

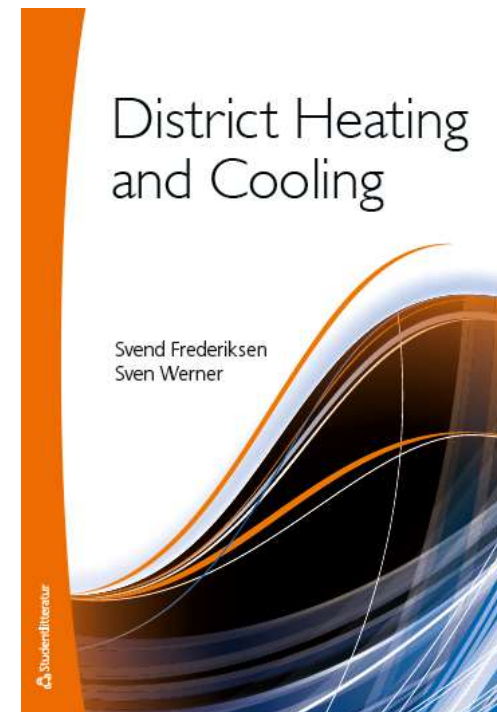
IEA-DHC TS2 WP4

Competitiveness – Benchmarking heat distribution characteristics

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Who is Sven Werner?

- Professor in energy technology at Halmstad University 2007-2017.
- Been active with district heating research since 1978. PhD in 1984 with 'The heat loads in district heating systems'.
- Have coordinated and participated in various projects concerning the future for district heating in Europe.
- Co-author of textbooks about district heating and cooling in 1993 and 2014 (Swedish versions), 2013 (English version), and 2017 (Korean version).
- Retired on Dec 31, 2017.



Outline

- Background
- Benchmarking research idea
- Benchmarking methodology – input parameters and output results
- Some early benchmarking examples from the IEA-DHC annex 10 project.

Background

- In district heating systems, heat deliveries compete with decentralised heat supply options.
- In this competition, the district heating option lose when high heat distribution costs appears from low heat densities.
- Lower future heat demands will decrease the future heat densities.
- Hence, heat distribution costs depend always on local conditions.

District Heating

Four parts:

1. Customer heating systems
2. Substations
3. Heat distribution network
4. Heat supply or recycling plants

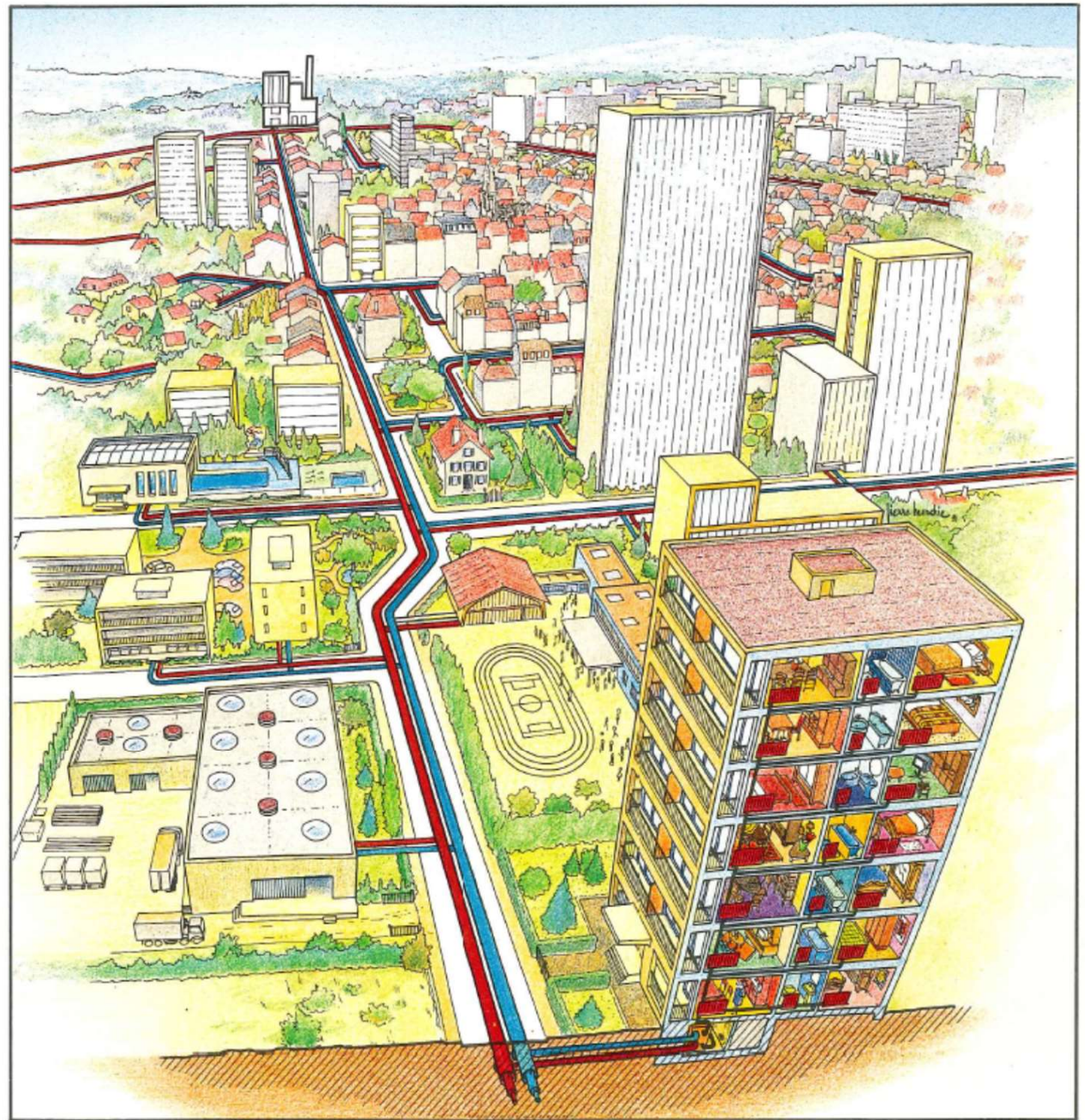


Figure 1-1. Overview drawing showing the basic parts of a district heating system. The picture was originally drawn by Pierre Merchie, France and originates from (AMFE 1991). Reprinted with permission.

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The market situation

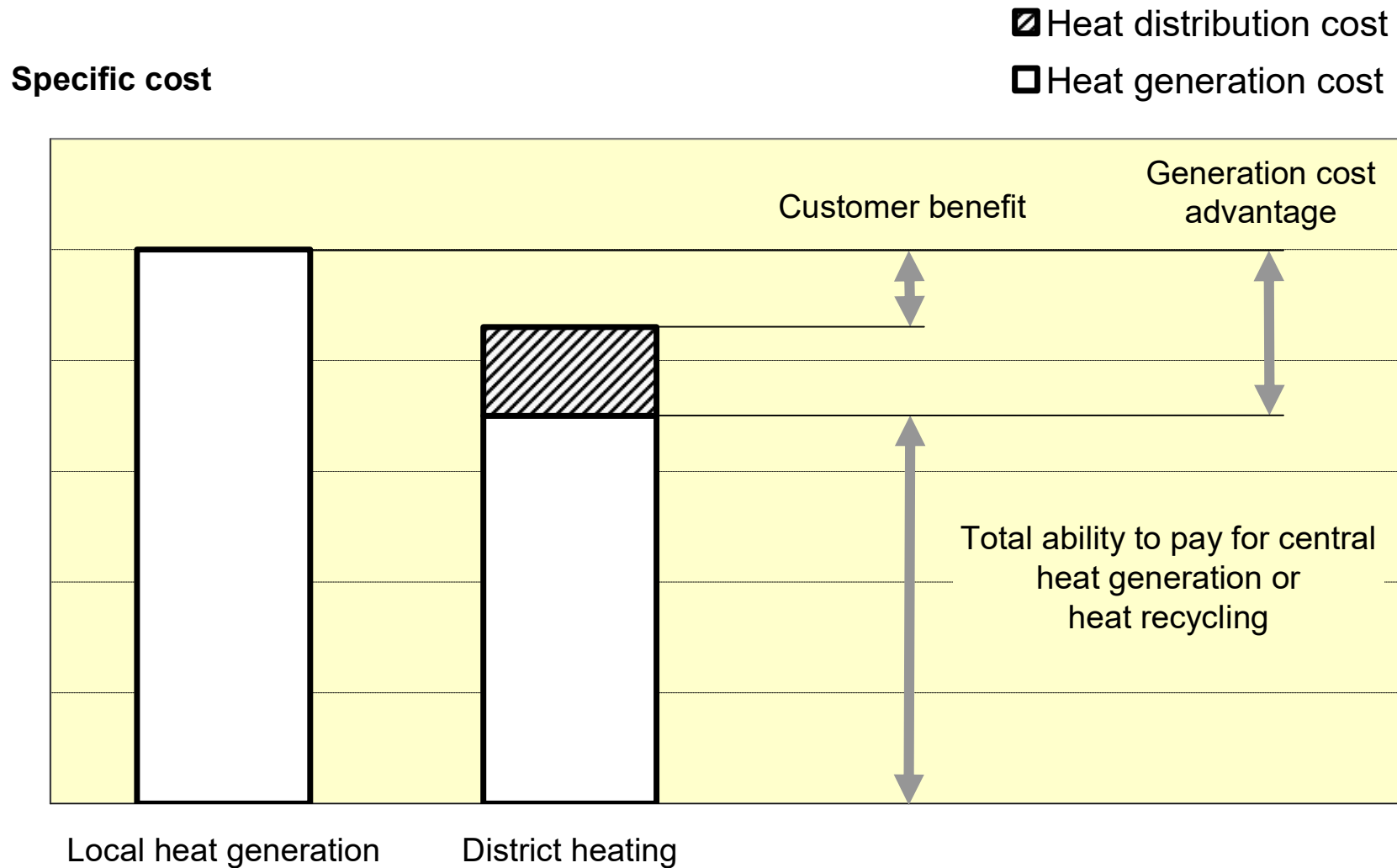


Figure 11-1. The general cost situation for district heating compared to that for local heat generation.

Benchmarking research idea

- Benchmarking of many new heat distribution networks operated with low or lower distribution temperatures
- By applying the benchmarking methodology developed in the IEA-DHC annex 10 project concerning 'Towards 4th Generation District Heating'

Input parameters

Nine characteristic input parameters for benchmarking

Land area for buildings served by heat distribution network

Total heated floor area in buildings connected

Trench length for heat distribution network

Heat annually supplied into the heat distribution network

Heat annually delivered from the heat distribution network

Average pipe diameter in the heat distribution network

Annual average supply temperature in the heat distribution network

Annual average return temperature in the heat distribution network

Annual average outdoor temperature

Output results

Nine characteristic output estimations for benchmarking

Annual temperature level

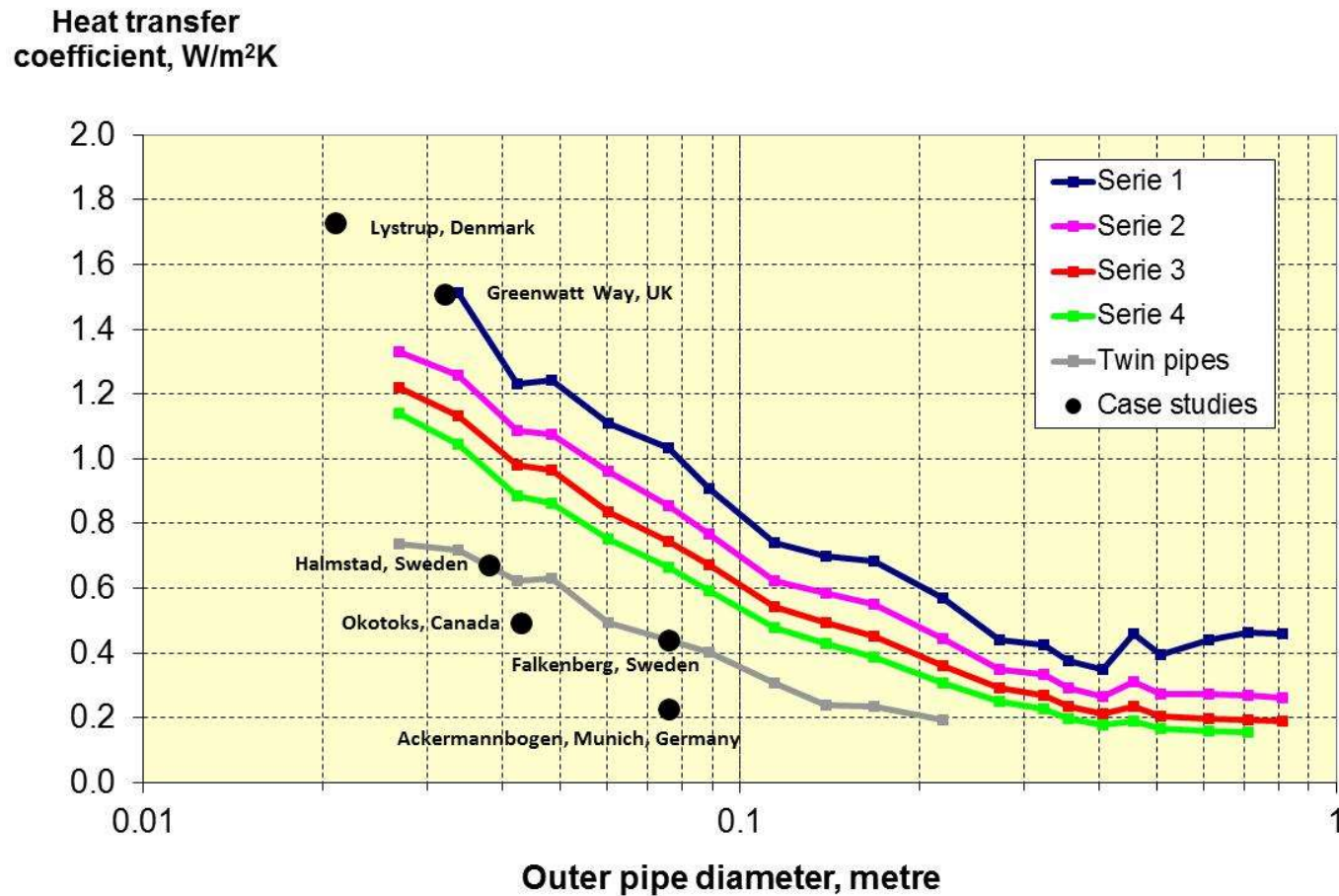
Concentration of heat demand (plot ratio, effective width, heat density, and linear heat density)

Customer heat demands (specific heat demands)

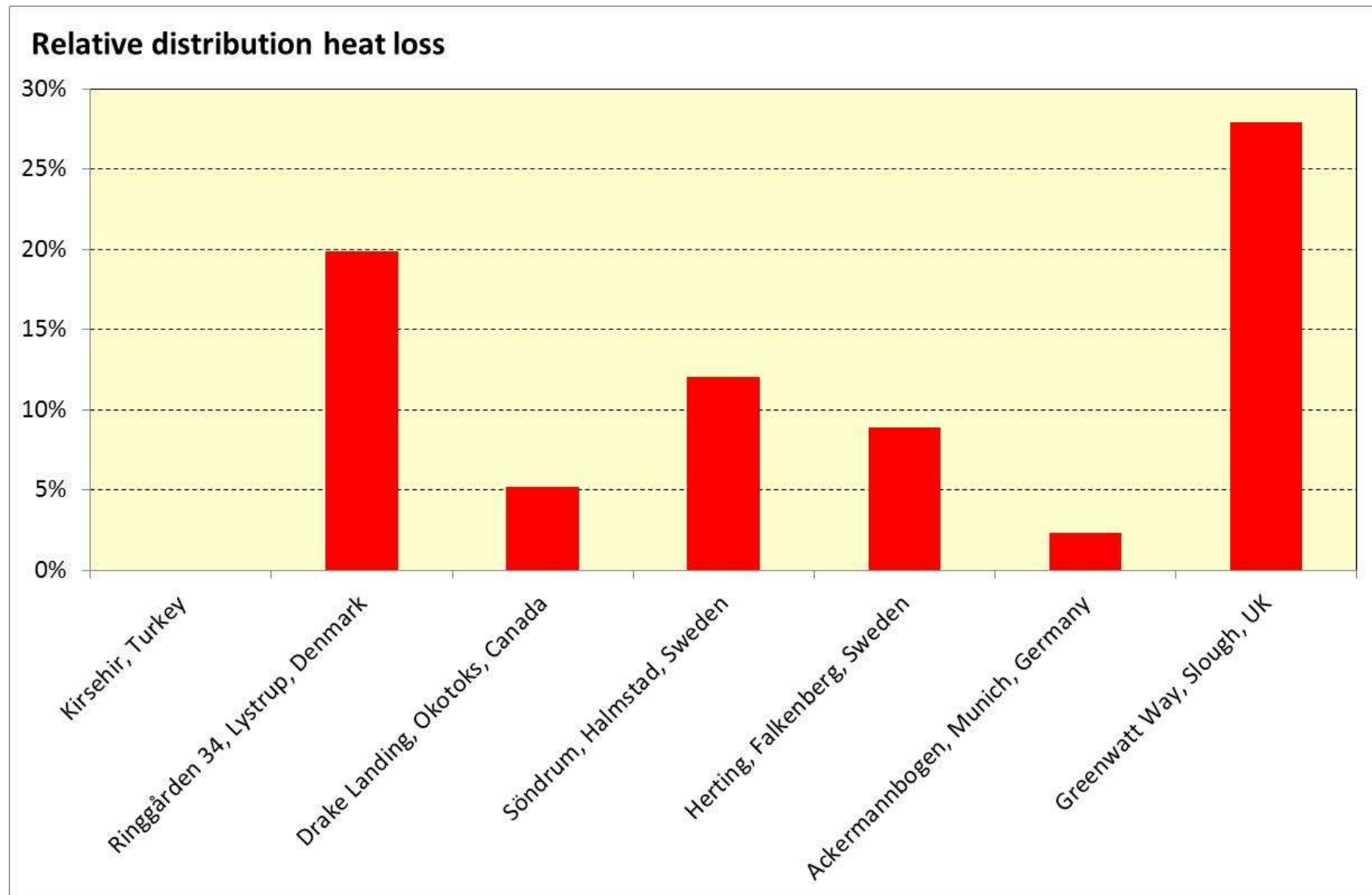
Heat distribution efficiency (relative heat distribution loss and heat transfer coefficient)

Heat distribution cost from installed pipes

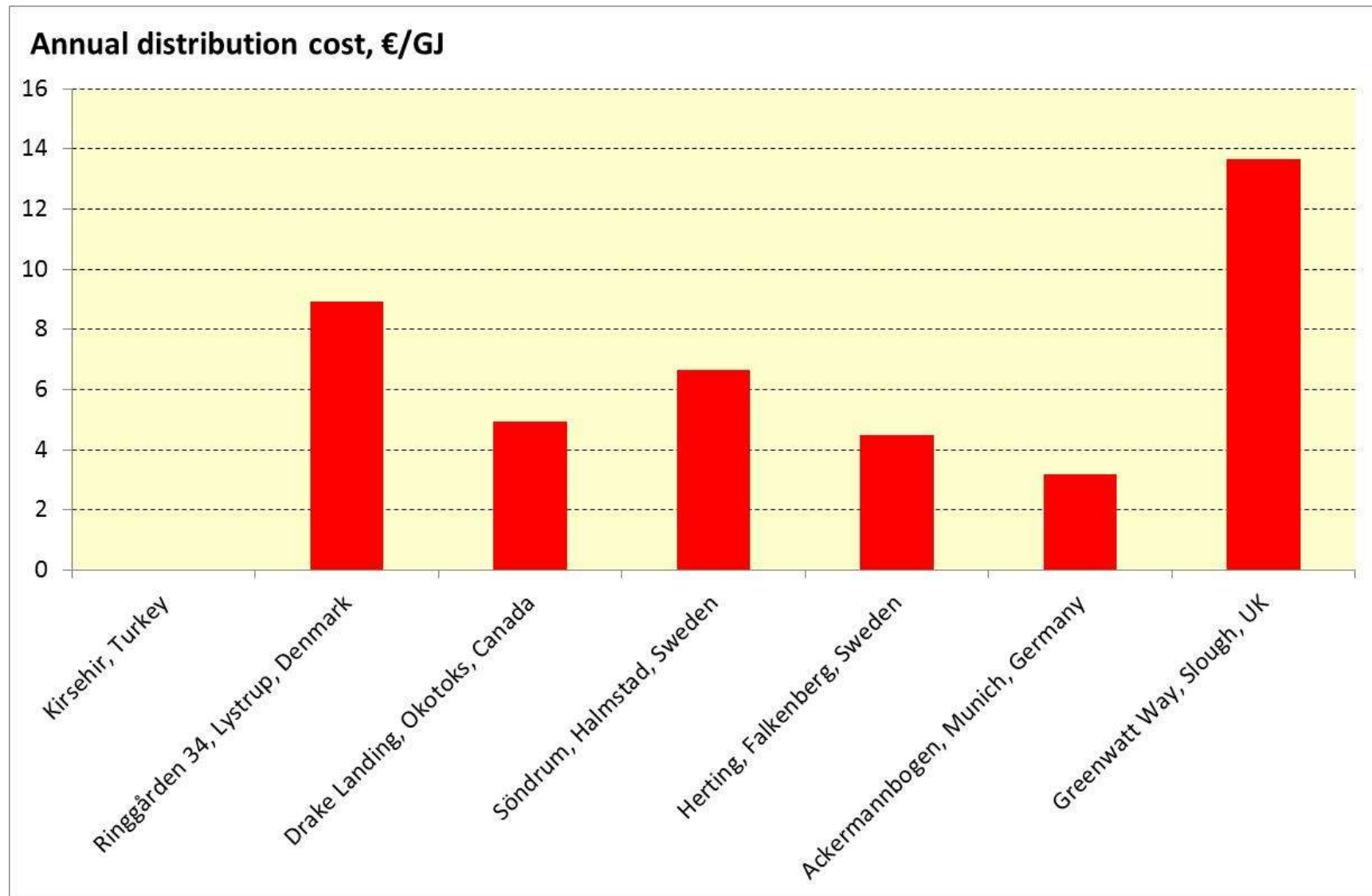
Example of output result from the Annex 10 project



Example of output result from the Annex 10 project

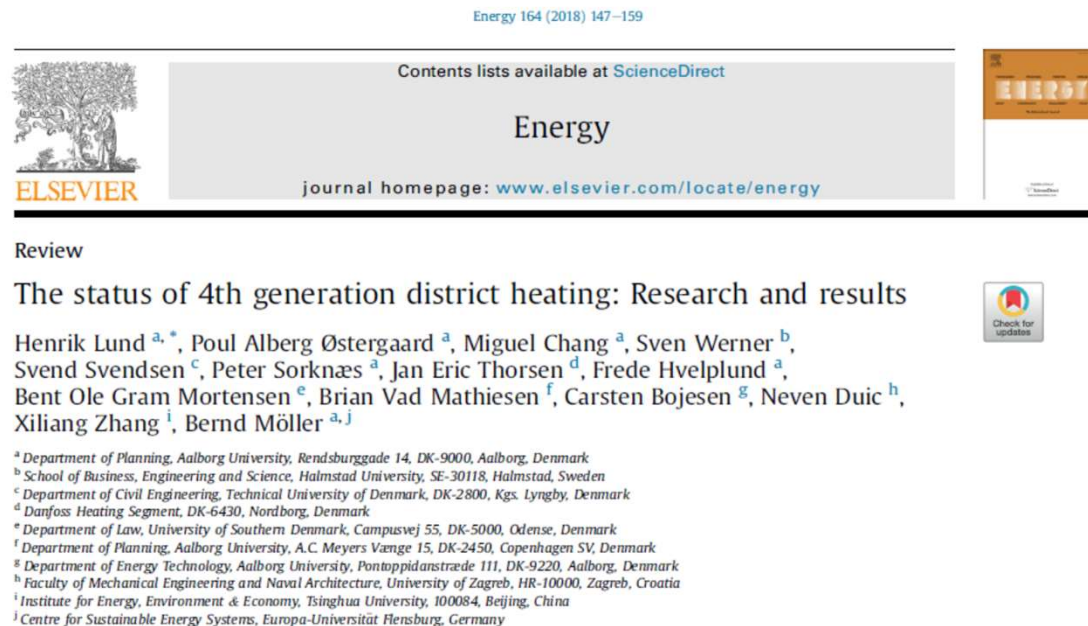


Example of output result from the Annex 10 project



The end

Thank you for your attentiaon



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