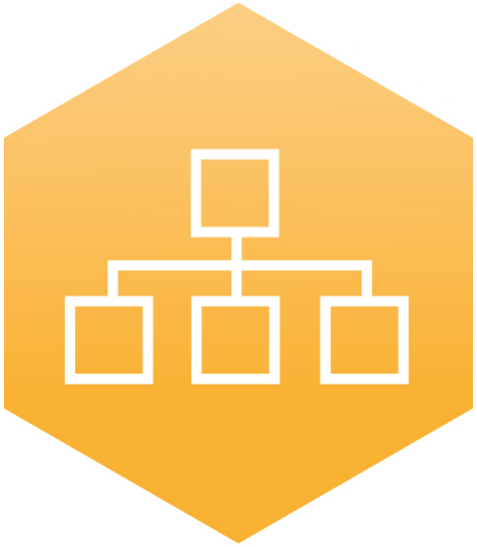
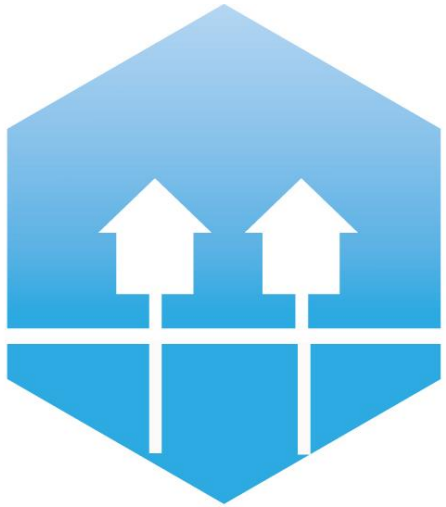
4th Generation District Heating Technologies and Systems
3rd Annual Conference 18 August 2014

Welcome





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4DH
4th Generation District Heating
Technologies and Systems

What and who are 4DH?

- Strategic Research Centre financed by the Danish Research Council and the partners
- Universities and Industry including manufactories, consultants and DH companies
- International partners

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Why 4th Generation ?

4DH
4th Generation District Heating Technologies and Systems

First Generation (1880-1930):

Steam as heat carrier. Is today in use in e.g. Manhattan, Paris and partly in Copenhagen.

Second Generation (1930-1970):

Pressurised hot water as heat carrier with temperature above 100 C.
Can be found today in older parts of current water-based systems.

Third Generation (1970-present):

Pressurised water with temperatures below 100 C.
Used in replacements in Central and Eastern Europe
and all extensions in China, Korea, Europe, USA and Canada.

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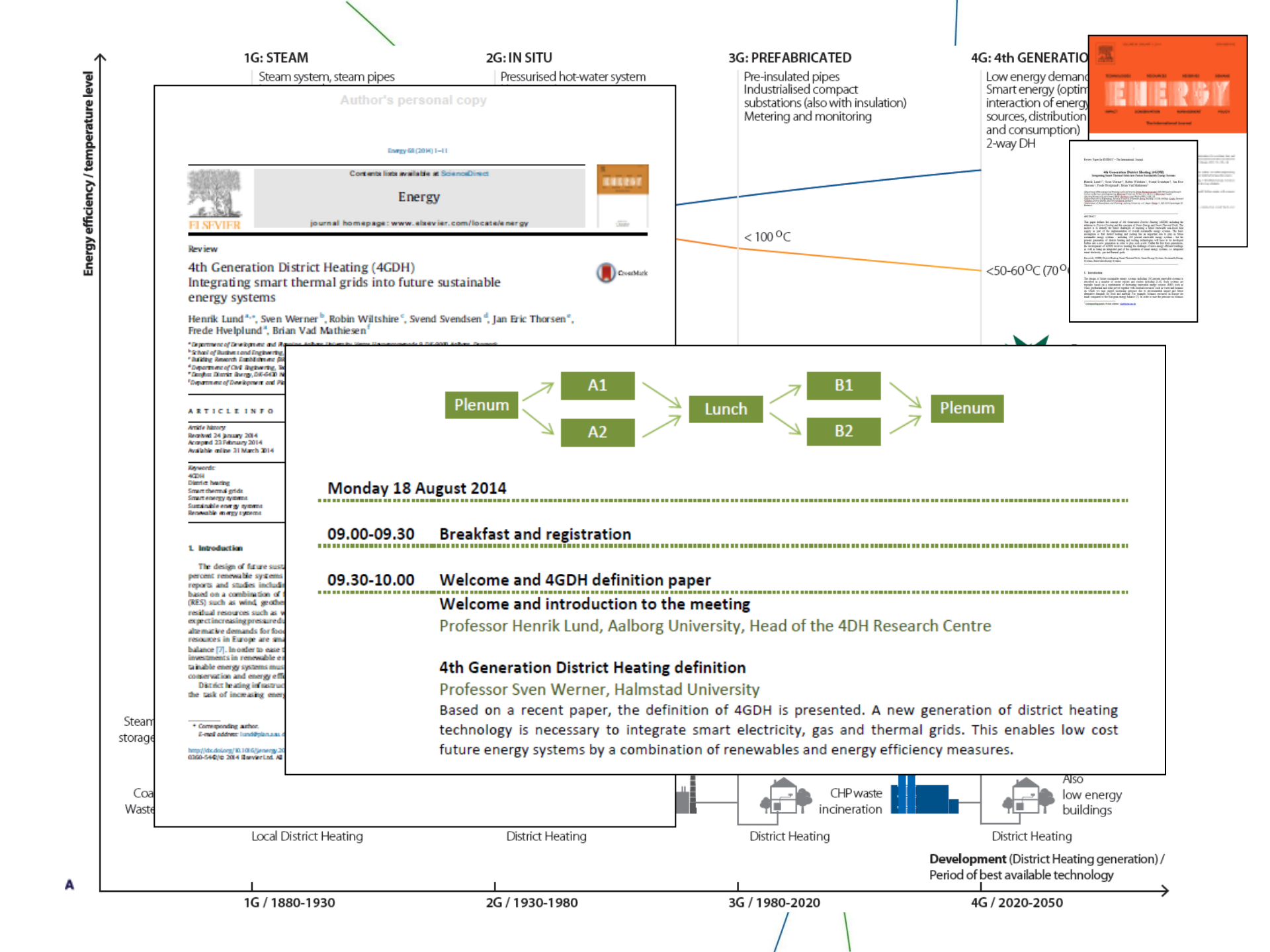
Energy efficiency / temperature level
1G: STEAM
Steam system, steam pipes
2G: IN SITU
Pressurised hot-water system
3G: PREFABRICATED
Pre-insulated pipes
Industrialised compact substations (also with insulation)
Metering and monitoring
4G: 4th GENERATIO
Low energy demand
Smart energy (optim
interaction of energy
sources, distribution
and consumption)
2-way DH
< 100 °C
<50-60 °C (70 °
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Review
4th Generation District Heating (4GDH)
Integrating smart thermal grids into future sustainable energy systems
Henrik Lund, Sven Werner, Robin Wiltshire, Svend Svendsen, Jan Eric Thorsen, Frede Hvelplund, Brian Vad Mathiesen
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1. Introduction
Plenum
A1
A2
Lunch
B1
B2
Plenum
Monday 18 August 2014
09.00-09.30 Breakfast and registration
09.30-10.00 Welcome and 4GDH definition paper
Welcome and introduction to the meeting
Professor Henrik Lund, Aalborg University, Head of the 4DH Research Centre
4th Generation District Heating definition
Professor Sven Werner, Halmstad University
Based on a recent paper, the definition of 4GDH is presented. A new generation of district heating technology is necessary to integrate smart electricity, gas and thermal grids. This enables low cost future energy systems by a combination of renewables and energy efficiency measures.
Steam storage
Coa
Waste
CHP waste incineration
Also low energy buildings
Local District Heating
District Heating
District Heating
District Heating
Development (District Heating generation) / Period of best available technology
A
1G / 1880-1930
2G / 1930-1980
3G / 1980-2020
4G / 2020-2050

13 PhD projects

Strategic Research Centre for 4th Generation District Heating Technologies and Systems

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PhD 1.1. Heating of existing buildings by low-temperature district heating
PhD 1.2. Supply of domestic hot water at comfort temperatures without Legionella
PhD 1.3. Conversion of existing district heating grids to low-temperature operation and extension to new areas of buildings
PhD 1.4 Minimising losses in the DH distribution grid

Ph.D. 2.1: Energy Scenarios for Denmark
Ph.D. 2.2 Thermal storage in district heating systems
Ph.D. 2.3 Distributed CHP-plants optimized across more electricity markets
Ph.D. 2.4 Low-temperature energy sources for district heating
Ph.D. 2.5 The role of district heating in the Chinese energy system

PhD 3.1: Strategic energy planning in a municipal and legal perspective
PhD 3.2: Price regulation, tariff models and ownership as elements of strategic energy planning
PhD 3.3: Geographical representations of heat demand, efficiency and supply
PhD 3.4: Geographical representations of renewable energy systems

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Results of the PhD projects

Monday 18 August 2014

09.00-09.30 **Breakfast and registration**

09.30-10.00 **Welcome and 4GDH definition paper**

Welcome and introduction to the meeting

Professor Henrik Lund, Aalborg University, Head of the 4DH Research Centre

4th Generation District Heating definition

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Europe and China

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10.00-11.00 Heat Roadmap Europe and China

GIS mapping and Heat Roadmap Europe

PhD fellow Urban Persson, Halmstad University

The central approach in the Heat Roadmap Europe project is to combine energy system modelling with GIS mapping of unique local conditions. In this presentation, the focus is on GIS mapping of Europe.

Heat Roadmap China

PhD fellow Weiming Xiong, Tsinghua University

In this presentation, a comparison of heat strategies from an energy system modelling perspective is presented. This study finds that district heating is an energy- and cost-efficient solution for China in combination with combined heat and power.

Anshan – First city to deploy European district heating model in China

Jan Eric Thorsen, Director, DEN Application Centre & HEX Research, Danfoss

Danfoss together with COWI is helping Anshan to turn into a world-leading city for district heating by recovering energy that is already available but wasted. This presentation shows the typical current system applied in China and suggested new solutions focusing on energy, emissions and finances.

Chair: Prof. Brian V. Mathiesen, Aalborg University, Deputy Head of the 4DH Research Centre

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District Heating in new building areas

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15.15-17.15 Challenges for district heating in new building areas

Introduction to the discussion
Professor Henrik Lund, Aalborg University, Head of the 4DH Research Centre

Methodology and results of the district heating analysis for the Danish Energy Agency
Hans Henrik Lindboe, Partner, Ea Energy Analyses
Presentation of the analyses in the recent study for the Danish Energy Agency, Fjernvarmeanalysen, focusing on the main results and the impact of current incentives. Based on the analysis, the importance of heat pumps, low-temperature systems and DH of new buildings can be discussed.

Strategy and technologies for transition to low-temperature district heating
Tom Diget, Manager, Viborg Fjernvarme
Viborg district heating has a long-term strategy to obtain high-efficient district heating with a minimum of heat loss. In this presentation, the implementation and technologies used in the short term to implement this strategy are presented with a focus on district heating for new buildings in Viborg.

Future district heating technologies
Lars Boye Mortensen, Project Manager, NIRAS
Perspectives and experiences on the implementation of future district heating concepts based on various NIRAS projects including a Flexenergy workshop in Brønderslev.

District heating supply in new buildings in Aarhus
Elsebeth Arendt, Head of Section, AffaldVarme Aarhus
In this presentation, the challenges and opportunities in the district heating supply of new buildings are discussed from an economic and consumer viewpoint.

Panel debate
Chair: Birger Lauersen, Manager International Affairs, Danish District Heating Association

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Renewable Energy Systems

A Smart Energy Systems Approach to the Choice and Modeling of 100% Renewable Solutions

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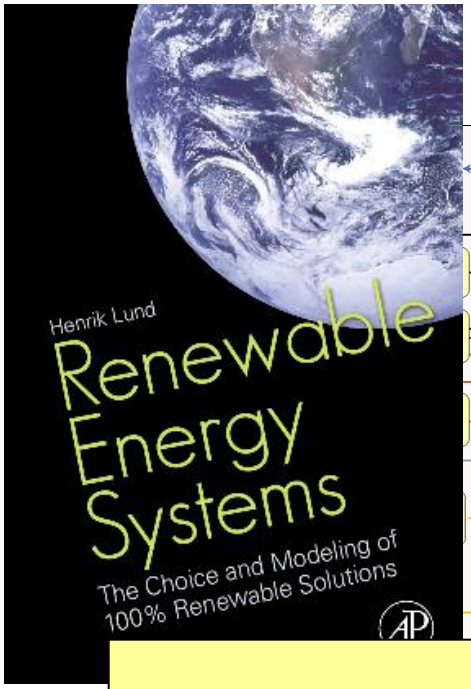

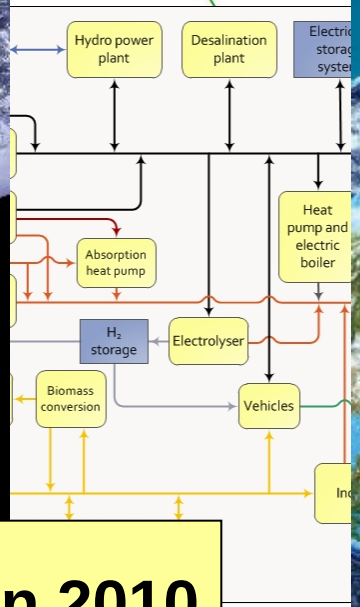

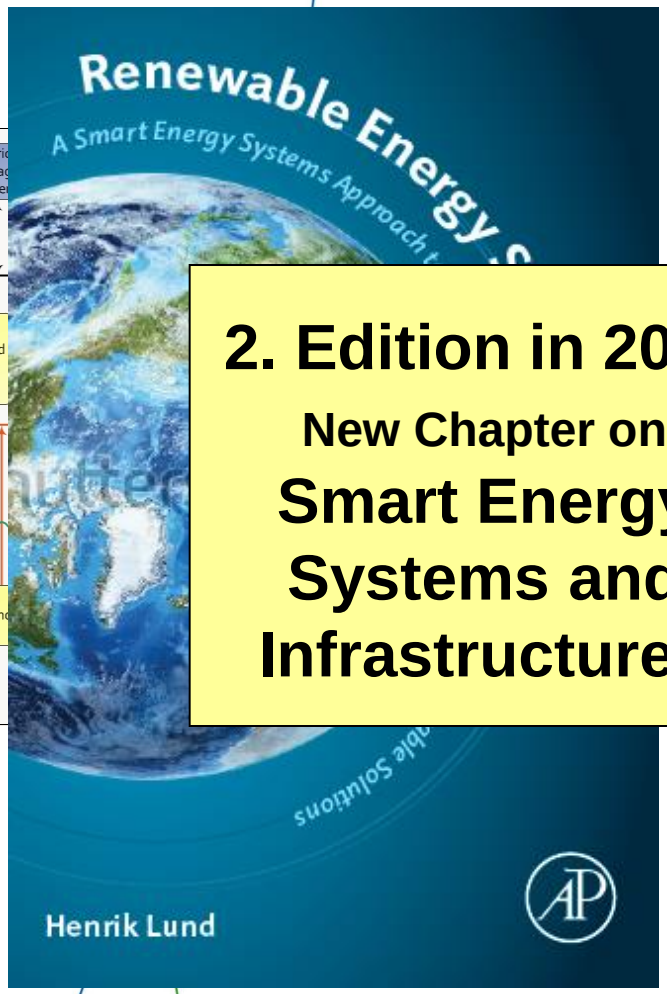

1. Edition in 2010

2. Edition in 2014

New Chapter on

Smart Energy Systems and Infrastructures

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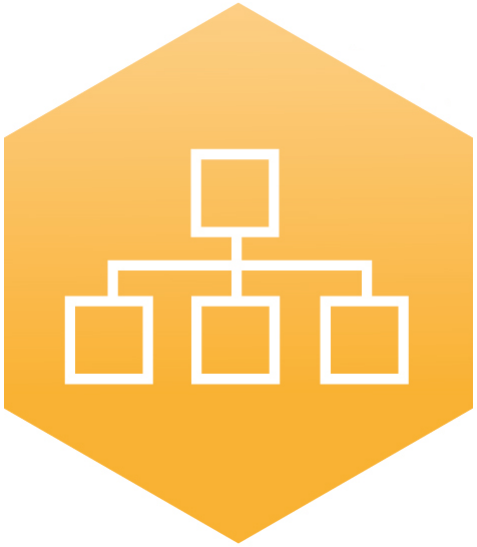

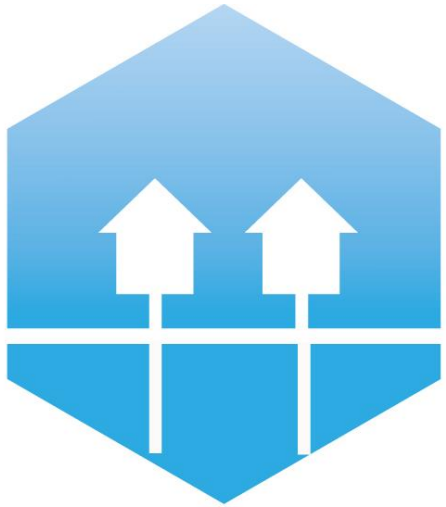

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Conference dinner 18:30
Utzon Restaurant

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