

Research & Innovation District Heating in Europe

Sven Werner
Halmstad University
Sweden

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Outline

1. DHC+ , the European DHC research platform since 2009
2. 4DH – Fourth generation district heating systems
3. Heat Roadmap Europe – Logic and results
4. First international textbook about district heating and cooling

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DHC+

- Now operating in the second commitment period 2012-2014
- 35 partners from 12 countries
- Performed projects : Ecoheat4EU, Ecoheat4cities, UPRES, SDH-Takeoff, Summerhet, Ecoheatcool.
- Ongoing projects: Rescue, SDHplus, Sunstore4, BiogasHeat
- Project applications: Stratego
- Vision for DHC, Research agenda, Education & Training (Berlin 2013), Annual conferences - next Oct 5-6, 2013
- Renewable heating and cooling platform
- More info at www.dhcplus.eu

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DHC+ members by country

DHC+, Overview of members						
Country	Component supplier	Consultants	DH association	Heat supplier	Research	Grand Total
Austria				1	1	2
Belgium			1		1	2
Croatia					1	1
Czech Republic			1			1
Denmark	3	1	1		2	7
Finland			1	2	1	4
France				2		2
Germany		1	1			2
Italy				1	1	2
Netherlands	1		1	1		3
Norway				1		1
Sweden	1	1	1	2	3	8
12	5	3	7	10	10	35

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4DH, Denmark

- Aalborg University (professor Henrik Lund) as coordinator with 33 active partners.
- 2012-2017, with a total budget of 10 M€, mainly financed by DSF, the Danish Council for Strategic Research. Currently, the largest district heating academic project in Europe.
- Considering all future market conditions (technology, supply/demand, and institutional frameworks) for the 4th generation of district heating technology.
- 13 PhD students

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4DH, Denmark

	<i>1st generation</i>	<i>2nd generation</i>	<i>3rd generation</i>
<i>Period of best available technology</i>	1880-1930	1930-1980	1980-
<i>Heat carrier</i>	Steam	Pressurised hot water, mostly over 100°C	Pressurised hot water, often below 100°C
<i>Labels</i>	STEAM	A. SOVIET DH TECHNOLOGY B. MARKET-BASED DH SYSTEMS	SCANDINAVIAN DH TECHNOLOGY
<i>Typical components</i>	<ul style="list-style-type: none"> • Steam pipes in concrete ducts • Often no condensate return • Steam traps • Compensators 	<ul style="list-style-type: none"> • Pipes in concrete ducts • Large shell- and tube heat exchangers • Extensive substations • Heavy, material intensive components 	<ul style="list-style-type: none"> • Prefabricated, preinsulated pipes directly buried into the ground. • Compact substations using brazed plate heat exchangers • Material lean components
<i>Quality</i>	Outdated technology	Low quality for the Soviet DH technology and high to medium quality for other systems	High quality
<i>Current use</i>	New York and Paris. Replacement in Hamburg and Munich	Older parts of all early district heating systems	All replacements in CEE and former USSR countries and all extensions and new systems in China, Korea, Europe, USA and Canada.

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4DH, Denmark

New future market conditions:

- Supply: Less heat from CHP using fossil fuels. More heat from renewables as solar, geothermal, biomass, and wind.
- Demand: Lower specific heat demands
- Technology: More efficient heat distribution with lower distribution temperatures

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Heat Roadmap Europe

- Subproject within the 4DH project in cooperation with Euroheat & Power, Brussels
- **What is the future market for district heating in Europe?**
- Heat Roadmap Europe, prestudy 1 (2012) concerning business-as-usual scenario with current heat demands
- Heat Roadmap Europe, prestudy 2 (2013) concerning a high energy efficiency scenario

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Heat Roadmap Europe - Why this study?

- The **heating and cooling sector has largely been overlooked** in all scenarios exploring the energy future towards 2050.
- This study focuses on the future European heat and cooling market and its importance in terms of cost-savings, job creation, investments, and **a smarter energy system.**

Heat Roadmap Europe - Mapping

- Normally, future energy projections are based on national inputs, as 27 slices for EU27, and generic options
- We use a higher resolution, about 1300 slices (NUTS3 regions)
- We want to consider specific regional and local options (existing district heating systems, heat surpluses, renewables etc)

HRE – Existing District Heating Systems in Europe by NUTS3 region

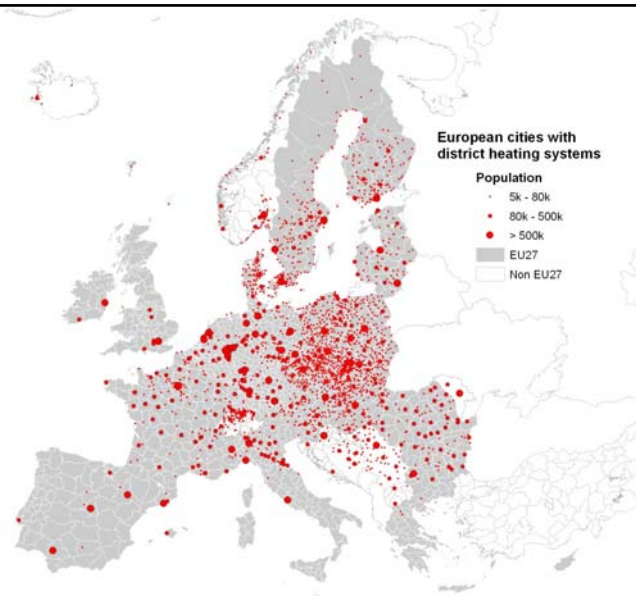


Figure 12-2. Map showing district heating systems in Europe in 2011. Systems have identified in 2779 cities and towns having more than 5000 inhabitants. Further 1395 district heating systems have been found in smaller towns and villages, mostly in Denmark, Sweden, Switzerland, Austria, the Czech Republic, and the Slovak Republic. According to national statistics, further about 1500 systems are in operation. Source: The European DHC database at Halmstad University (Urban Persson).

HRE - Current waste incineration plants by NUTS3 region

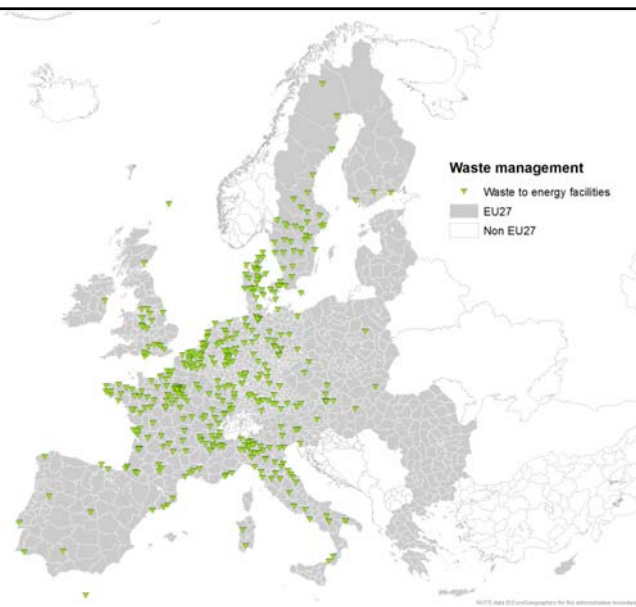
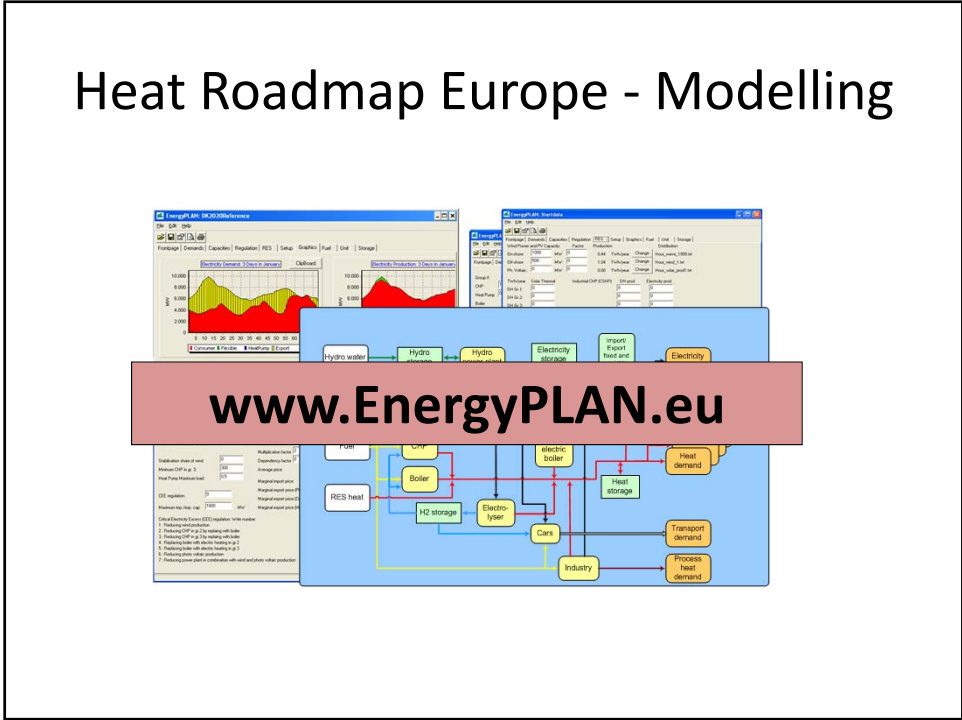
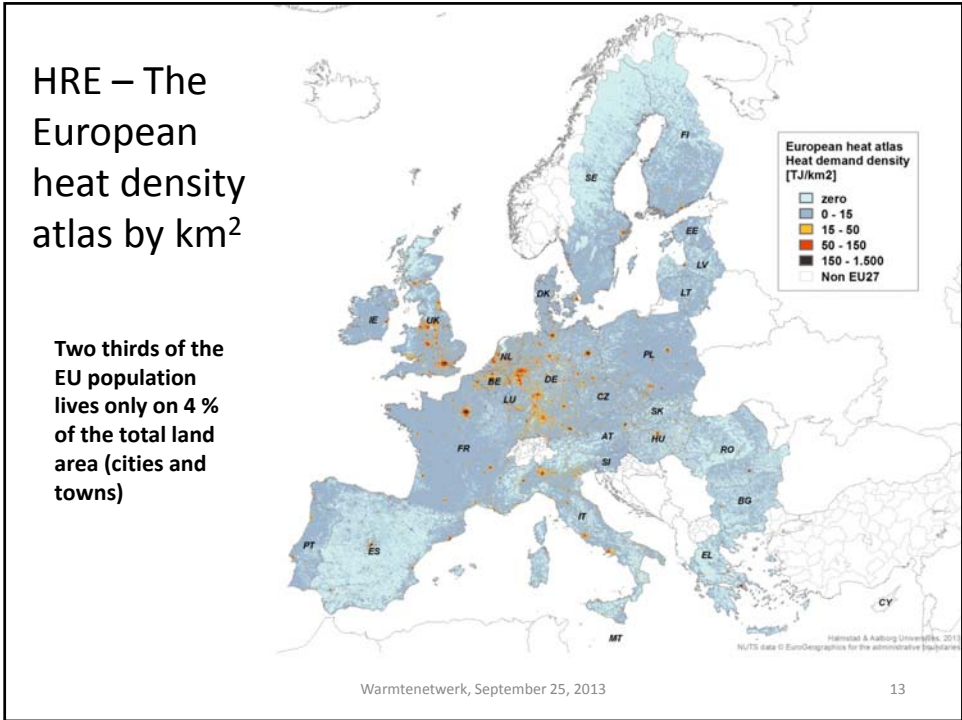


Figure 41. Locations of 414 waste incineration plants in Europe. Sources: CEWEP, E-PRTR, ISWA, and some national sources for Sweden, Denmark, and France.



Heat Roadmap Europe - Results

- All results are benchmarked against the EC communication called Energy Roadmap 2050 (Dec 2011), which did not see a bright future for district heating.
- Our both prestudies presume a market share of 50% for district heating in 2050 for heating the EU27 buildings. The current market share is 13%.

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Heat Roadmap Europe 1 - Results

- Reduced fuel costs of 30 Billion EUR with 50% district heating in 2050
- Total costs are reduced by 14 Billion EUR in 2050
- Additional investments of a total of 500 billion EUR and additional jobs from 2013 to 2050: 8-9 million man-year in total
- Lower carbon dioxide emissions with 650 Mton in 2050

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Heat Roadmap Europe 1 – Results (hot spot regions)

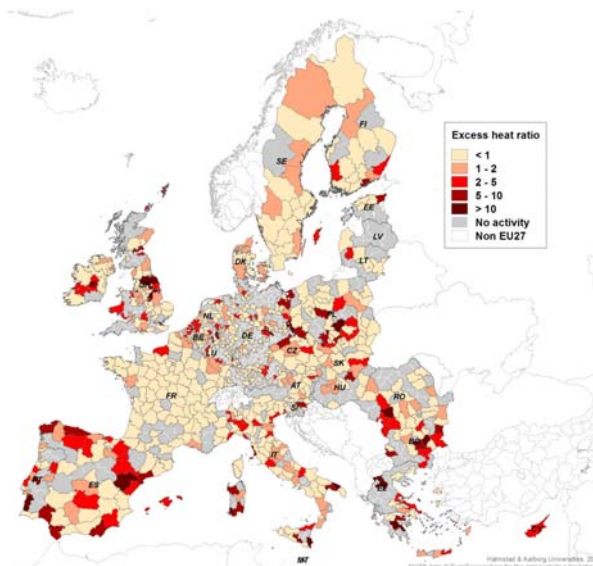
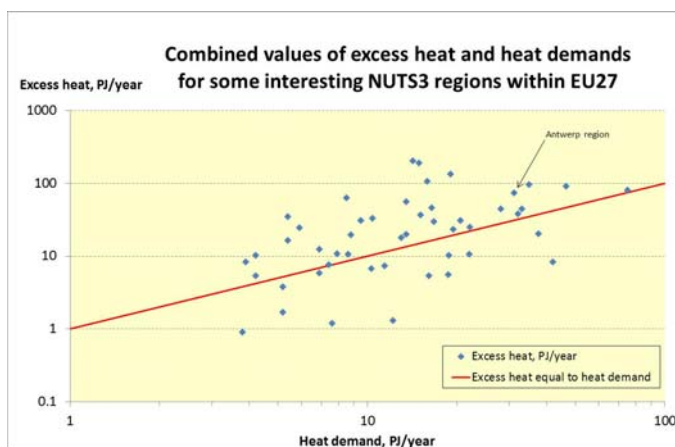


Figure 25: EU27 NUTS3 regions by their excess heat ratio, i.e. their share of excess heat relative their share of low temperature heat demands in residential and service sectors.

Heat Roadmap Europe 1 – Results (hot spot regions)



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Heat Roadmap Europe 2 - Results

- Same primary energy supply, carbon dioxide emissions, and import dependency as in the EC 2011 communication
- But the price tag with 50 % district heating in 2050 will be lower : 100 Billion EUR/year in less end use investments.

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Heat Roadmap Europe - Conclusion

District heating are here to stay, but district heating has to change

(the 4th generation has to replace the 3rd generation of district heating technology)

Download the two HRE prestudies at

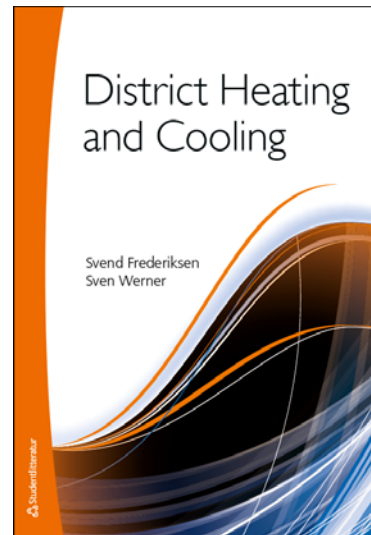
www.4dh.dk/hre

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International textbook 2009-2012

- Update of the 1993 Swedish textbook
- 586 pages, with a combination of technical and non-technical content
- Ambition with an European perspective, but still many Swedish examples
- Published on August 12, 2013



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The End

ANY QUESTIONS?

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