URB Energy

WP 4 Energy Supply

WORKSHOP 2

DISTRICT HEATING AND COGENERATION

Background information from Germany & Berlin

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moderators:
Ms Aina Bataraga, FORTUM Jelgava

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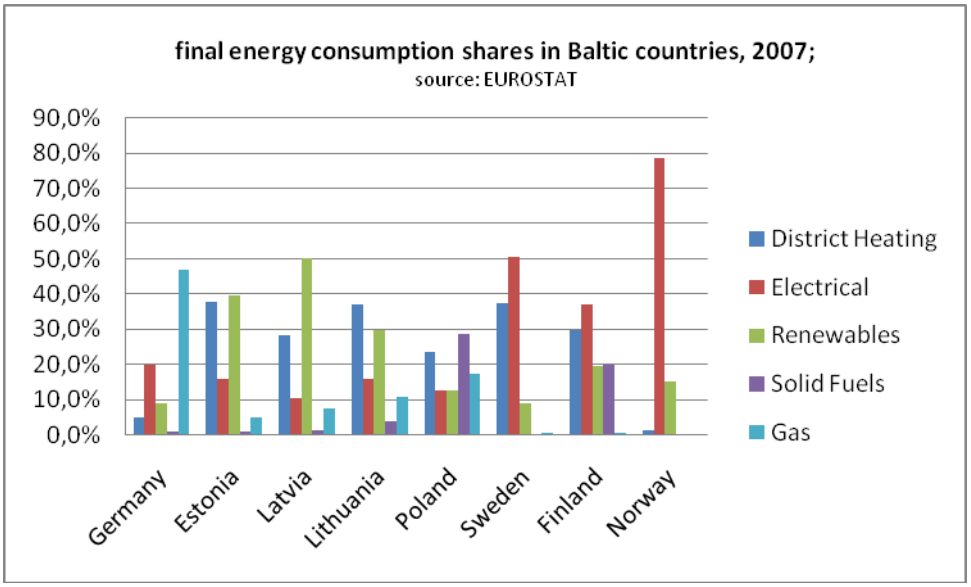
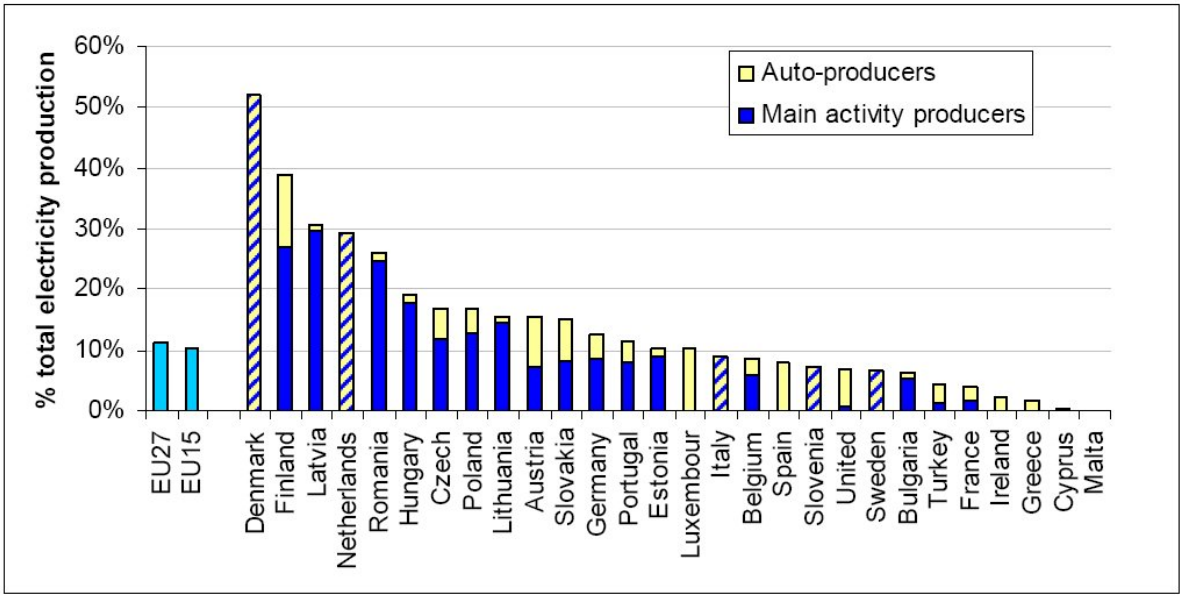
Baltic Sea Region Programme 2007-2013

Share of final energy consumption / district heating in Baltic Sea countries



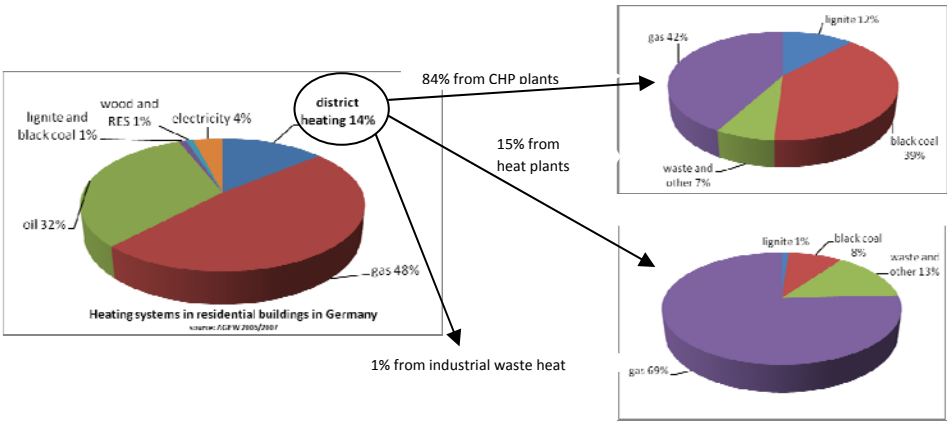
Share of cogeneration in EU-27 in electricity production (2005)



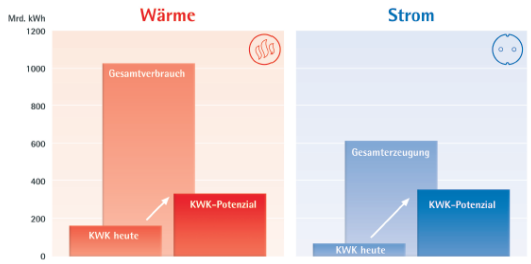
Source: EUROSTAT

BACKGROUND FIGURES GERMANY:

Heating systems:

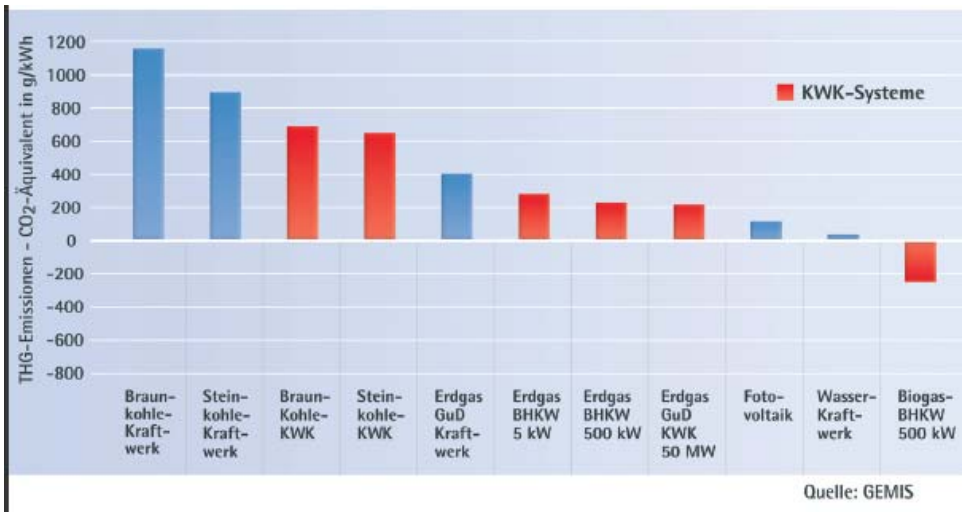


Potential of cogeneration for heat and electricity in Germany



Source: Bremer Energie Institut, DLR 2005

Greenhouse gas emissions –
CO_2 equivalent g/kWh of electricity production systems



Red: CHP systems

Braunkohlekraftwerk – lignite power plant
Steinkohlekraftwerk – black coal power plant
Braunkohle KWK – lignite CHP
Steinkohle KWK – black coal CHP
Erdgas GuD Kraftwerk - Gas and Steam power plant
Erdgas BHKW 5 kW – Gas Block CHP 5 kW
Erdgas BHKW 500 kW – Gas Block CHP 500 kW
Erdgas GuD KWK 50 MW - Gas and Steam power plant CHP 50 MW
Fotovoltaik- Photovoltaic
Wasserkraftwerk- HydroPowerplant
Biogas BHKW 500 kW- Biogas Block CHP 500 kW

Heat supply policy in Germany[1]

1. **Energy saving Act 2009** (EnEV 2009): decommissioning of night storage heaters[2]

2. **Heat Act (EEWärmeG): Increase share of RES from 6% (2006) to 14% (2020)** All owners of new buildings must cover part of their heat demand from renewable energy sources. Share is specified according to which energy source is used:

- solar radiation, at least 15 percent
- biogas, at least 30 percent
- all others, at least 50 percent.
  (Act can be extended to existing buildings on Länder level)[3]

3. Amendment to the **Heating Costs Ordinance** (HeizkostenV) which increases consumption share in allocation system (fix and consumption share)

4. Amendment to the **CHP act (KWKG)**

- double electricity production from CHP to 25% by 2020
- funding of high efficiency CHP plants
- feed-in tariff for electricity (12,5-14,5 ct/kWh), new: same tariff for self suppy

Advantages and Disadvantages of District heating:
(Source: institute for energy engineering, TU Berlin)

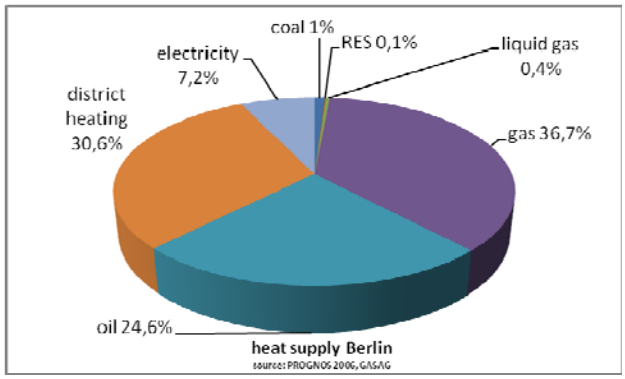
+ less fireplaces in town
  → lower local emissions
  → less dangers of fire and explosions

+ comfortable for comsumers
  → little space needed in house
  → little maintenance

+ in connection with cogeneration
  → primary energy and CO_2 savings

- higher energy losses in pipelines
- only profitable in densely populated areas
- construction of pipeline route is expensive, especially in existing built areas

Heat supply in Berlin:



District heating (DH) background information Berlin:

→ around 30% of Berlin is supplied with district heating
→ around 92% of district heating is produced from CHP plants
→ 42% of electricity production in Berlin is produced from CHP plants
→ length of district heating grid: 1.450 km
→ additional 280 block heat and power plants

Energy providers

→ Vattenfall largest DH provider supplies more than 1,000 000 households

Renovation/ costs

→ around 20% of the grid have been renovated since 1990

→ Costs for renovation/renewal of pipelines: Ca. 500 EUR/m (House transfer connection DN20) and up to 2,500 EUR/m for main pipeline DN 500.

Heat losses

→ the heat losses of the grid amount (depending on various grid parameters) 12-15,5% before renovation and 6,5-10% after renovation

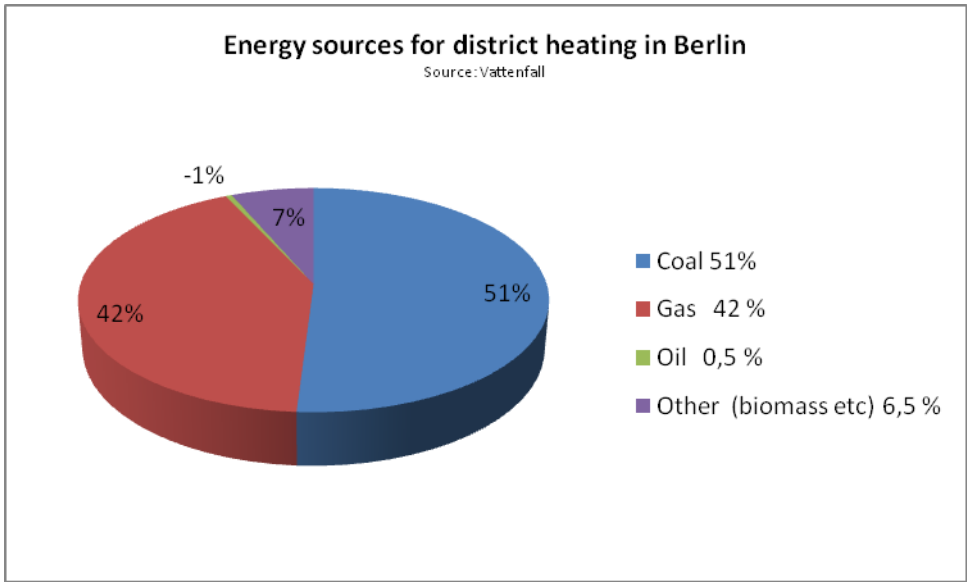
Current development

→ newly connected households: around 20,000 every year

CO_2 effect

→ average CO_2 effect: 1 t CO_2 saved per newly connected household

Energy sources for district heating in Berlin



Potential for improvement in Berlin

(according to Bremer Energie Konsens):[4]

→ share of fossil carbon based fuels still high (57% for heat, 75% for electricity)
→ conversion to gas (in connection with new built Gas and Steam heat power plants) could increase electricity production by 15% and a CO_2 reduction of 33% (-2.7m t CO_2)

Potential strategy

(according to Bremer Energie Konsens):

→ develop heat atlas displaying each building
→ allow lead time in planning of local and district heating extension (client-friendly)
→ make use of connection opportunities in the process (new buildings, refurbishments)
→ emphasize connection activities

- provide low district heating prices
- enact compulsory connection and use for certain areas

Problem in Berlin:

- district heating and gas grids were sold (less influence)
- majority of district heating grid is owned by Vattenfall Europe (monopoly)

Overview of district heating grid of Berlin:

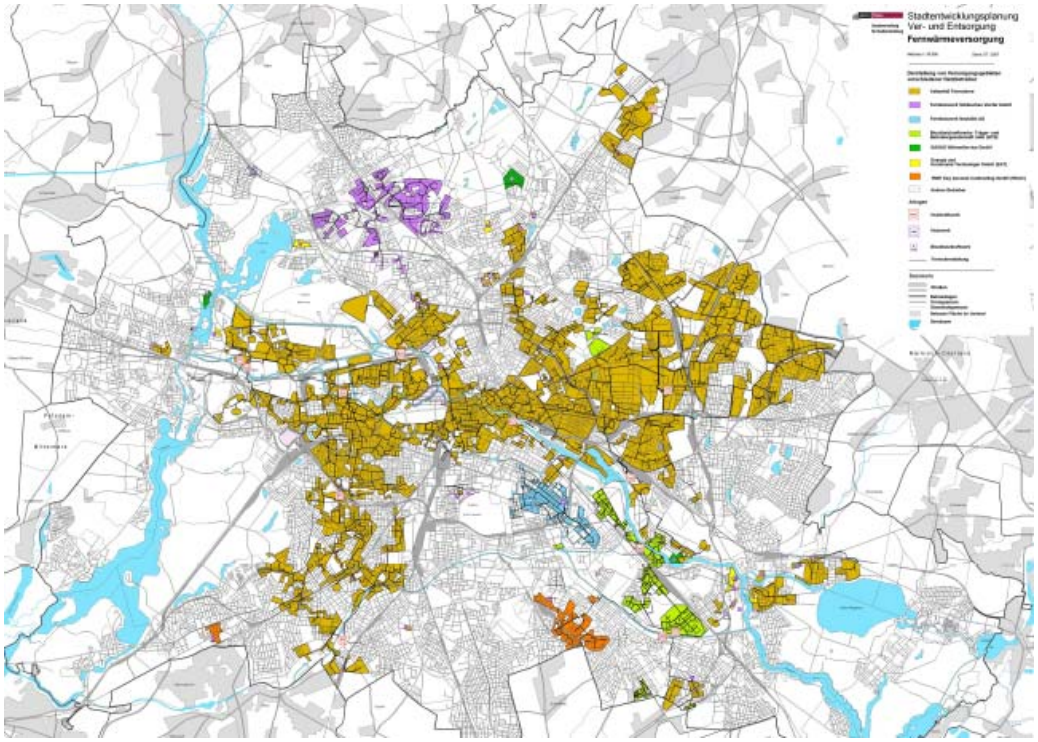
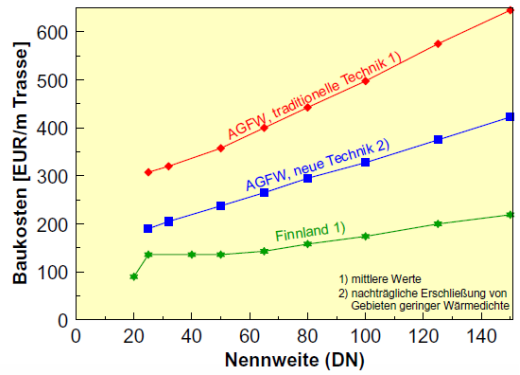


Fig. district heating grid Berlin, brown: Vattenfall grid
Source: Senatsverwaltung für Stadtentwicklung

Costs for construction of DH pipelines [€/m pipeline] in relation to pipeline size in Germany and Finland[5]



Source: AGFW, DLR

Sources:

[1] http://www.bmwi.de/BMWi/Redaktion/PDF/E/eckpunkt-fuer-ein-integriertes-energie-und-klimaprogramm,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf

[2] http://www.bmwi.de/BMWi/Redaktion/PDF/E/eckpunkt-fuer-ein-integriertes-energie-und-klimaprogramm,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf

[3] http://www.bmu.de/files/pdfs/allgemein/application/pdf/broschuere_waermegesetz_bf.pdf

[4] http://www.berliner-energietage.de/uploads/tx_seminars/3.3_Innovative_Fernwaerme_Schulz.pdf

[5] http://www.bmu.de/files/erneuerbare_energien/downloads/application/pdf/2007-03-14_nast_nahwaerme.pdf