Technology Collaboration Programme
by IEA

DHC MARKET OUTLOOK, INSIGHTS AND TRENDS

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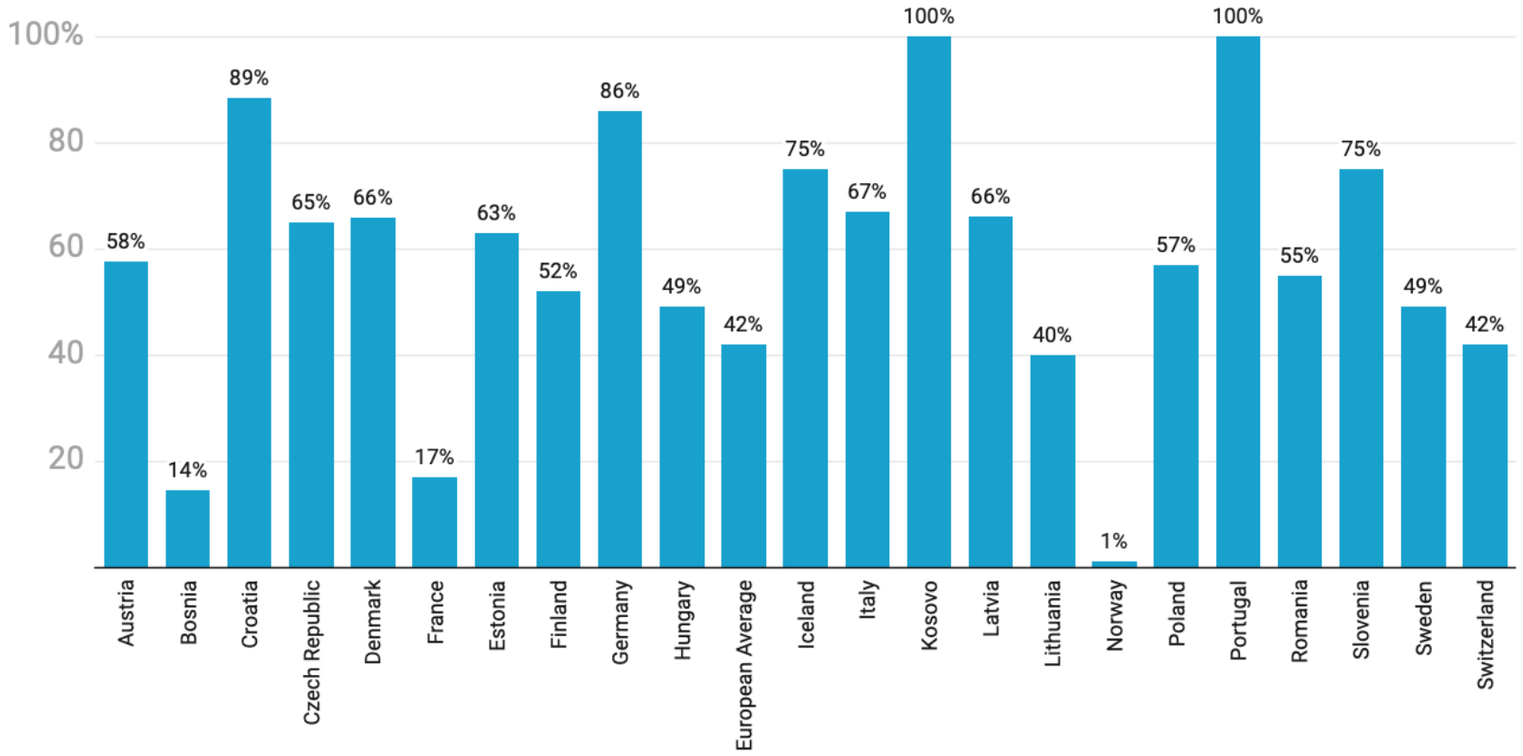
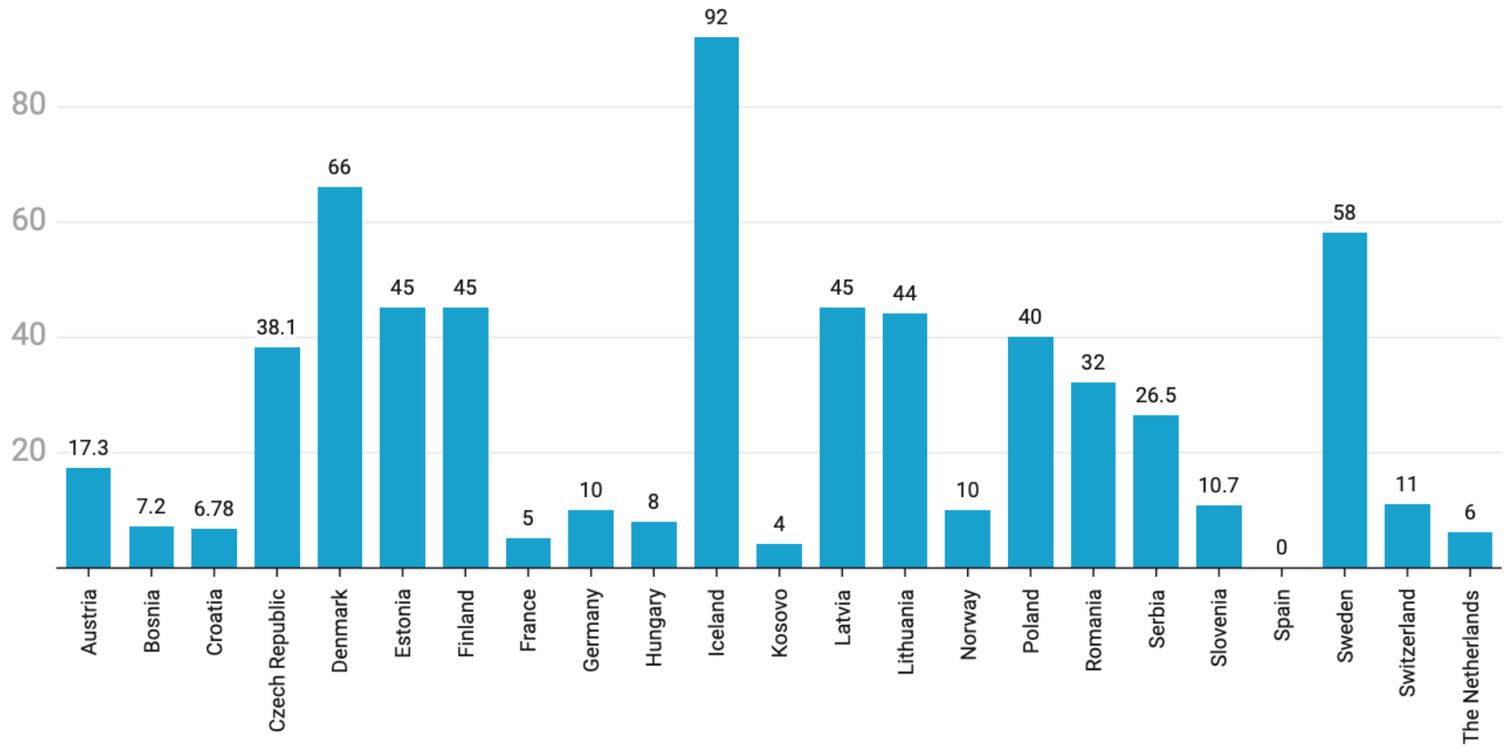
Share of CHP heat in DHC



- CHP: Key technology for DHC
  - Very diverse application
  - Europe average: 42 %

Source: Euroheat and Power, 2023: Insights and Trends

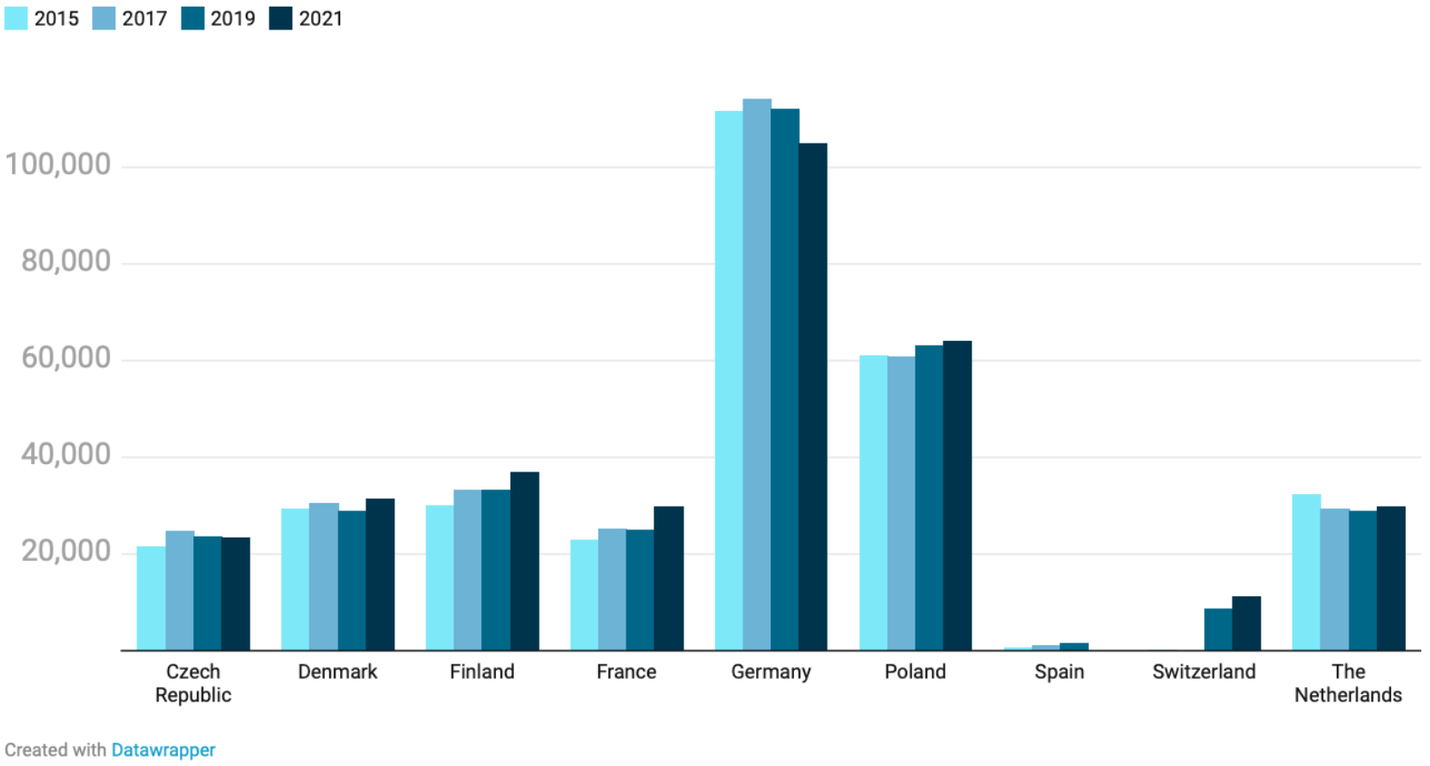
Share of DHC in Europe in residential and service sectors



- Global DH share: 12% of space heating and DHW
  - 43% of the heat comes from waste and renewable sources
  - 70 million people served
  - Predicted to grow up to 50% of the market
  - DH is beginning to boom

Source: Euroheat and Power, 2023: Insights and Trends

District heating sales to consumers in GWh per year

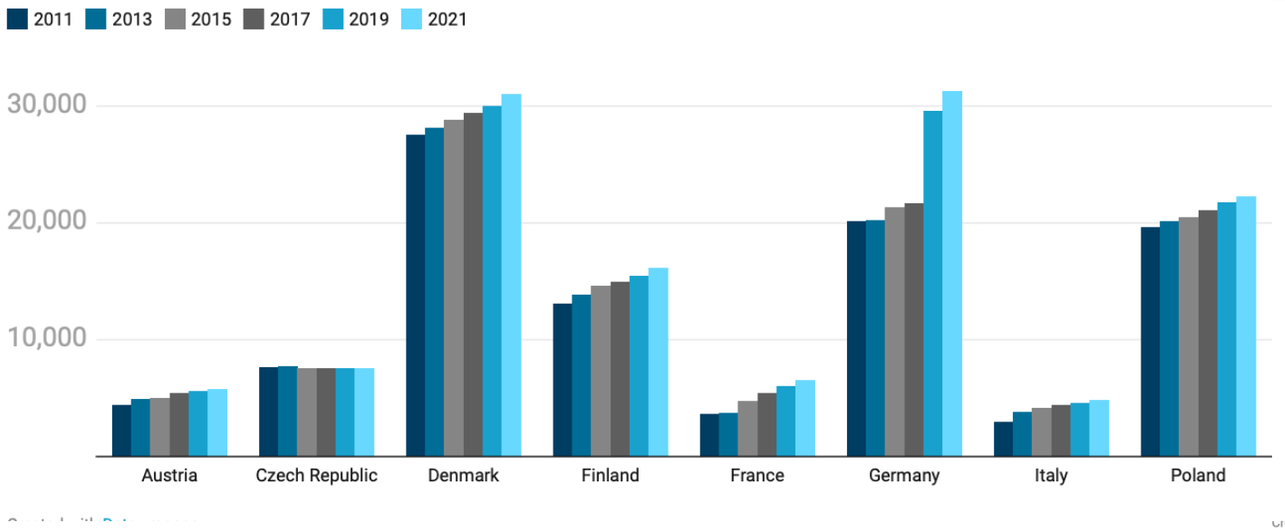


- Heat sales change slightly
- Warmer climate and better insulation lead to lower demand in spite of more connections

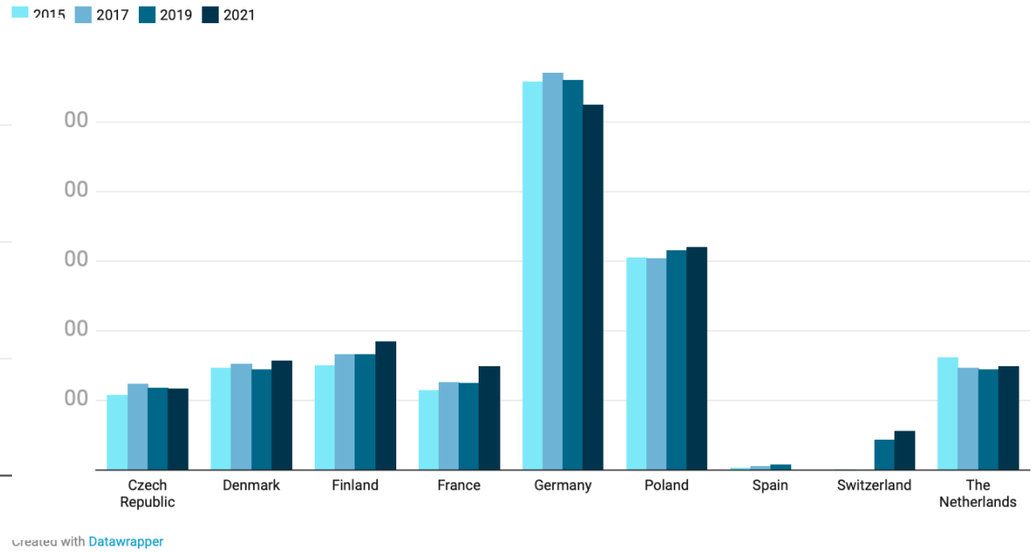
Source: Euroheat and Power, 2023: Insights and Trends

District heating trench length in km (one way)

Trench length (km_one_wa)



Sales to consumers (GWh / a)



- Higher sales does not mean larger network (see Denmark vs. Germany or Finland vs. France)

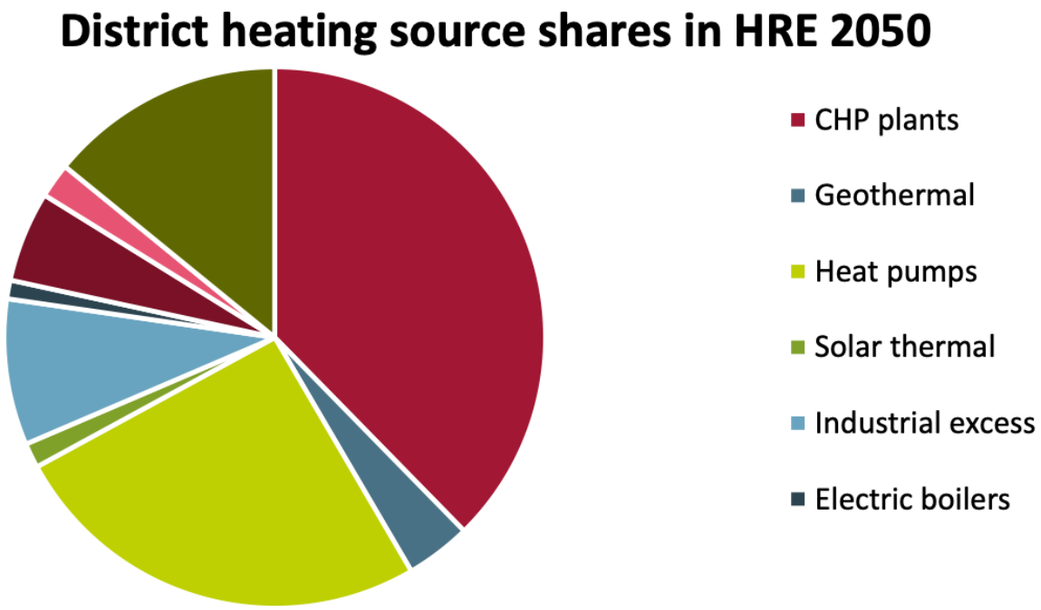
Source: Euroheat and Power, 2023: Insights and Trends

Trends in European DHC

Countries	Expected growth by 2030	Source
Austria	+ 350k new households	Forecast of Austrian Energy agency (2022)
Denmark	+250/300k new households by 2028 (Phase out of 400k gas boilers to be replaced by District Heating and individual heat pumps)	Estimate by stakeholders
France	+ 215k households/year	Estimate by the national association
Germany	Between 300-600k households/year	Estimate by the national association
Scotland	+ 650k households	Heat Network (Scotland) Act, (2021)
The Netherlands	+ 500k households	Climate agreement between government and sectors - Klimaatakkoord (2019)

Source: Euroheat and Power, 2023: Insights and Trends

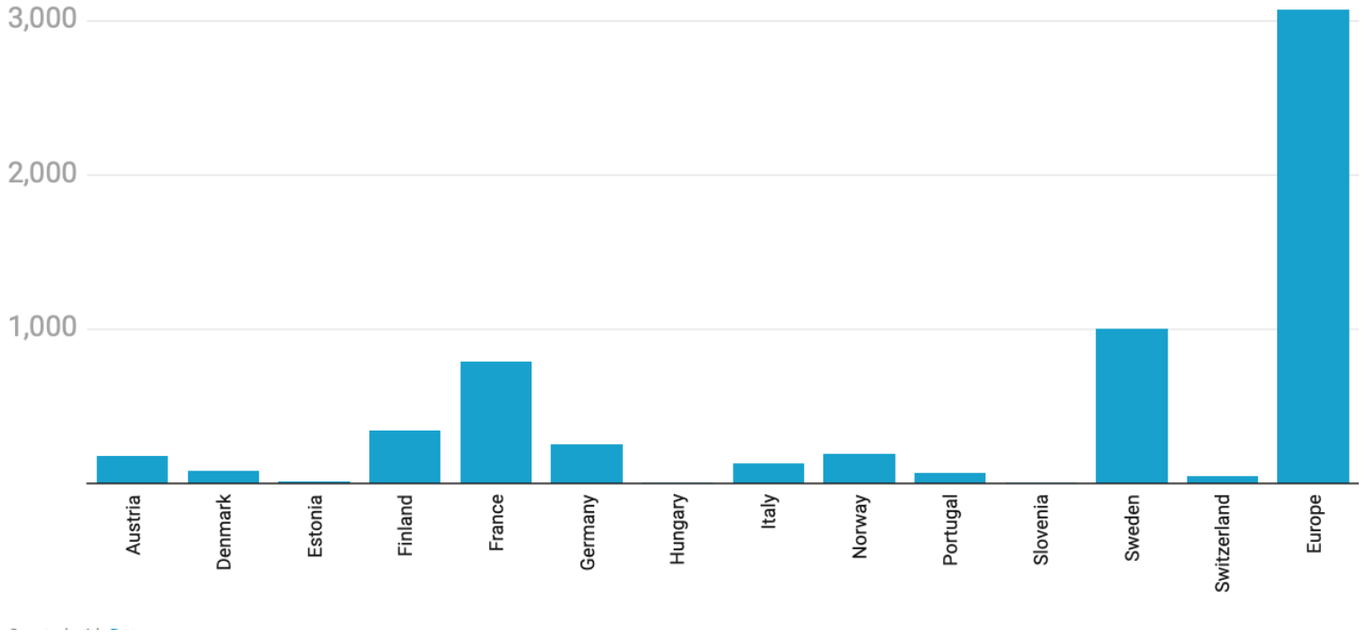
Trends in European DH



- CHP: Key technology for DH in 2050
- Large Heat pumps likely to rise
- Geothermal could be significantly higher
  - due to closed loop systems emerging since 2018
  - Geothermal CHP could rise
- No more boilers!
  - Due to low exergy efficiency

Source: Heatroadmap Europe 4, 2018:

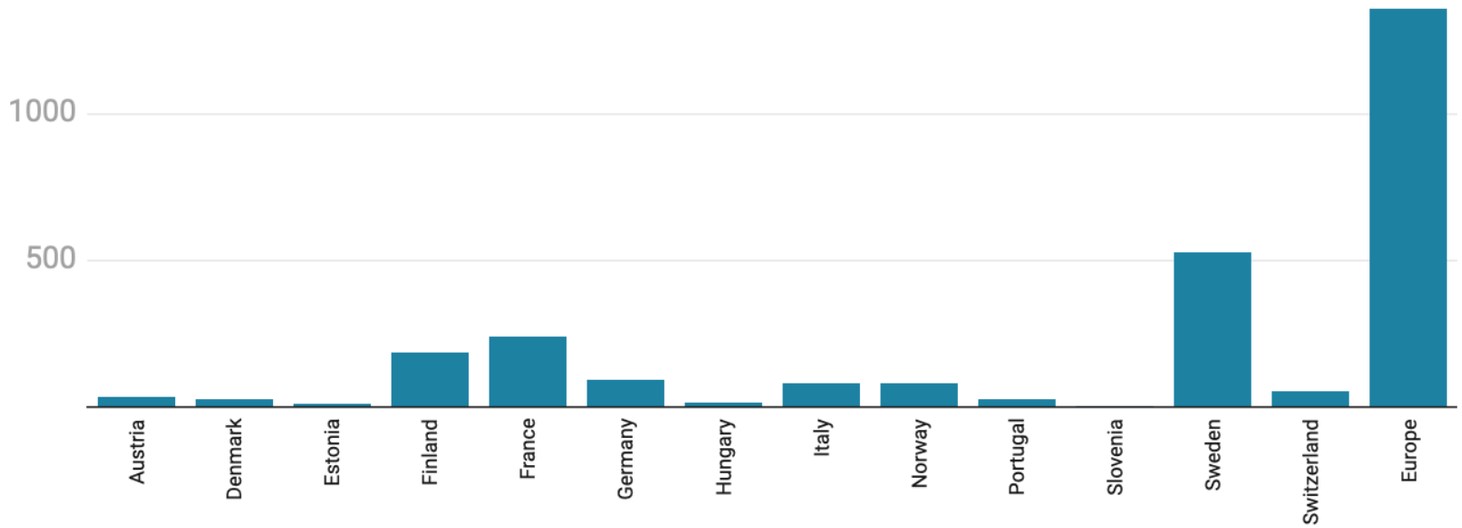
District cooling sales in GWh / a



- Much lower than district heating
  - Max. DH: 100 000 GWh / a
  - Max. DC: 1 000 GWh / a
  - DH : DC ≈ 100 : 1

Source: Euroheat and Power, 2023: Insights and Trends

District cooling trench length in km (one way)



- Much lower than district heating
  - Max. DH: 30 000 km
  - Max. DC: 550 km
  - DH : DC ≈ 55 : 1
- DC needs more trench length per sold unit than DH
  - Due to lower temperature difference between forward and return

Source: Euroheat and Power, 2023: Insights and Trends

China – the largest global district heating market

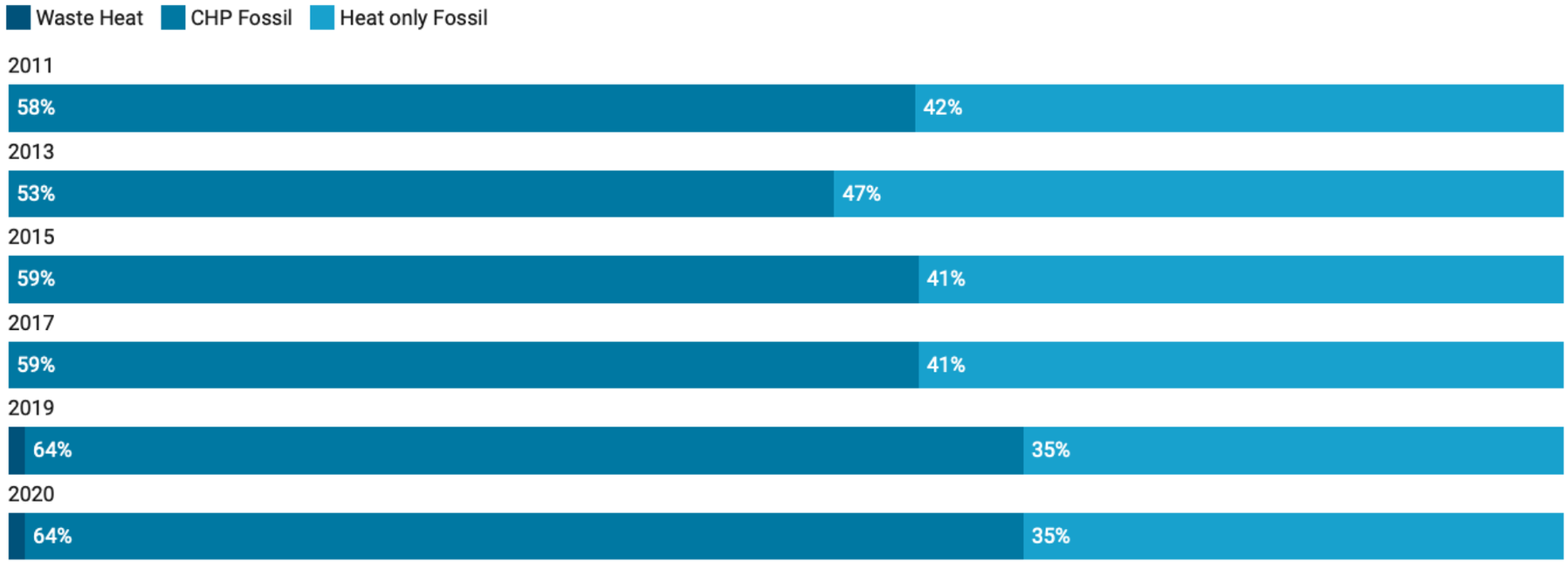
- 313 million people served by DH: 4.5 times the amount of Europe
- 550 000+ km trench length: 5 times the amount of Europe
  - Extreme growth: by 210 % in 10 years (2011 – 2021) → 30 000 km+ per year
- High but decreasing carbon emissions:

Year	Heating area (billion m2)	Energy consumption for heating (billion tce)	Energy consumption for heating per unit area (kgce/m2)	Total heat supply (million GWh)	CO2 emissions (billion tCO2)	Carbon emissions per unit of heat supply (tCO2/GWh)
2017	14.17	0.20	14.20	1.40	0.53	378.60
2019	15.16	0.21	14.10	1.59	0.55	346.50
2021	16.20	0.21	13.10	1.65	0.49	296.70

Source: Prof. Jianjun Xia in Euroheat and Power, 2023: China country report

China – the largest global district heating market

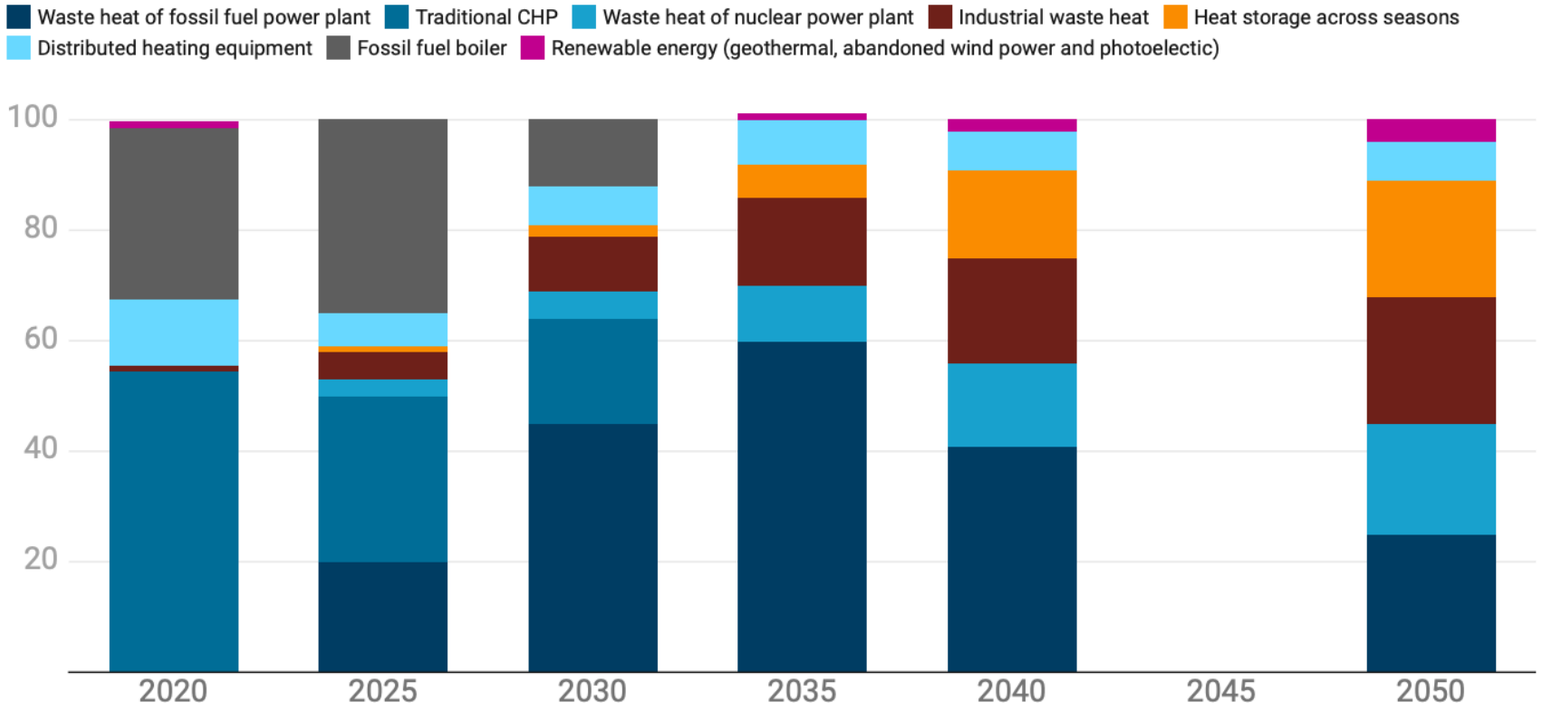
- CHP share in DH has grown inspite of big heat sales gains – so CHP is further raising in China



Source: Prof. Jianjun Xia in Euroheat and Power, 2023: China country report

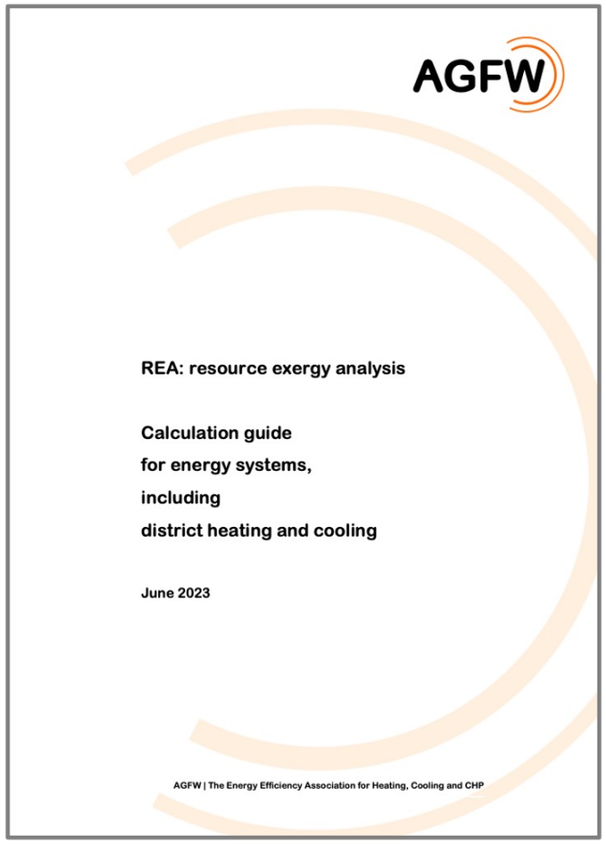
China – the largest global district heating market

- Trends in Chinese DH: Nuclear CHP, Waste heat, Industrial waste heat, seasonal storage



Source: Prof. Jianjun Xia in Euroheat and Power, 2023: China country report

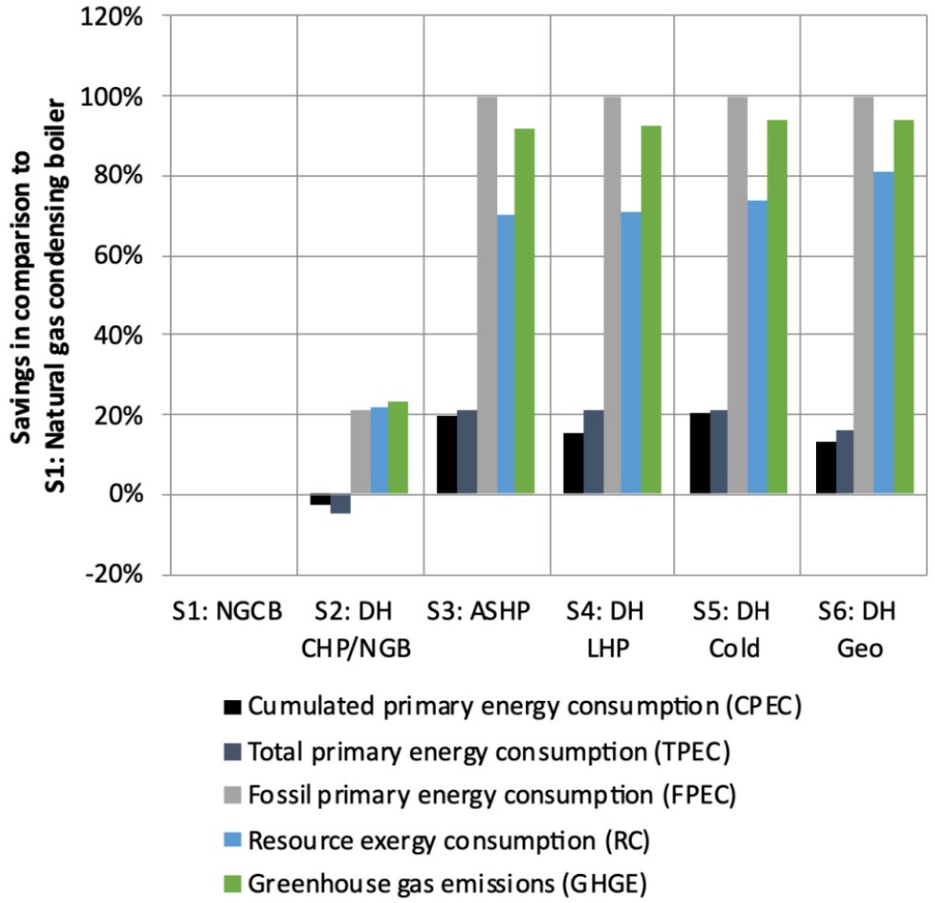
Assessment of DHC benefits



Source: agfw.de

- challenging, due to complexity and lack of practice tests
- greenhouse gas analysis → direct emissions reduction
- resource exergy analysis → indirect emissions reduction
  - Move from energy to exergy = energy · energy quality
  - Avoid issues with primary energy factors and misrepresentation
  - Download guideline: www.agfw.de/rea/en

Assessment of DHC benefits



- S1: Decentralized natural gas condensing boiler
- S2: Natural gas DH with 50% CHP and 50% Boiler
- S3: Decentralized air-source heat pump (PV power)
- S4: DH with optimal large heat pump (PV power)
- S5: Cold DH with decentralized heat pumps (PV power)
- S6: DH with closed loop geothermal heat

- DH already saves a lot and can also integrate heat pumps as well as otherwise „lost” sources
- Resource exergy consumption → new key metric

Source: IEA DHC, 2023: Annex TS3 / Appendix I: Resource exergy analysis of hybrid energy systems

Summary

- DHC is booming and CHP is and will be a key element
- Large variations in experience and deployment of DHC
- DC currently much less relevant than DH
- Accurate benefits assessment of new DHC requires REA: resource exergy analysis
- Many challenges on legal, financial and practical level
  - Can be overcome with innovation, collaboration and education

Image by starline on Freepik

Contact us!

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