

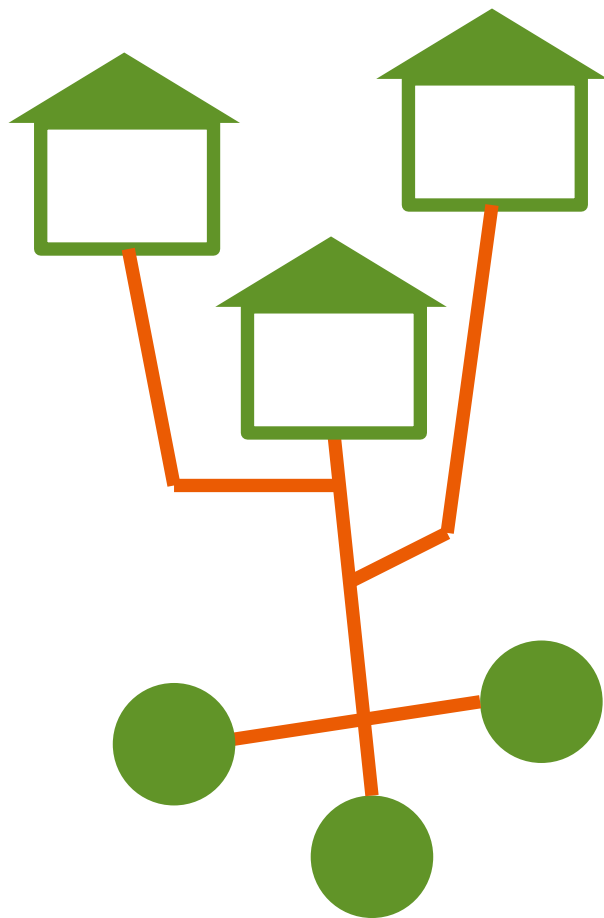
# Thermal energy networks: Gaps and Barriers for Energy Technology Development and Deployment

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IEA Technology Collaboration Programme on  
District Heating and Cooling

# What are thermal energy networks?



- Thermal energy = heating and cooling
- Thermal energy networks – transport heating and cooling from generators to the customer via insulated pipes.
- Thermal energy networks + generators + customers:
  - district heating and cooling= district energy

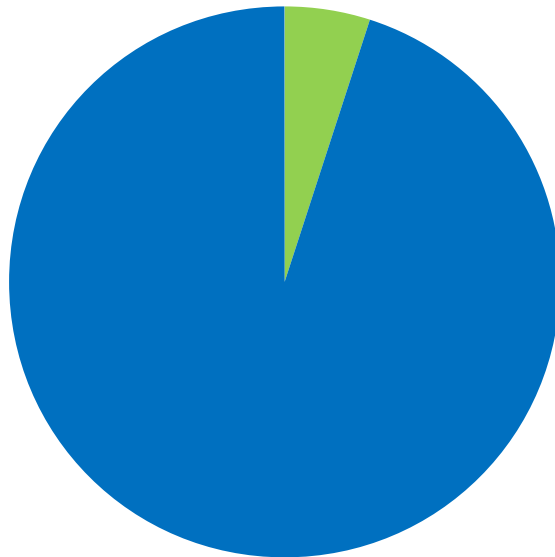


# Overview

1. Why thermal energy networks?
2. What are benefits and challenges of thermal energy networks?
3. How can the best solutions be identified?
4. Take home

# Low-carbon cities?

per m<sup>2</sup> ground



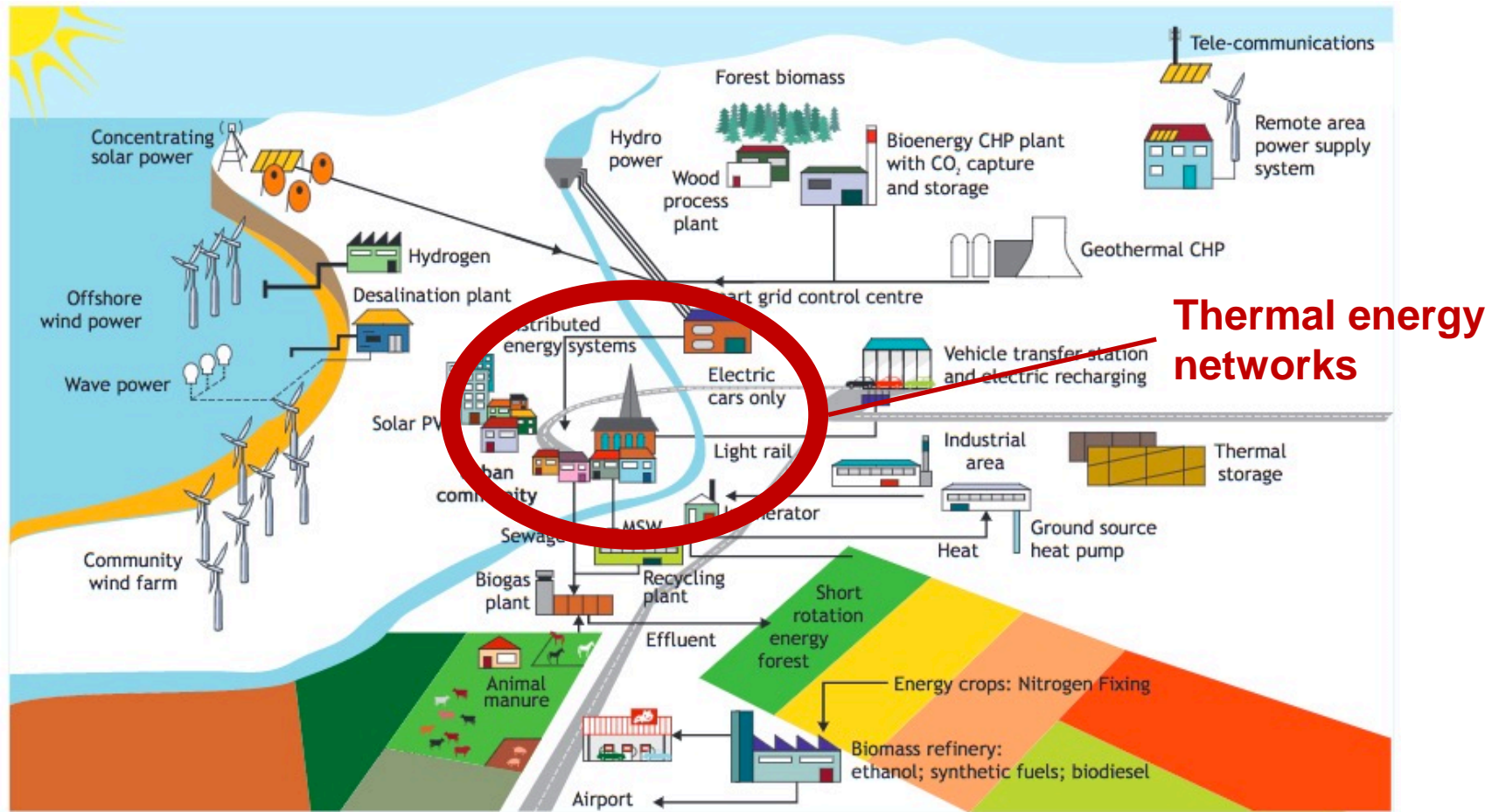
■ Urban renewables

■ Demand

source: [1]

- Urban renewables: 4 – 5 % of urban demand
  - demand density > **20 x** supply density [1]
- **Large “imports” of renewables into cities: unavoidable**

# How to create a sustainable energy future?



source: [4]



# What are benefits of thermal energy networks?



source: fotolia.com

## Benefits

- open urban areas for all thermal technologies
- more efficient
- more renewable options
- more resilient
- more cost effective
- create jobs

source: iea-dhc.org

# What can bring us ahead?

## Development challenges

- integration of renewables
- integration with the power and natural gas market
- transformation of old systems
- optimizing supply, demand and operation

## Deployment challenges

- low awareness of benefits
- high investment cost
- policy support required
- strategic planning required

source: [iea-dhc.org](http://iea-dhc.org)

# How to find the best solutions?

Energy ~ counting coins



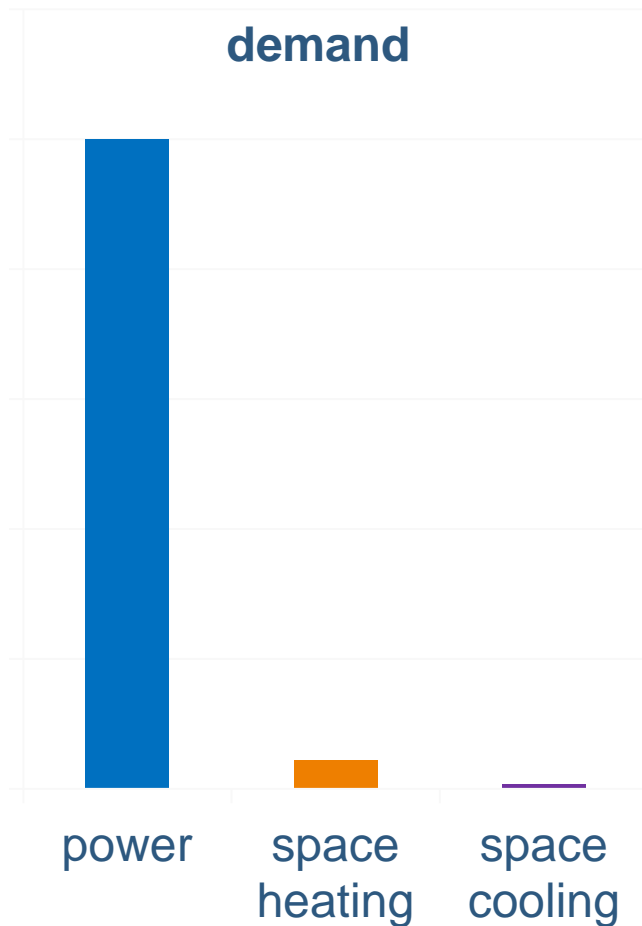
Exergy ~ counting money



$$\text{exergy} = \text{energy} \times \text{energy quality}$$



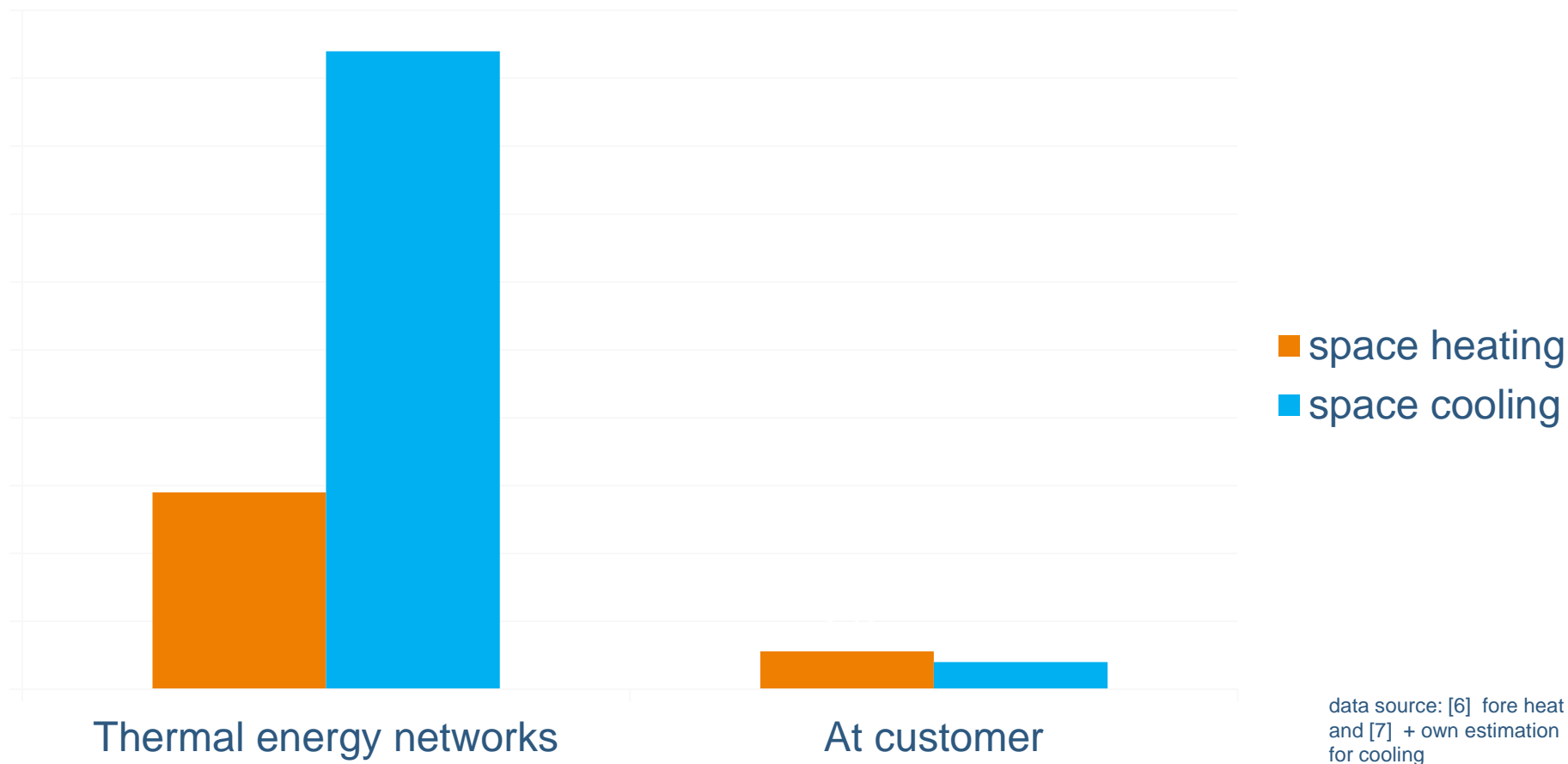
# Why is thermal energy special?



- all energy is converted to heat in the end
- thermal energy is mostly of low energy quality
- energy quality ~ power content (simplified)

data source: [7]

# Maximum resource efficiency (exergy) in urban areas

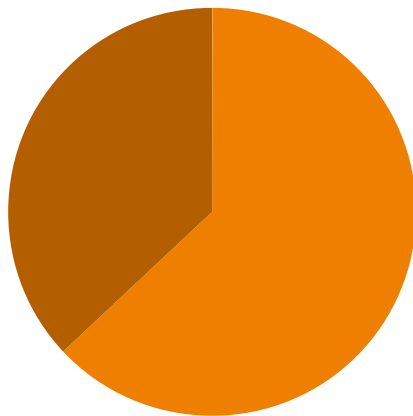




# Thermal energy networks: How well can it work?

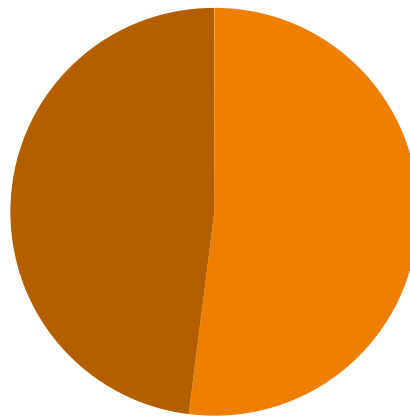
- Citizens currently served by District Heating [2]

Denmark 2015



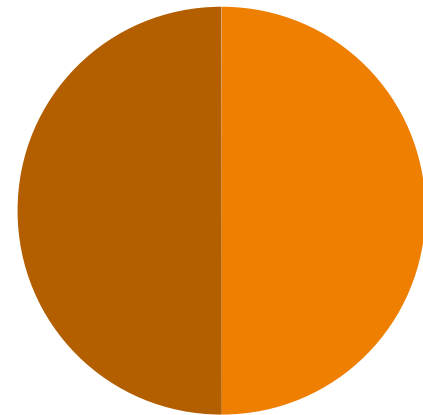
■ District heating  
■ Other heating

Sweden 2015



■ District heating  
■ Other heating

Finland 2015



■ District heating  
■ Other heating

# Take away: How we can help each other?

1. Get in touch to find synergies
2. Learn “how” from others: Don’t “invent” the wheel
3. Consider thermal energy networks as enablers for your technology
4. Raise awareness

→ **Keep in mind: thermal energy networks are there to help you!**



# Thank you for your attention!

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# References

- [1] Grubler, A. 2012: Urban Energy Systems and the Role of Urban Renewables: Findings from the [Global Energy Assessment](#)
- [2] EuroHeat&Power 2015: [Country by Country Survey 2015](#)
- [3] Bensmann, K., M. Pehnt, Z. Bastian 2016: Der gebäudeindividuelle [Sanierungsfahrplan für Wohngebäude \(iSFP\)](#)
- [4] IEA, 2009: Cities, towns & renewable energy: [Yes In My Front Yard](#)
- [5] Global CCS Institute: 2.1 [Heating Demand in Europe](#)



# References

- [6] Hertle, H., A. Jentsch, L. Eisenmann, J. Brasche, S. Brückner, C. Schmitt, C.Sager, M. Schurig, 2016: [Die Nutzung von Exergieströmen in kommunalen Strom-Wärme-Systemen zur Erreichung der CO2-Neutralität von Kommunen bis zum Jahr 2050, UBA Climate Change 35/2016](#)
- [7] Jentsch, A. 2015: [Exergieausweis Online v1.0.15](#)
- [8] European Commission: [2050 Energy Strategy](#)
- [9] International Energy Agency 2016: [Energy Technology Perspectives 2016](#)