ASIA CLEAN ENERGY FORUM 2025
Empowering the Future: Clean Energy Innovations,
Regional Cooperation and Integration, and Financing Solutions
2–6 June | ADB Headquarters, Manila

DORNIER Group

Thematic track Session 1.4.
Unlocking Potential Emerging Energy Resources

5th June 2025 | 11.00 AM –12.30 PM

Innovative district heating and cooling – case studies from successful projects in Europe

Dr. Ilka Lewington
Head of Markets
and Regulation

Tim Nowak
Team Lead Consulting
Renewable Heat Supply

Julian Feller
Project Engineer
Renewable Heat Supply

The Dornier Group

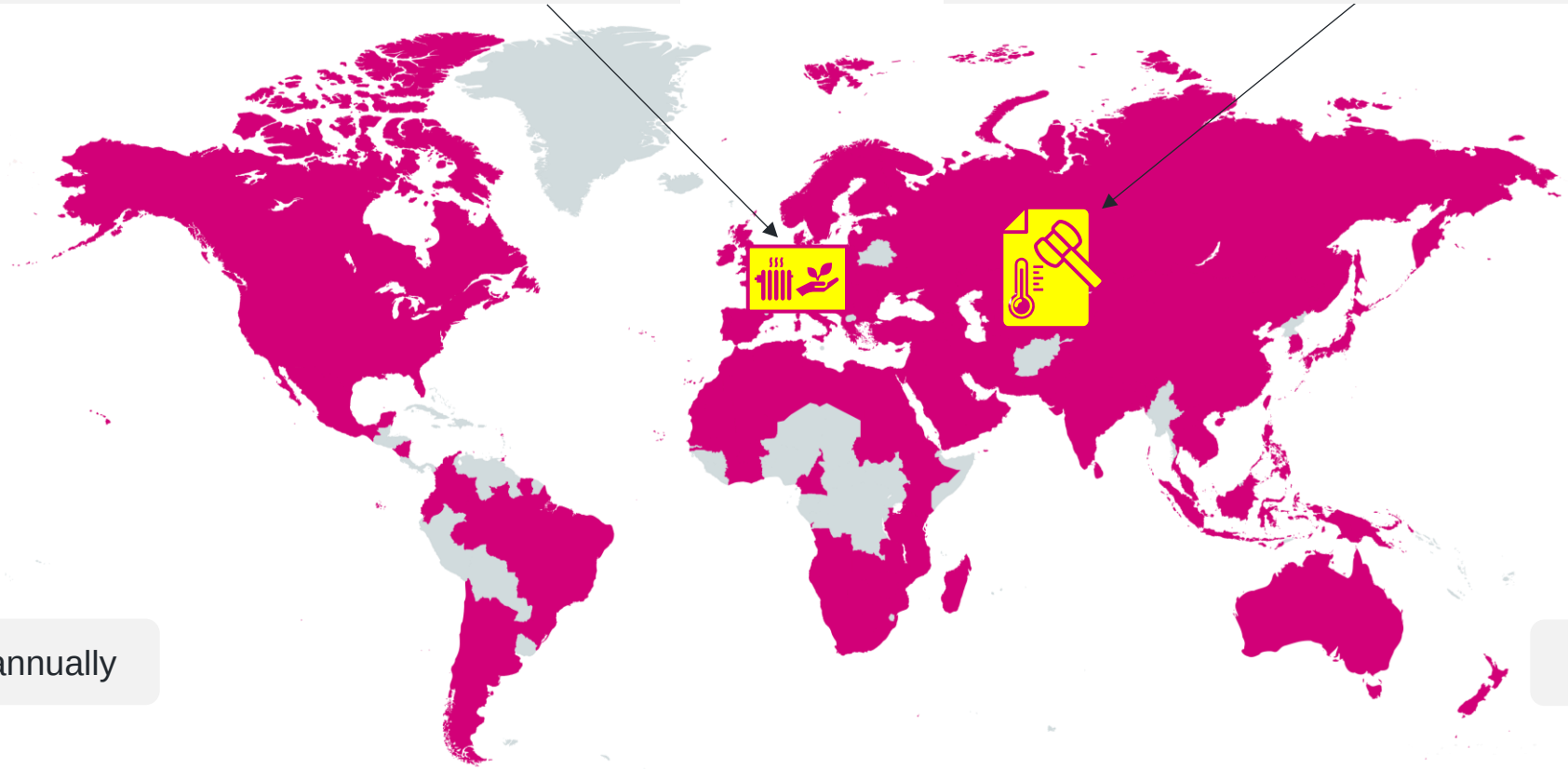
…with a global footprint

German Heat Sector Transition (Wärmewende)

more information [1]

Heat Sector Legislation in Kazakhstan

more information [2]



60 YEARS

of market experience

100 MILLION €

turnover in 2023

900 PROJECTS

completed on average annually

600 EMPLOYEES

worldwide

23 SUBSIDIARIES

distributed across

15 COUNTRIES

Europe, MENA, APAC

1 | https://dornier-group.com/dienstleistung/kommunale-waermeplanung-transformationsplaene-und-machbarkeitsstudien-fuer-waermenetze/
2 | https://www.youtube.com/playlist?list=PLSvhvfIMBPc0Ls0hNdhdC4QImaaP5EitE

The Story of Transition to Sustainable Heating

Heating (and cooling)

the ultimate decarbonization candidate

Sustainable district heating

the concept, the components, the potential and the challenges

Implementing the transition to sustainable district heating

methods, tools and instruments

Source: https://www.kesselheld.de/fernwaermeleitung-preis/

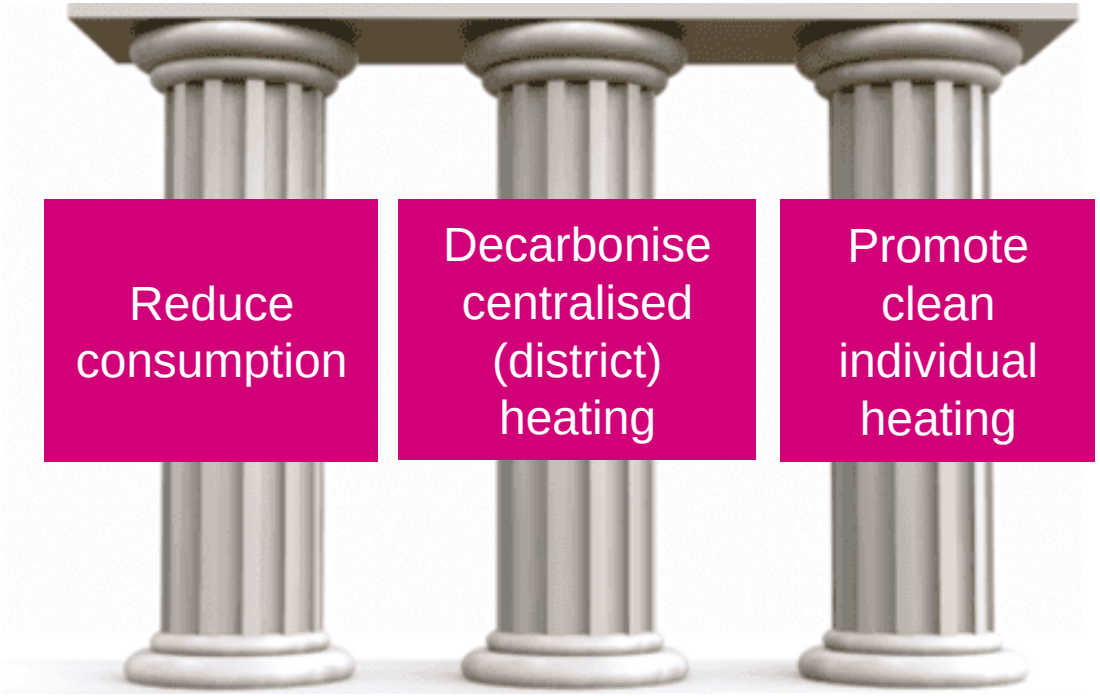
Source: https://www.kesselheld.de/fernwaerme/

Heating (cooling) and decarbonisation

- High share of countries' energy consumption 50% (households)
- Low use of renewable Energy, e.g. 83% fossil for space heating (EU, CA)
- Low CO_2 abatement costs, e.g. Kazachstan 10-40 \$/tCO_2
- Opportunities for diverse and local engagement
- Opportunities to directly improve social justice

⚠

The heating and cooling sector could/should be the **prime candidate for decarbonisation** in many countries.



Three pillars of heat sector decarbonisation
(source: WorldBank)

Sustainable district heating – the concept

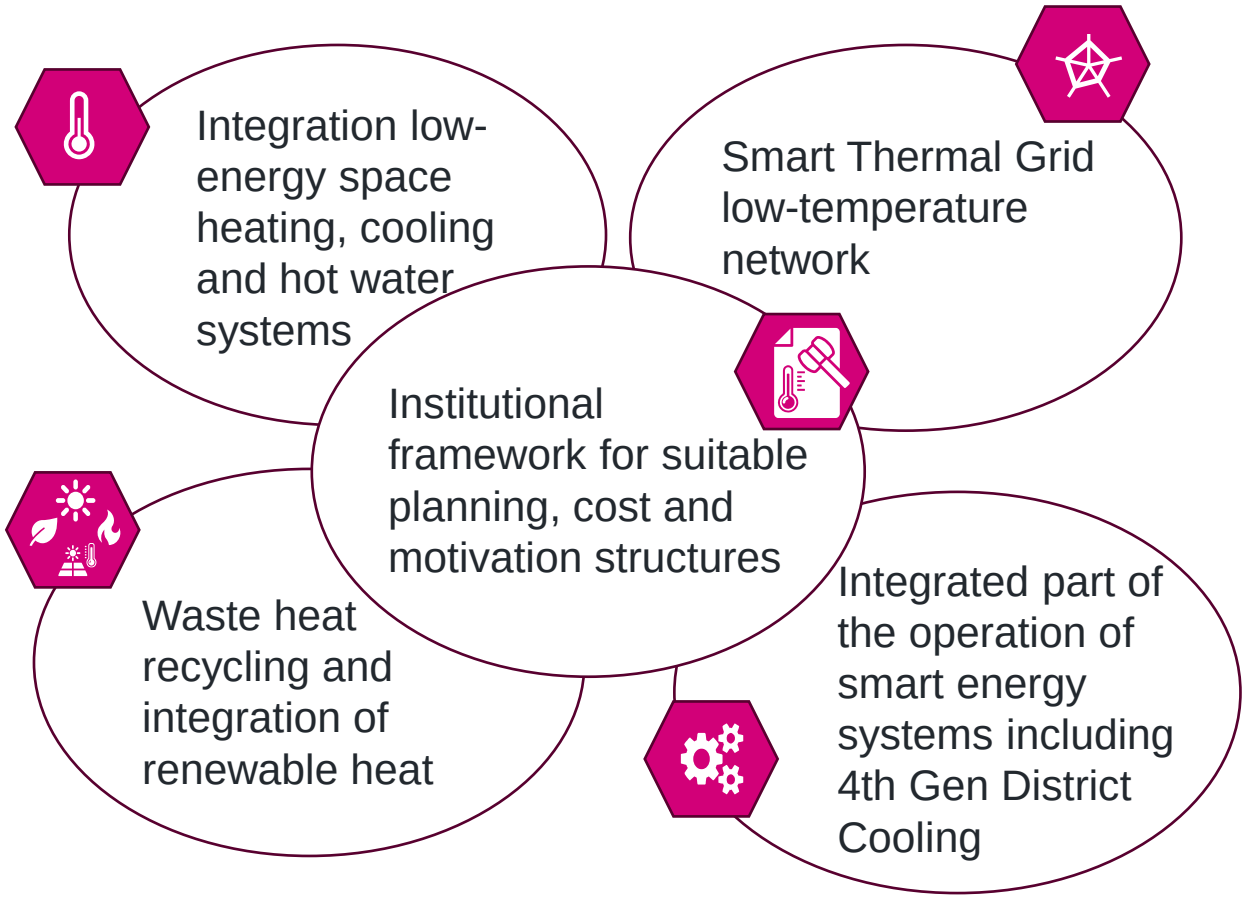
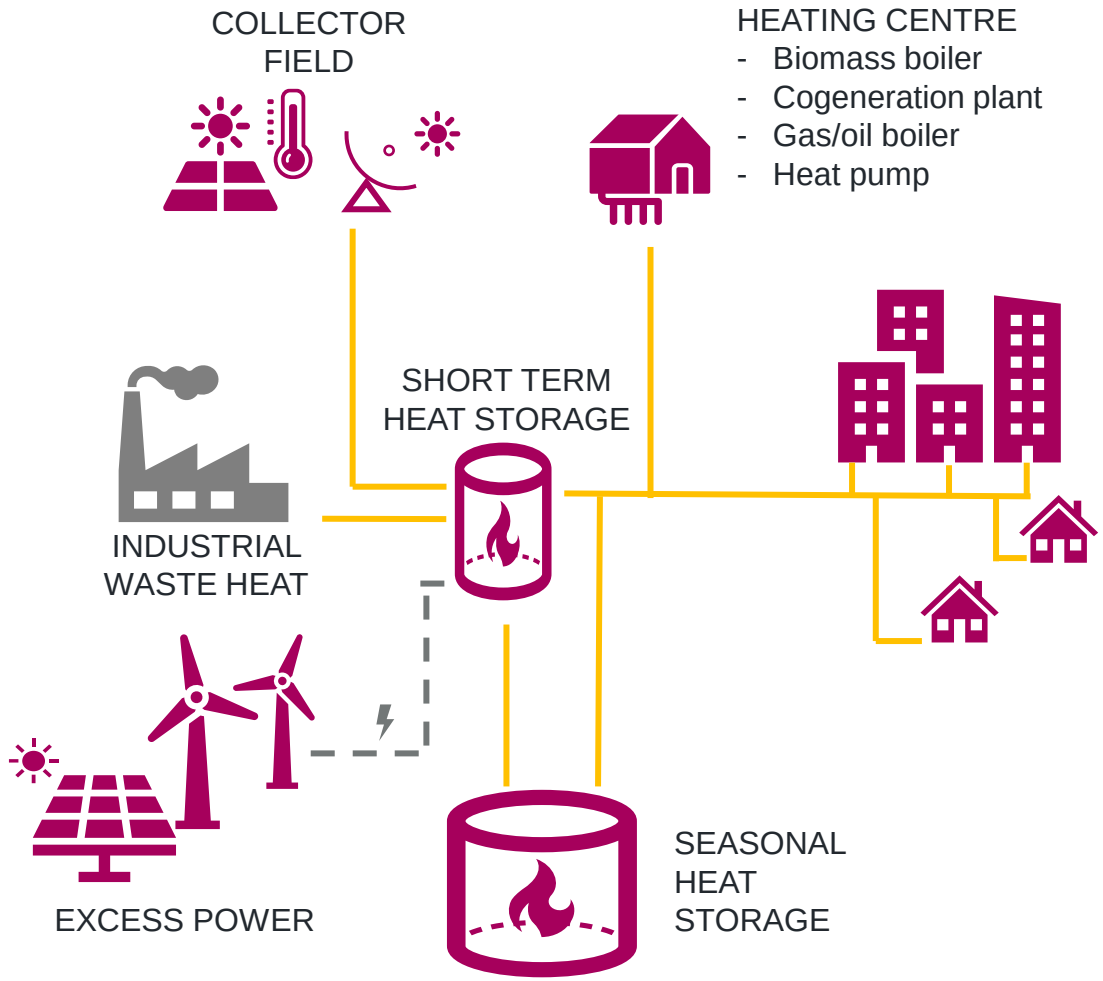


Illustration of the concept of 4th Generation District Heating including smart thermal grids



Sustainable district heating – the components

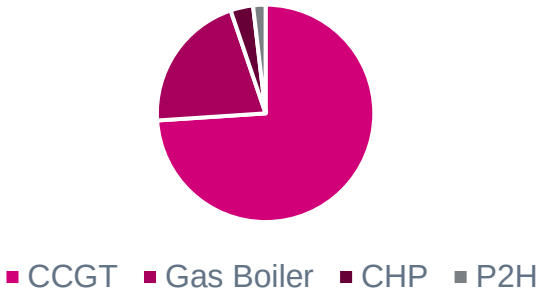
Wide range of technologies and combinations

- Potential for Renewable Heat
  - Solar Thermal
  - Rivers, Lakes, Sewage, Groundwater
  - Deep-Geothermal
  - Waste Heat Data Centre
  - Industrial Wasteheat
  - Biomass, Biogas
  - H_2 CHP – Potential with Hydrogen
  - Sector-Coupling with E-Grid
- \+ Heat Storage
- Suitable Technology for Heat Generation
- Heating Network, Pipelines, Pumps, Heat Exchangers
- High density heat demand
  - Mostly in urban areas with high density population or industrial areas, including industrial heat process heat demand
- Planning & Optimization Tools

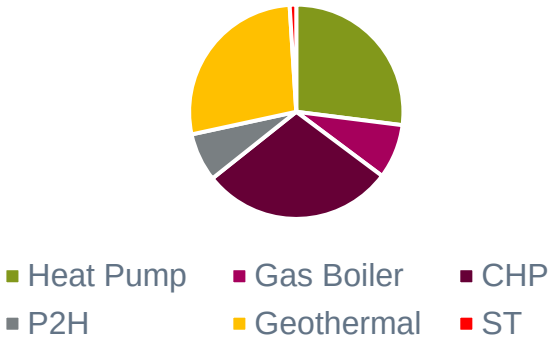
Sustainable district heating – the potential

Concept case study 1: a city with approximately 200,000 inhabitants in the eastern part of Germany

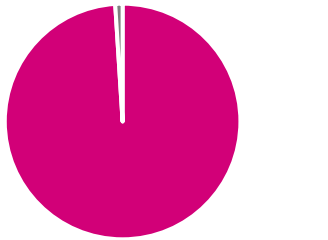
Share of Heat Generation by Technology in 2023



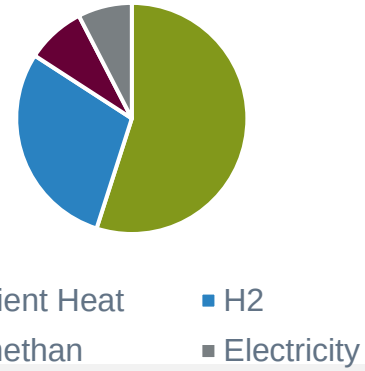
Share of Heat Generation by Technology in 2045



Share of the fuel sources in 2023



Share of the fuel sources in 2045



Main Parameters	2023	2045
Energy consumption per year [GWh]	598	762
Max Capacity [MW]	285	485
Network length [km]	215	336
Temperature [°C]	125/62	80/30
Emissions [t CO_2]	72.902	0

If both the hydrogen and the electricity for the P2H system are sourced entirely from renewable energy, the resulting CO_2 emissions are calculated to be zero.

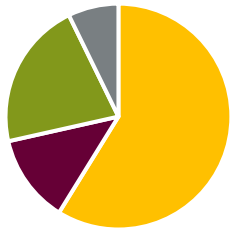
The CAPEX for the full transformation plan is estimated at 664 Mio.€

Sustainable district heating – the potential

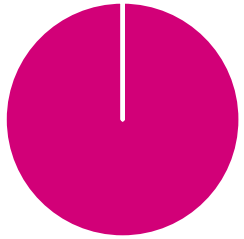
Concept case study 2: a residential area in the western part of Germany with 270 house connection stations

Share of Heat Generation by Technology in 2023

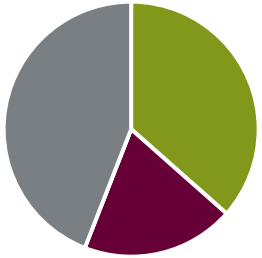
Share of Heat Generation by Technology in 2045



Share of the fuel sources in 2023



Share of the fuel sources in 2045



Main Parameters	2023	2045
Energy consumption per year [GWh]	13,6	20,5
Max Capacity [MW]	5	12,9
Network length [km]	3,6	5,5
Temperature [°C]	90/60	80/40
Emissions CO_2 [t CO_2]	3.422	659

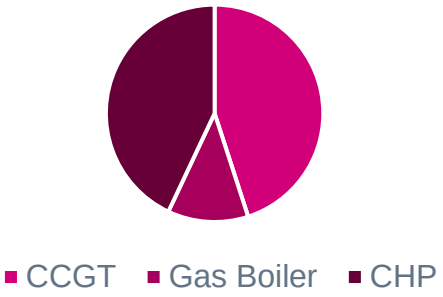
If both the hydrogen and the electricity for the Geothermal system are sourced entirely from renewable energy, the resulting CO_2 emissions are calculated to be zero.

The CAPEX for the full transformation plan is estimated at 33 Mio.€

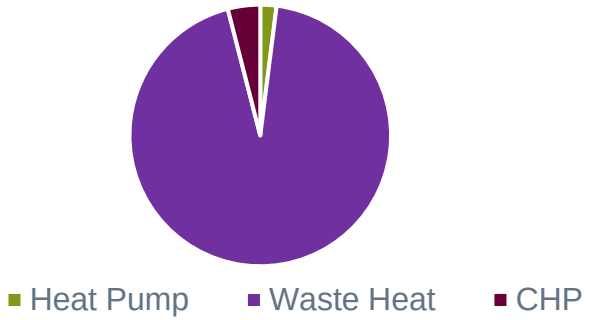
Sustainable district heating – the potential

Concept case study 3: a city with approximately 80,000 inhabitants in middle Germany

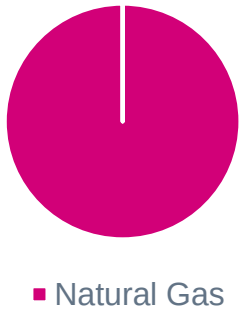
Share of Heat Generation by Technology in 2023



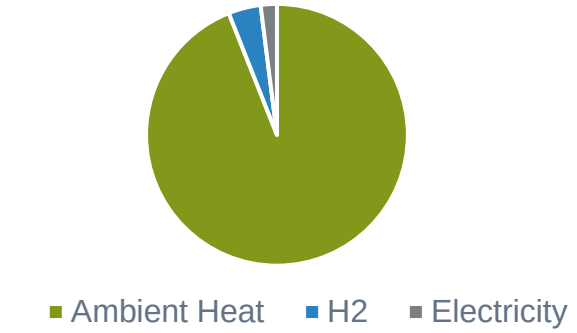
Share of Heat Generation by Technology in 2045



Share of the fuel sources in 2023



Share of the fuel sources in 2045



Main Parameters	2023	2045
Energy consumption per year [GWh]	242	142
Max Capacity [MW]	145	147
Network length [km]	130	130
Temperature [°C]	125/62	85/40
Emissions CO_2 [t CO_2]	99.184	875

The primary heat source is the waste heat from a large algae production facility. This waste heat can be used directly and fed into the heating network. The CAPEX for the full transformation plan is estimated at 41 Mio.€

Sustainable district heating – the challenges

Technological:

rapidly developing new technologies, need careful planning, sophisticated dimensioning

Intermittent nature of renewable heat sources

Temporal availability of some alternative and renewable sources

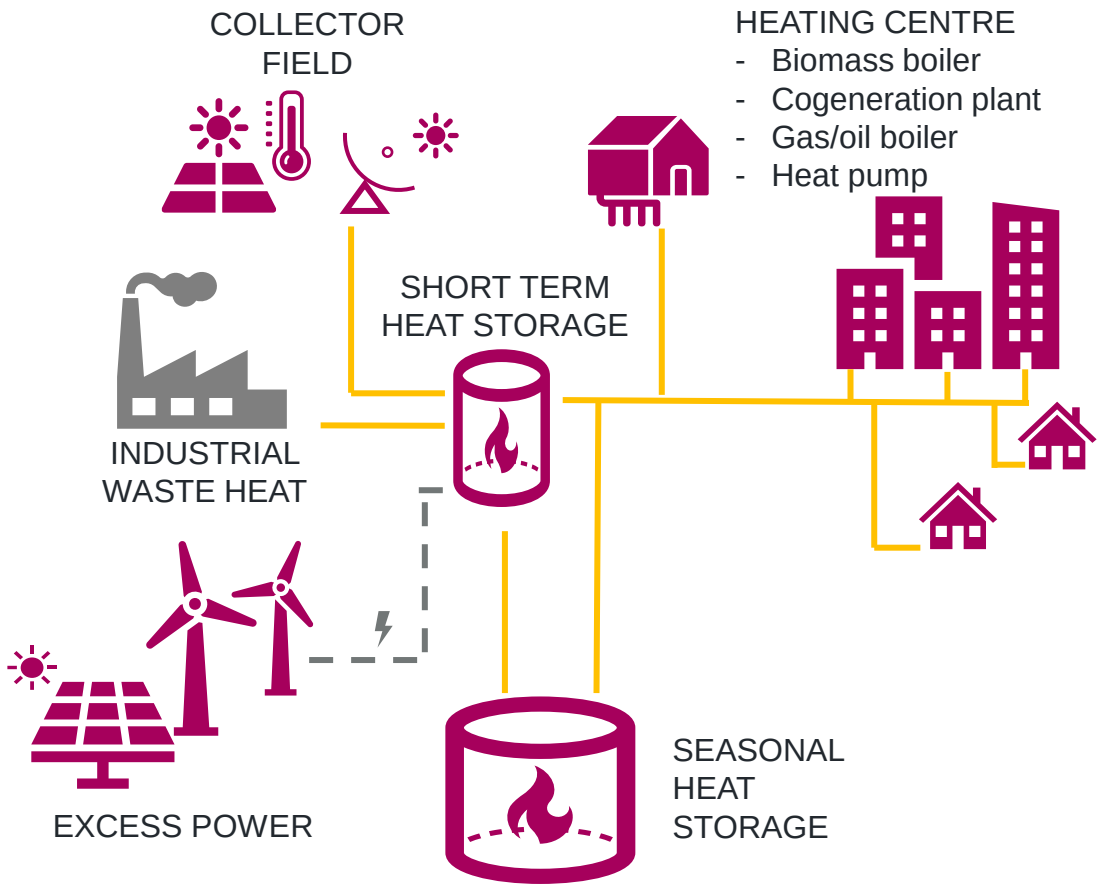
Range of physical properties of heat sources

Geographical: Every location is different

Administratively: heat sector (market) is local and with a mix of private and public (community) ownership - but transition needs central government target setting, monitoring and support

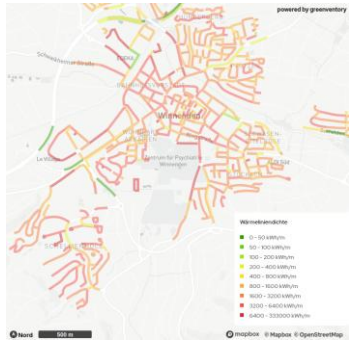
Financial: heat sector transition seems expensive, because it means that “suddenly“ all direct and indirect carbon subsidies will be priced in

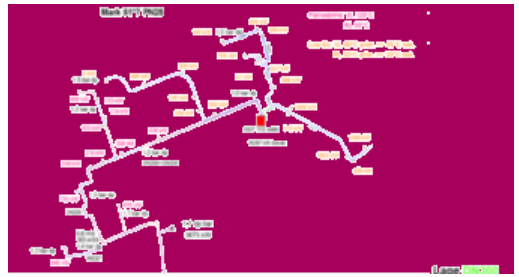
Dimensioning of diverse energy sources working in a portfolio – how to find the optimum?



Implementing the transition: tools and instruments

Analytical step	Aim	Examples of tools
Analysis of existing heat supply system and estimation of future demand and heat system zones	Visualisation Building level energy consumption assessment	QGIS Energiekartografie Digital Twin Wärmewendetool
Technology-specific assessment of low-carbon technologies	Determination of usable energy yields from renewable and alternative sources depending on the natural conditions	SolarKeymark, ScenoCalc, SCFW, Greenius GeotIS Pvsyst, PVSol, Pvcase, Thermoflow, Thermos
Portfolio assessment of shortlisted technologies	Creation of technically feasible portfolios (combinations) of renewable and alternative heat sources for reliable and efficient satisfaction of future heat demand	TRNSYS, HOMER, EPSILON, SAM, Thermoflex, STANET, nPro
Technico-economic optimisation of low-carbon heating system	Finding the optimum future low-carbon heating system based on technical and economic characteristics	QuaSiMo, AHEAD, Financial Models, Technikkatalog





Conclusion

- Decarbonising district heating (cooling) is a priority
- The contribution to countries‘ climate goals can be substantial
- Sustainable (district) heating (as opposed to traditional carbon-based) relies on
  - Engagement
  - Diversity
  - Smartness
- Therefore it also contributes to society development towards modernisation, fairness and inclusiveness

Decarbonise centralised (district) heating

Technologies and tools are ready for an affordable, sustainable and just heating (cooling) sector!

Solar Thermal
- SW Lübeck
- CSP-Projekte

Heat Pumps
- SW Bochum
- Energievers. Halle
- DVV Dessau

Geo Thermal
- SW Bochum
- EW Potsdam

Biomass
- BS Energy
- KNG Rostock

Power to Heat
- SW Erfurt
- Vattenfall Wärme AG

Heat Storage
- SW Erfurt
- Enercity

Conclusion

Risk

How to eliminate, mitigate or allocate risk?
Risk includes technical, commercial, market, legal and policy?

→ **diversification in technology**

Scaling

What are the optimum scaling pathways a strategig roadmap?
Can existing energy infrastructure be leveraged?

→ **Key concept is always the same, scaling through automatic optimization of local assessment**

Bankability

How to secure bankable contracts?
Financial engineering structure?

→ **leverging of municipal and state support systems, innovative third party PPAs**

Partnerships

Who are our key partners?
What capabilities do the bring?

→ **local partnerships, municipality, commercial actors**

DORNIER Group

VENTURE THE IMPOSSIBLE
TO ATTAIN THE BEST...

PROF. CLAUDE DORNIER

Ilka.lewington@dornier-group.com

Tim.nowak@dornier-group.com