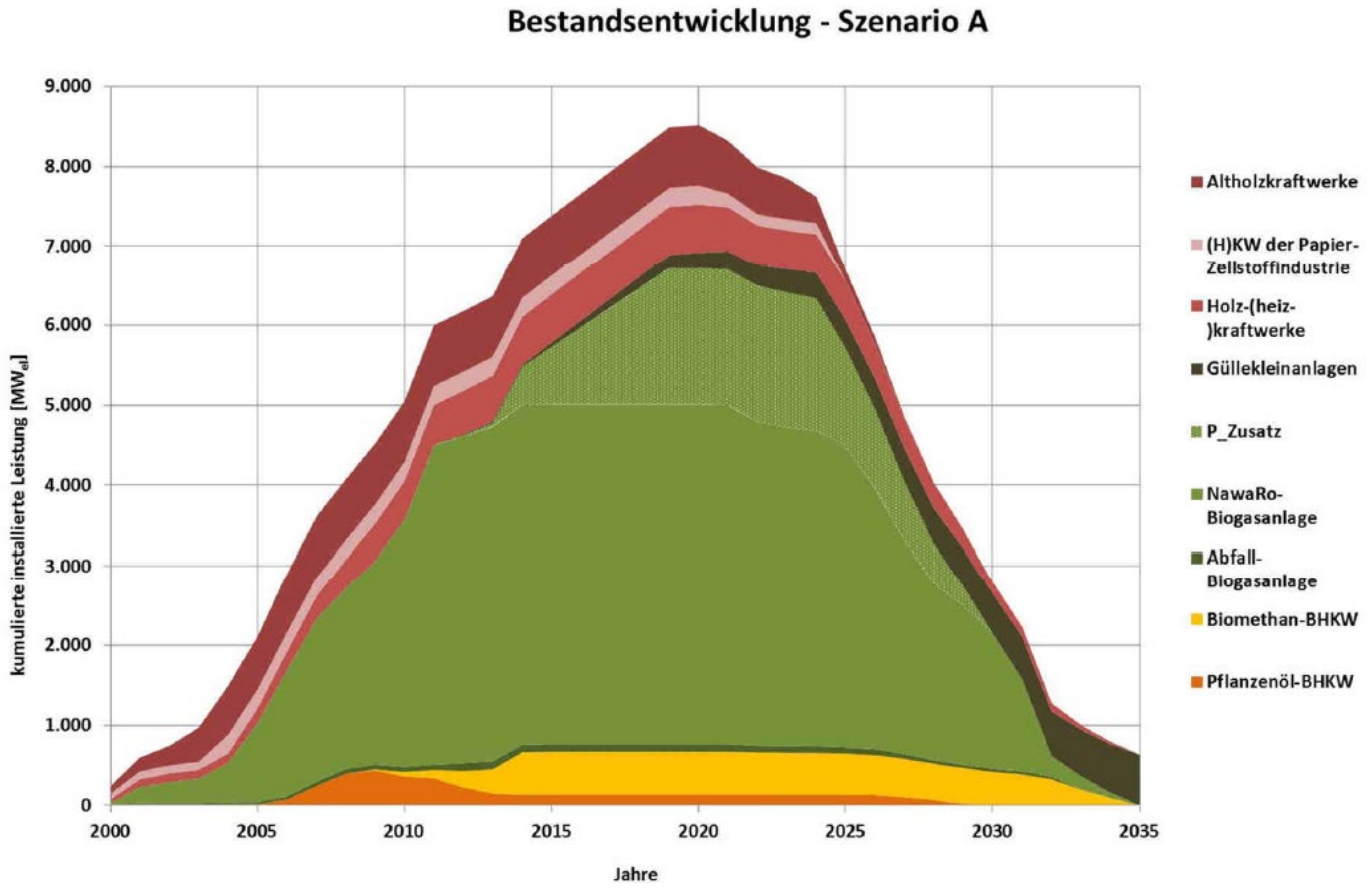
BACKGROUND BIOENERGY
Outlook



Source: Dotzauer et al., 2015, Entwicklung der Biomasseverstromung bei Fortschreibung der aktuellen EEG-Vergütung

BE20Plus
Overview

Bioenergy – potentials, long term prospects and strategies for power plants after 2020 (BE20plus)

Main objective:

*„…to identify and evaluate **aditional revenue streams** on the basis of technical and ecomomical analyses, wich adress operational strategies and perspectives for **existing bioenergy plants** (BEPs)“*

Quelle: Dotzauer, M. 2018: BE20plus Stakeholder-Workshop, 18.04.18, Berlin

Deutsches Biomasseforschungszentrum gemeinnützige GmbH

DBFZ

izes gGmbH Institut für ZukunftsEnergie- und Stoffstromsysteme

Universität Stuttgart IER Institut für Energiewirtschaft und rationelle Energieanwendung

UNIVERSITÄT HOHENHEIM

NEXT KRAFTWERKE

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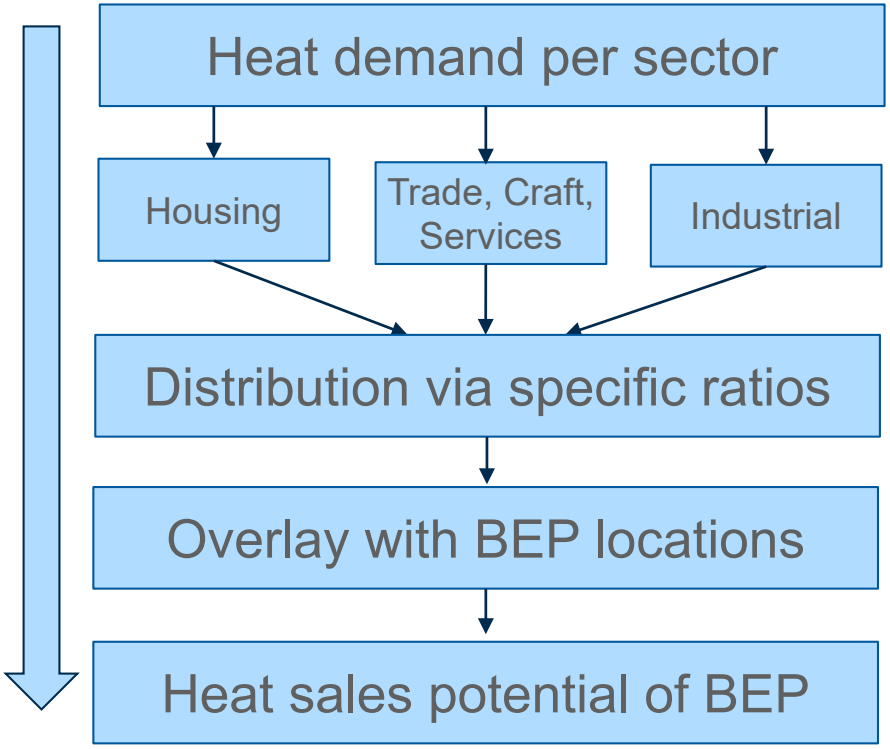
MODELLING APPROACH
Model scheme and input data

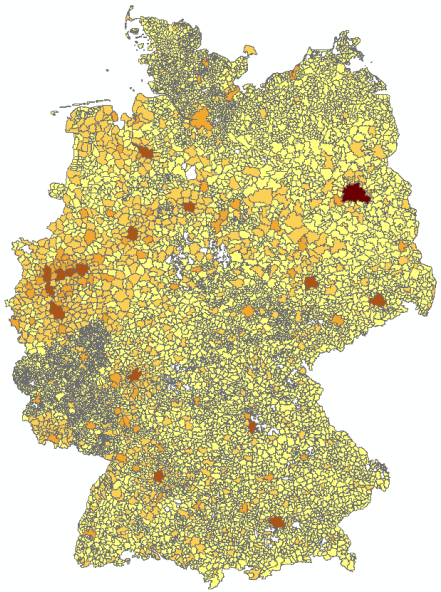


- Top-down-approach
- GIS-Analysis using publicly available data
- Separate analysis for each sector
- Addiditional analysis for „special buildings“
  - Hospitals
  - Schools (different types)
  - Swimming pools
  - Greenhouses

MODELLING APPROACH

Example housing sector

Heat demand on community level → Selection of residential areas → Adjustment through No. of inhabitants → Heat demand on living space level



Heat demand per community =

$$\Sigma\,(a * b * c) + d * e$$

a = Number of buildings

b = heat demand per living space

c = living space by building age and type

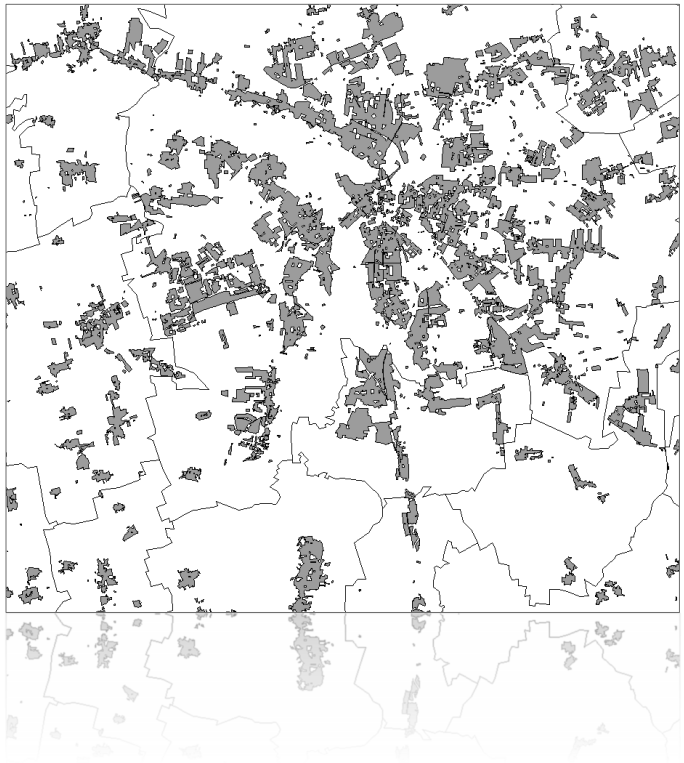
d = Number of inhabitants

e = hot water consumption per inhabitant

MODELLING APPROACH

Example housing sector

Heat demand on community level → Selection of residential areas → Adjustment through no. of inhabitants → Heat demand on living space level

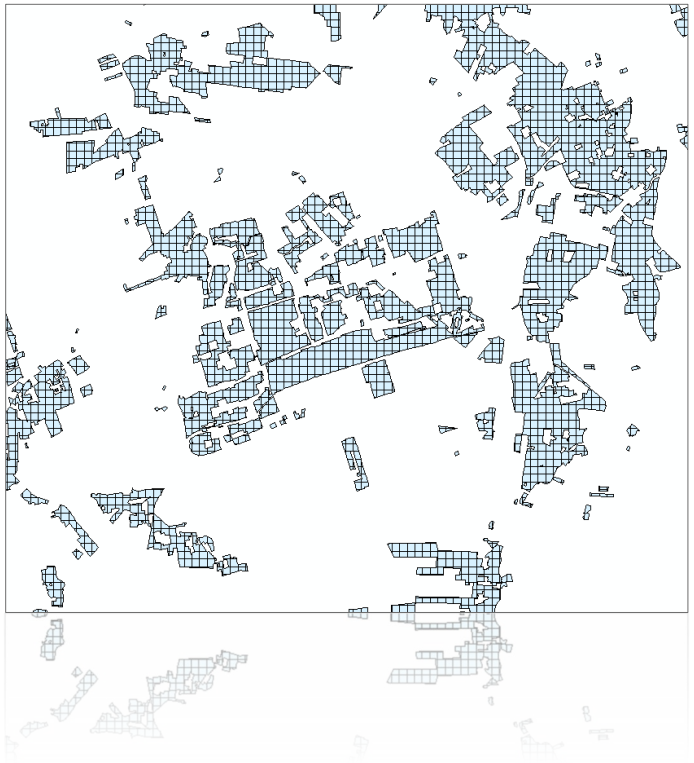


- ATKIS Basis-DLM
- Selection of residential areas
- Definition of ratio residential areas / community area
- Area factor = A single surface / Σ A living space areas

MODELLING APPROACH

Example housing sector

Heat demand on community level → Selection of residential areas → Adjustment through No. of inhabitants → Heat demand on living space level



- Adustment through No. of inhabitants necessary
- Zenus-Data (2011) available von 100m-raster-cells
- Summation of raster-cells for each living space area
- Inhabitant-factor = Σ No. of inhabitants single surface / total population of community

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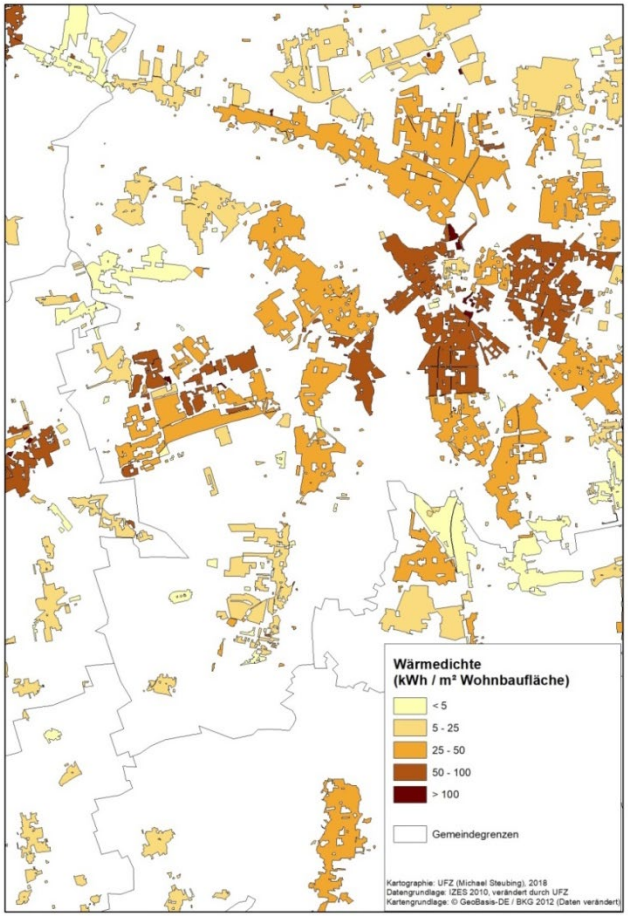
MODELLING APPROACH

Example housing sector

Heat demand on community level → Selection of residential areas → Adjustment through No. of inhabitants → Heat demand on living space level



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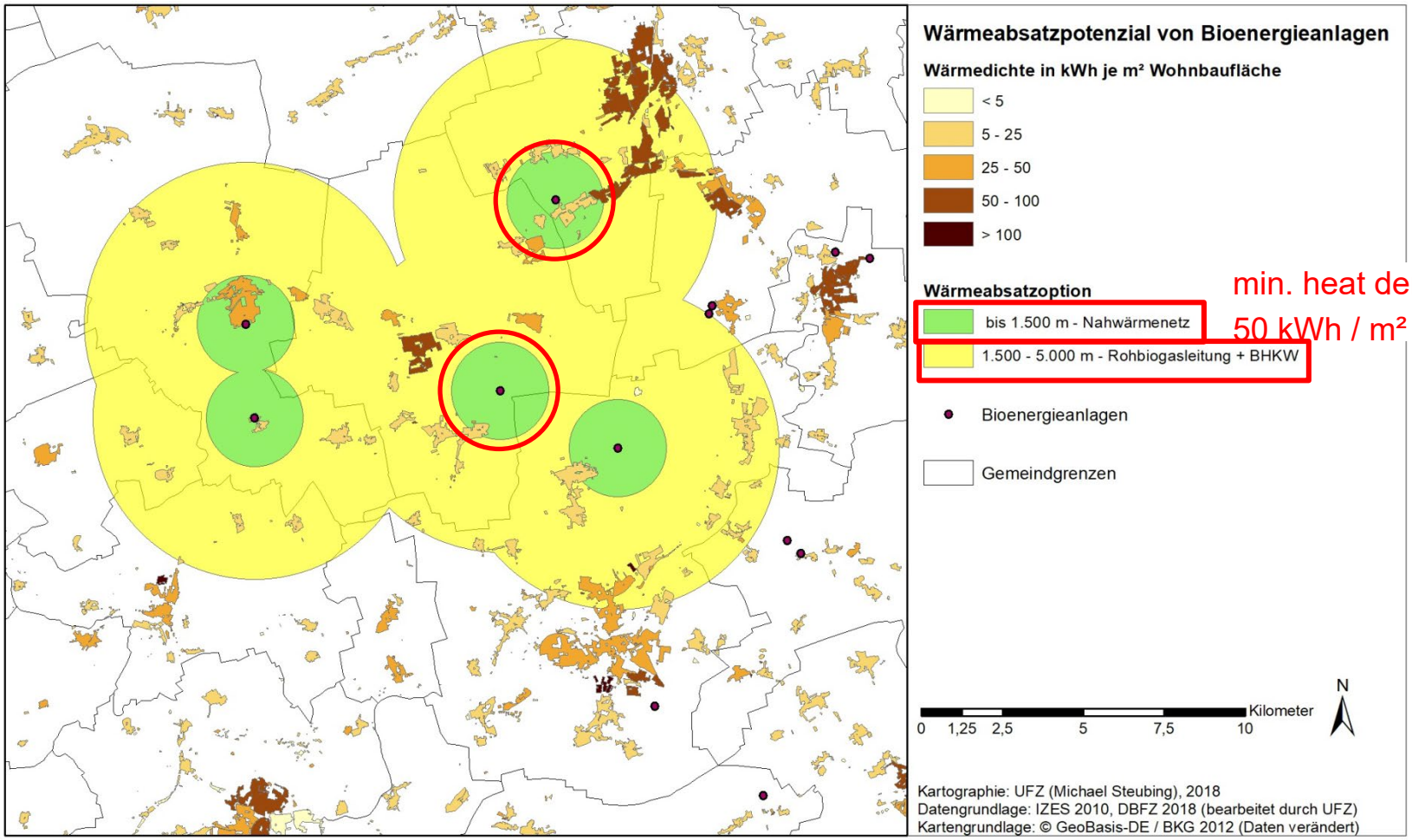
MODELLING APPROACH

Options for local heat networks



min. heat density = 50 kWh / m²

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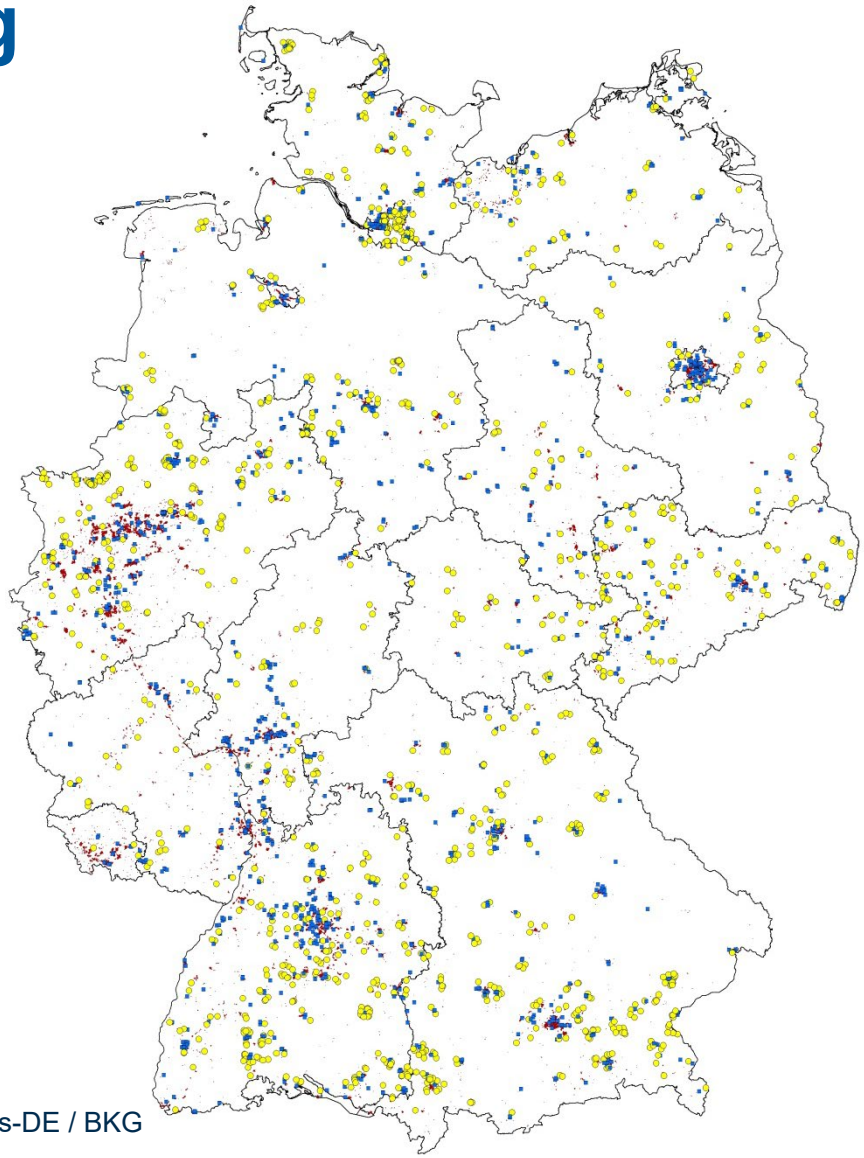
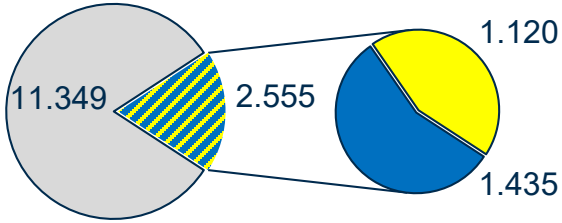
RESULTS
Housing



Kartengrundlage: © GeoBasis-DE / BKG 2012 (Daten verändert)

Number of BEPs with heat sales potential



- no potential
- local heat network
- raw biogas pipeline + CHP

Heat sales potential:
~146 TWH in total
(provisional)

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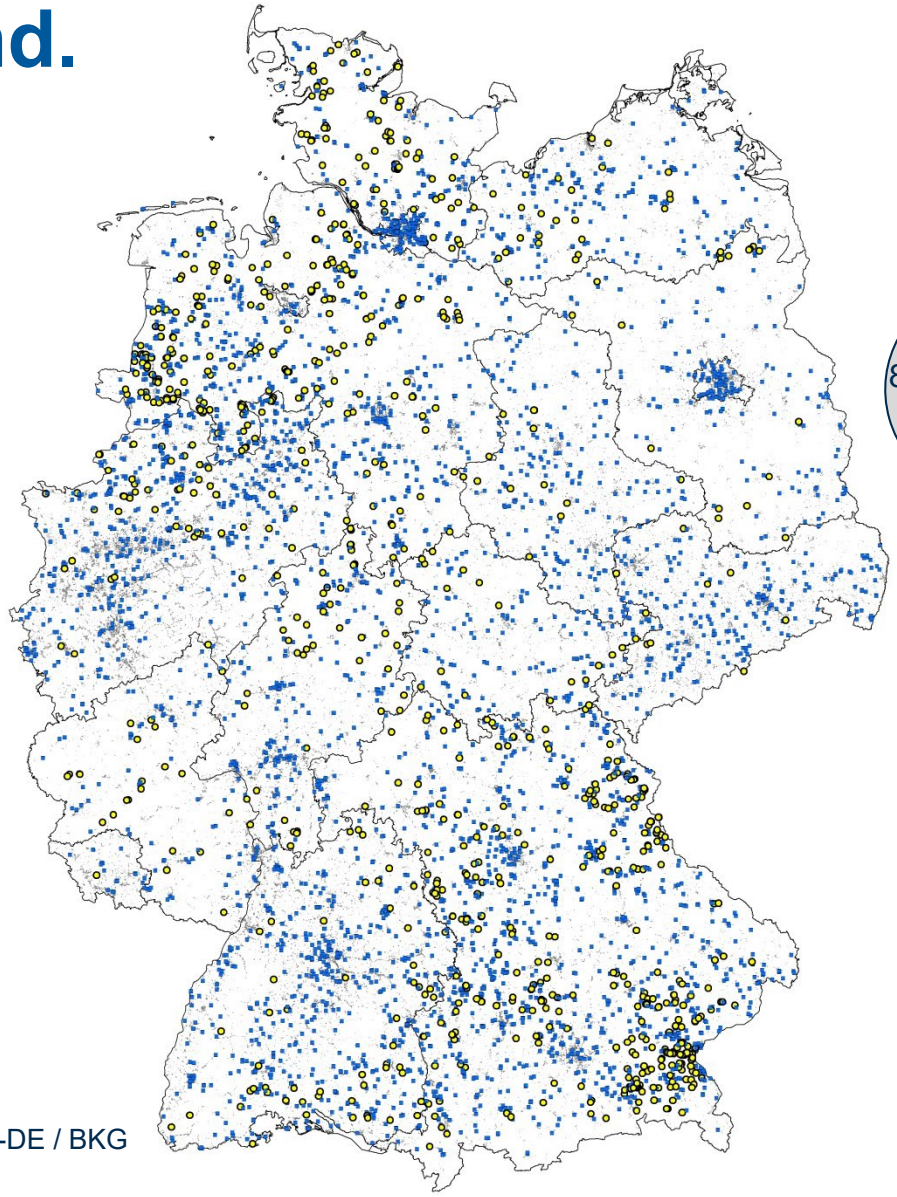
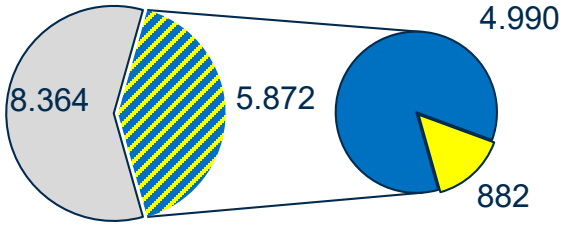
RESULTS PER SECTOR
TCS + Ind.



Number of BEPs with heat sales potential



- no potential
- local heat network
- raw biogas pipeline + CHP

Heat sales potential:
~171 TWH in total
(provisional)

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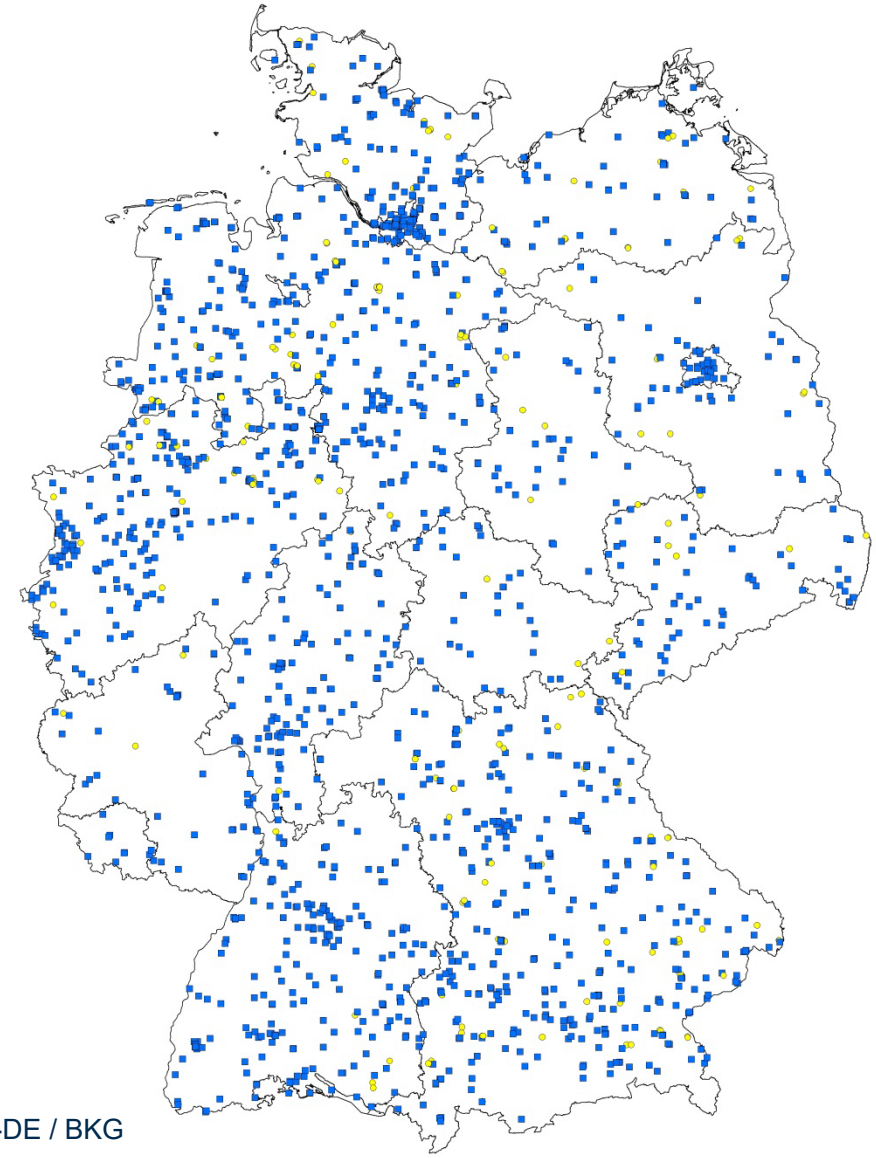
RESULTS
Special



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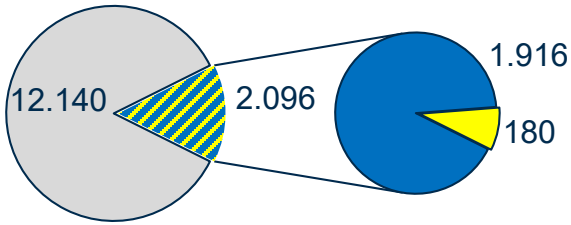
Number of BEPs with heat sales potential



- no potential
- local heat network
- raw biogas pipeline + CHP

Heat sales potential:

~ 3 TWH in total (provisional)

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CONCLUSIONS

- Roughly on third of BEPs in Germany have heat sales potential
  - But: no geographical details or existing heat networks considerd
- Biggest potential in TCS-sector
- To generate additional revenue streams, this potential has to be further exploited
- Time is a crucial factor since investing in local heat networks is a long term decision

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