Waste Heat in District Heating Systems
ReUseHeat

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ReUseHeat

Recovery of Urban Excess Heat

- 16 Partners from 10 countries
- 4 Demo-Sites
- H2020 Research and innovation (Horizon 2020)
- October 2017 - September 2022

  (1 year extension due to COVID-19)
- funding: 5 Mio. €
- more info: https://www.reuseheat.eu/

ReUseHeat

Recovery of Urban Excess Heat

What do you think is the potential of waste heat in the EU w/o industrial sources?

Die Demo-Projekte

- Berlin – Metro Station cooling
  - Partner: OCHSNER (HP producer) + Vattenfall
- Madrid – cooling process in hospital
  - Partner: Asime
- Nizza – sewage water
  - Partner: EDF
- Braunschweig – data center
  - Partner: BS|ENERGY + Veolia

Potential EU (nearby DH systems)

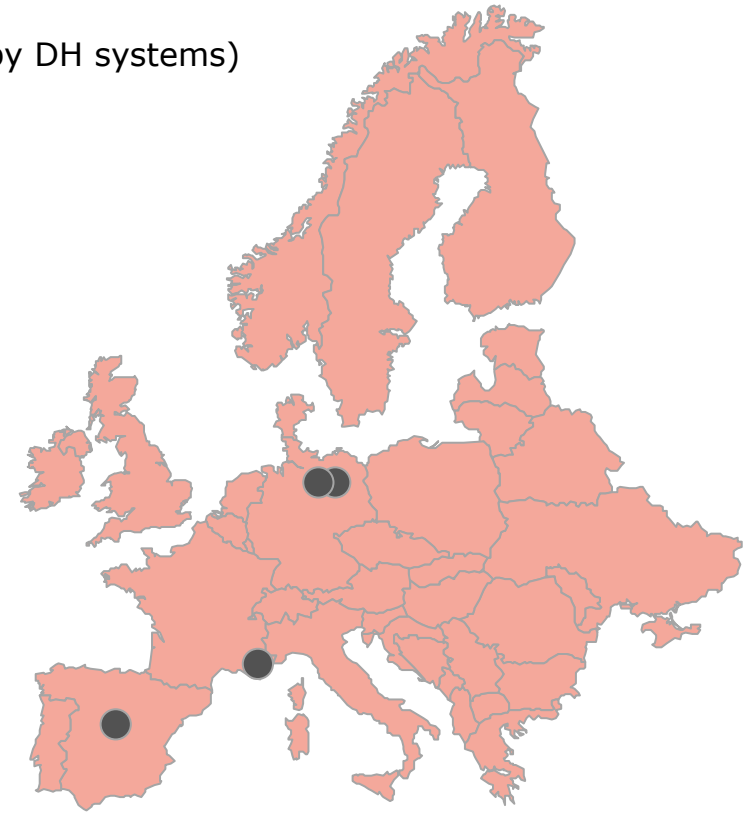
6,7 - 11,2 TWh/a

3,3 - 10 TWh/a

150 TWh/a

48 TWh/a

~ 220 TWh/a



EU28: 2.625 TWh/a (2015, residential)

data centers = waste heat source

- most of electricity in IT is converted to heat
- cooling system up to 40 % of total energy costs in data centers
- rise in data center consumption (56 TWh in 2007, ~ 104 TWh in 2020)

→ waste heat use makes sense (decarbonisation for district heating + energy savings for data center operators)

The city of Braunschweig

- 2nd largest city in Lower Saxony
- 250.000 inhabitants
- science center/focus (universities,private research)
- heat supply by BS|ENERGY (district heat and natural gas)

Demo Site

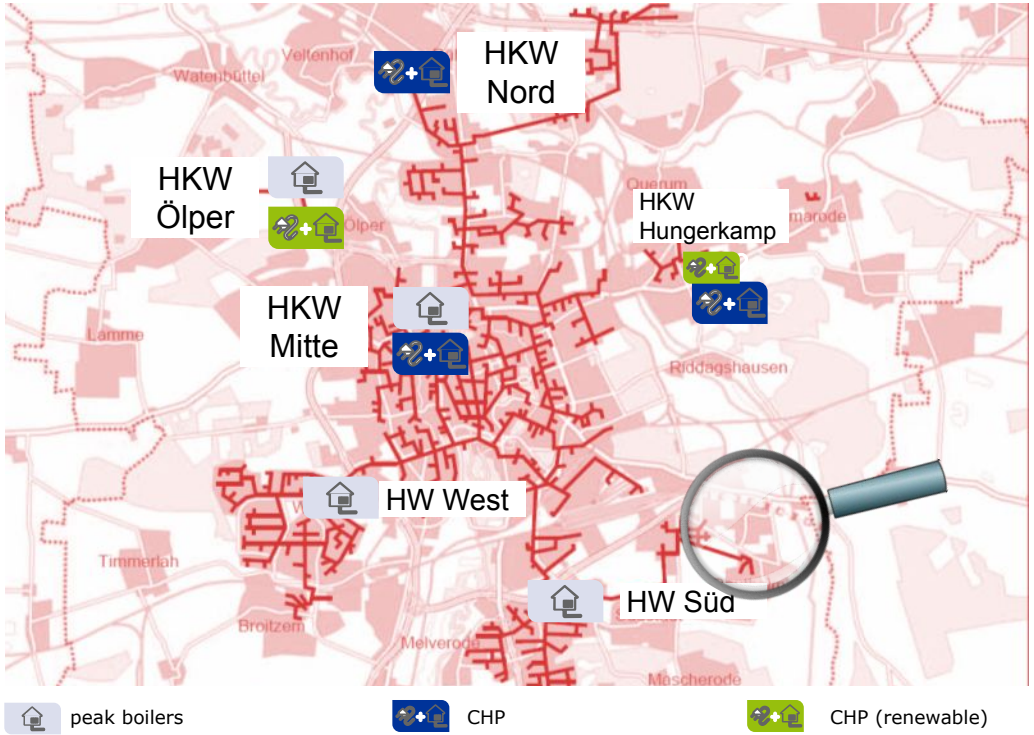
Geplantes Gewerbegebiet

Energy generation

data center

residential area (400 AU), 21 ha property

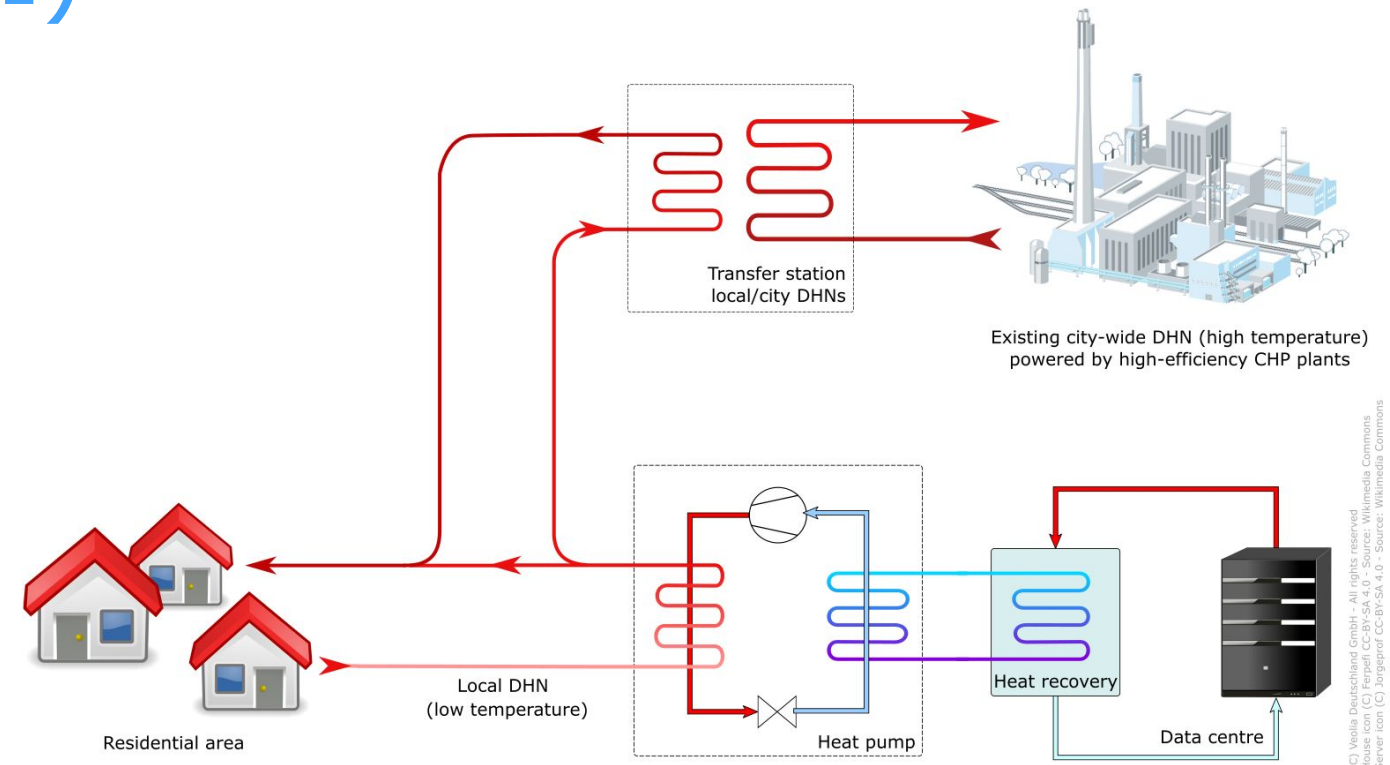
existing high-temperature district heating



On-site,01.2017

energy concept (I)

- bypass in cooling cycle of data center (ca.25 °C)
- external heat exchanger for the waste heat (outside of data center)
- heat pump use to rise the temperature to supply flow (~ 70°C)
- peak load coverage by existing district heating system (CHP powered)



Wohngebiet:

~ 400 Wohneinheiten

Rechenzentrum:

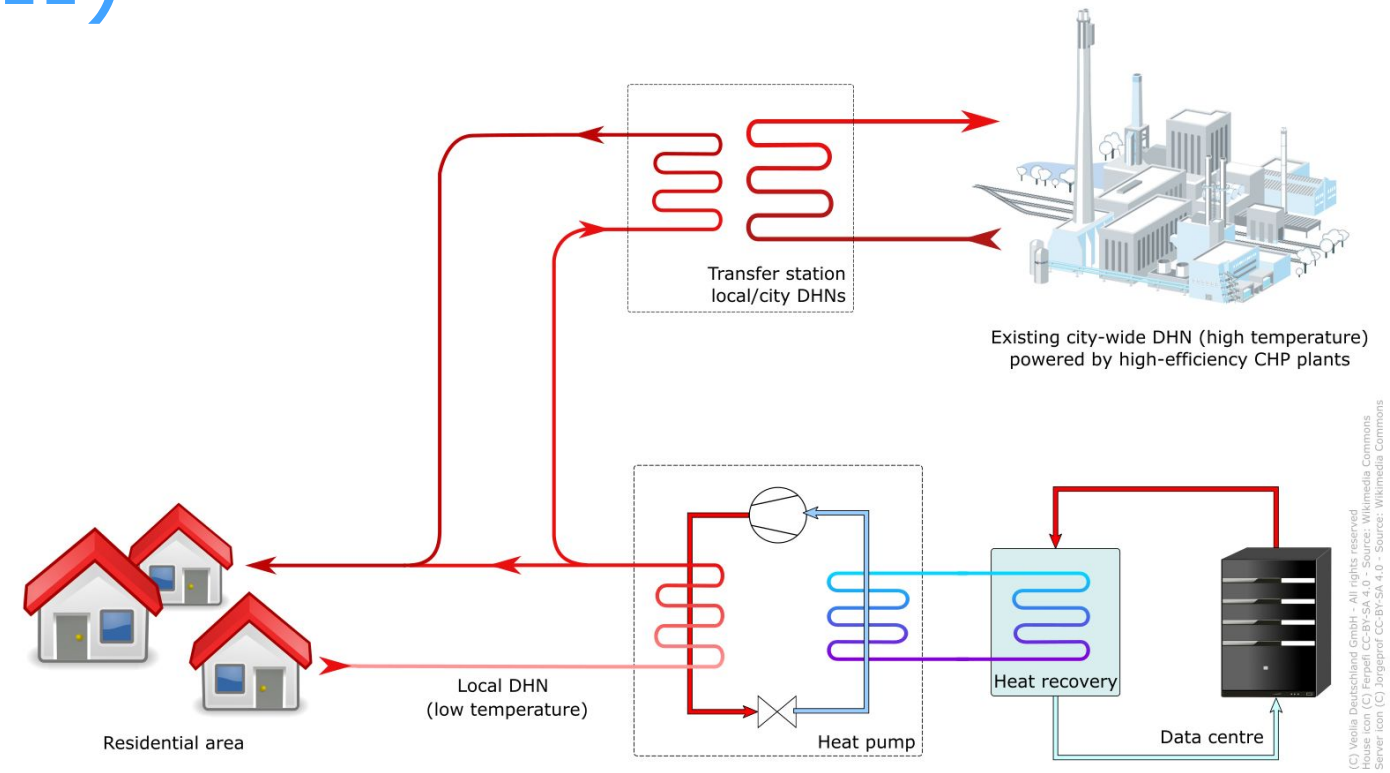
~ 250 kW Abwärme genutzt

~ 10 MW_{th} verfügbar

energy concept (II)

- supplied area > 48.000 m²
- length of low-temperature network: 2.750 m
- connection to district heating (HT): ca. 670 m

  length of waste heat cycle: ca. 220 m
- heat from waste heat: 2.300 MWh/a
- expected SPF: 3,6
- CO_2-reduction: **ca. 300 t/a** (ca. 130 g/kWh)



residential:

~ 400 AU

data center:

~ 10 MW total cooling loaf

~ 250 kW used in DH system

choice of heat pump

→ sustainability all over

thermeco2

HHR 45- HHR 1000

Provider - Engie

requirements working fluid:
- non-toxic
- non-flammable
- low GWP

-> **CO_2 heat pump** was chosen

On-site,10.2018

HP delivery 03.2019

On-site, 10.2019

challenges

law/ordinance/funding:

- changing funding possibilities over project time (more attractive available)
  → goal must be that no funding is needed
- contracts between data center operator and energy supplier (delivery obligation etc.)

economics:

- uncertainties regarding future electricity prices → maybe use of long-term delivery contracts
- higher investments
- higher risks compared to environmental heat sources

location:

- data center must be located nearby data center
- competition with existing DH systems (here CHP heat)

risks

availability of waste heat

- delay in data center commissioning (COVID) - no waste heat

- risks in future necessities → maybe change in data center operator strategy → closing of data center or lower than expected installations

→ use of waste is different than "classic" heat generation facilities, divergence of supply and demand

opportunities

high potential of waste heat in cities

- waste heat is a huge potential for decarbonisation of heat supply (green electricitry is available more easily than green heat)
- many heat sources in cities available (industry, sewage water, ….)
- important: definition of prerequisites for decentralized feed-in (hydraulics, prices/bonus etc) needed

→ In new district heating system and in renovation of existing DH waste heat can play a major role!

Questions?