SMART ENERGY SYSTEM

OPTIMISATION WITH RENEWABLES

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PERNILLE M. OVERBYE - BACKGROUND

• B.Sc. Mechanical Engineering Copenhagen & M.Sc. Thermal Energy Cranfield University UK

• 1992 -> 10 years living and working in the UK
• 2002 -> Ramboll Denmark & Energy – always within district energy
• 2005 – 2011 Building up district energy in the UK from Copenhagen
• 2011 – 2014 Head of department in Copenhagen – focus on our international projects
• 2014 – 2016 Managing Director Ramboll Inc. Canada District Energy
• 2017 – ???? Head of department – District Energy planning and infrastructure
OUR VISION IS TO CREATE LIVEABLE CITIES WITH SMART SOLUTIONS FOR THE CITIZENS
SMART ENERGY

Ensuring an efficient and stable integration of fluctuating, renewable energy

- National power grid
- City-wide district heating grid
  - Storage for CHP and RES
- City district cooling grid
  - Storage and optimal cooling
- National natural gas grid
  - Storage, CHP and small houses
- Buildings and other end-users
  - Optimized building envelope
  - Low temperature heating
  - High temperature cooling
  - Micro DC grid electronics
  - Adjust consumption to dynamic prices

Ramboll
SUGGESTIONS FOR RENEWABLE HEAT SOURCES AND (SEASONAL) STORAGE

Individual solar heating is 6 times more expensive than large scale

Underground water pit-storage
FUEL AND TECHNOLOGY OPTIONS
THE FUTURE DISTRICT HEATING – IS HERE NOW
Greater Copenhagen District Heating System  
Case 1 in JRC Study Report on Efficient DH&C in EU

Efficient district heating and cooling systems in the EU  
Case studies analysis, replicable key success factors and potential policy implications

Prepared by TNO with the JRC:
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2010
CASE: Heat Pump for heating and cooling
HEAT PUMP FOR DISTRICT HEATING AND COOLING
TAARNBY, COPENHAGEN, DENMARK

Visualization: Ramboll
IN CONCLUSION

• It is important to focus on integrated solutions, including building envelope, building installations, district heating and power system.

• **District heating** is a natural part of the urban infrastructure in modern cities.

• District heating is a **precondition** for efficient, flexible and cost-effective use of renewable energy and CHP for urban heating, recovered low-temperature heat (industries, wastewater, etc.) and not least waste-to-energy and wind.

• **District cooling** is a natural part of the urban infrastructure in districts with sufficient cooling load.

• A stable energy policy since 1976, municipal planning and a tradition for **co-operation in the society** have been important preconditions for CO₂ emission reductions in Denmark.
WORKING TOGETHER IN BELGIUM
THANK YOU

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