



# Heat Roadmap Europe 2050

Presented by:

Sven Werner, Halmstad University

[sven.werner@hh.se](mailto:sven.werner@hh.se)

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## **Heat Roadmap Europe** 2050

STUDY FOR THE EU27

by



Aalborg University

David Connolly  
Brian Vad Mathiesen  
Poul Alberg Østergaard  
Bernd Möller  
Steffen Nielsen  
Henrik Lund

Halmstad University

Urban Persson  
Daniel Nilsson  
Sven Werner



Ecofys Germany GmbH

Jan Grözinger  
Thosmas Boersmans  
Michelle Bosquet

PlanEnergi

Daniel Trier



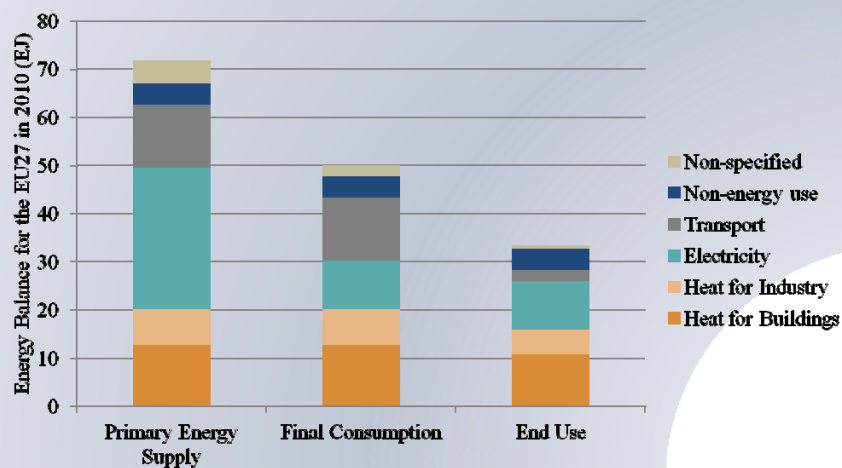
for



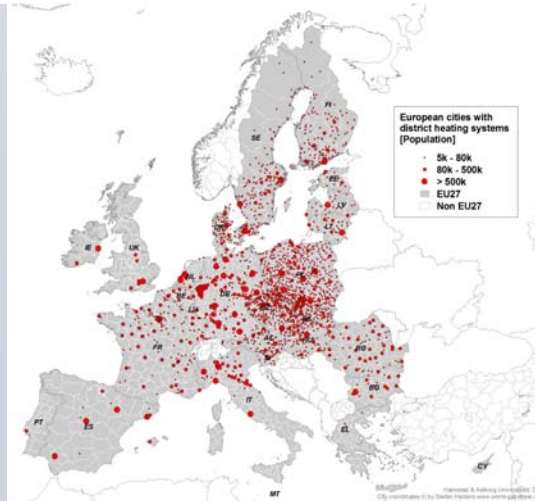
## Why this study?

- ↳ 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**

## The EU is wasting energy (heat)...



## ... and 6000 District Heating systems already exist in the EU



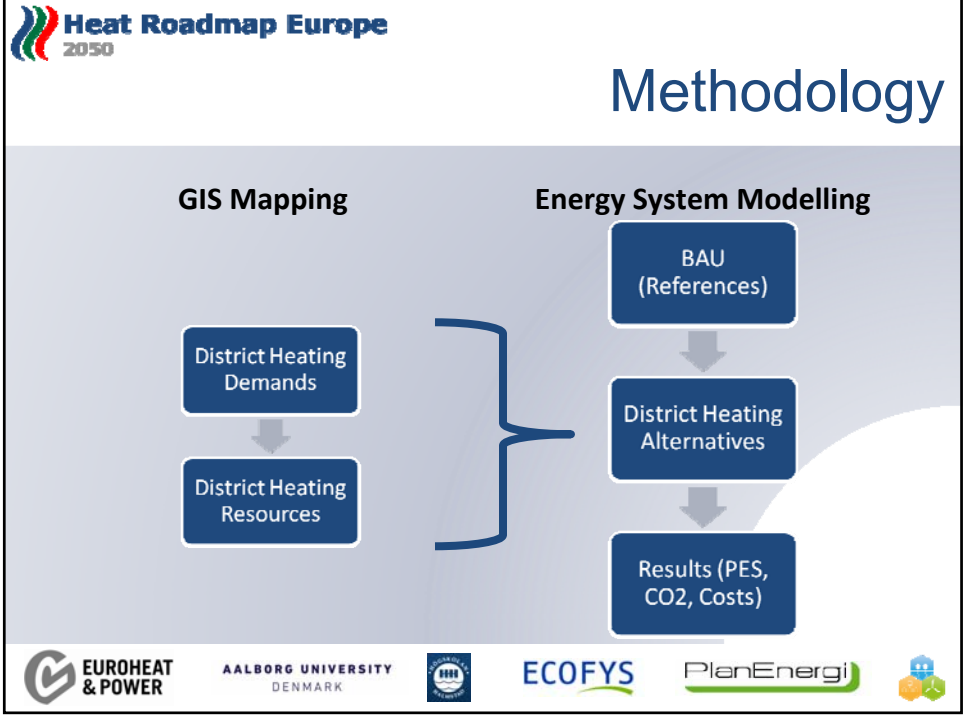
## What is this Study?

### Two Reports:

Pre-study 1 (2012): Is DHC beneficial in a business-as-usual scenario?

Pre-study 2 (2013): Is DHC beneficial in a low-heat demand scenario?





**Heat Roadmap Europe 2050**

## GIS Mapping: Many Heat Sources

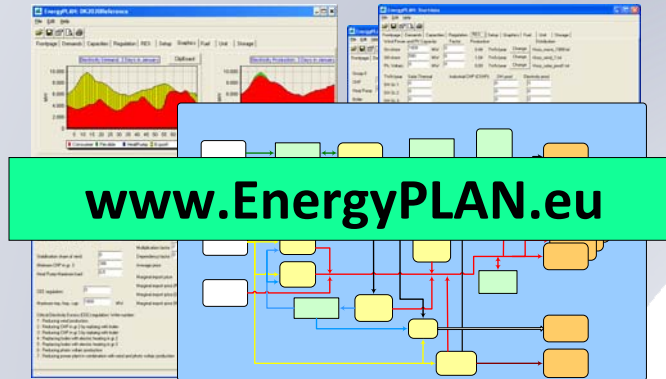
- ↳ Urban areas (Heating Demands)
- ↳ Power and Heat Generation
- ↳ Waste Management
- ↳ Industrial waste heat potential
- ↳ Geothermal heat
- ↳ Solar Thermal
- ↳ the study indicates that the **market shares for district heating for buildings can be increased to 30% in 2030 and 50% in 2050.**

**Map Legend: European heat after heat demand density (TWh/GJ)**

0	0 - 10
10	10 - 20
20	20 - 30
30	30 - 40
40	40 - 50
50	50 - 60
60	60 - 70
70	70 - 80
80	80 - 90
90	90 - 100
100	100 - 110
110	110 - 120
120	120 - 130
130	130 - 140
140	140 - 150
150	150 - 160
160	160 - 170
170	170 - 180
180	180 - 190
190	190 - 200
200	200 - 210
210	210 - 220
220	220 - 230
230	230 - 240
240	240 - 250
250	250 - 260
260	260 - 270
270	270 - 280
280	280 - 290
290	290 - 300
300	300 - 310
310	310 - 320
320	320 - 330
330	330 - 340
340	340 - 350
350	350 - 360
360	360 - 370
370	370 - 380
380	380 - 390
390	390 - 400
400	400 - 410
410	410 - 420
420	420 - 430
430	430 - 440
440	440 - 450
450	450 - 460
460	460 - 470
470	470 - 480
480	480 - 490
490	490 - 500
500	500 - 510
510	510 - 520
520	520 - 530
530	530 - 540
540	540 - 550
550	550 - 560
560	560 - 570
570	570 - 580
580	580 - 590
590	590 - 600
600	600 - 610
610	610 - 620
620	620 - 630
630	630 - 640
640	640 - 650
650	650 - 660
660	660 - 670
670	670 - 680
680	680 - 690
690	690 - 700
700	700 - 710
710	710 - 720
720	720 - 730
730	730 - 740
740	740 - 750
750	750 - 760
760	760 - 770
770	770 - 780
780	780 - 790
790	790 - 800
800	800 - 810
810	810 - 820
820	820 - 830
830	830 - 840
840	840 - 850
850	850 - 860
860	860 - 870
870	870 - 880
880	880 - 890
890	890 - 900
900	900 - 910
910	910 - 920
920	920 - 930
930	930 - 940
940	940 - 950
950	950 - 960
960	960 - 970
970	970 - 980
980	980 - 990
990	990 - 1000

**Logos:** EUROHEAT & POWER, AALBORG UNIVERSITY DENMARK, ECOFYS, PlanEnergi

# Energy Systems Analyses Model

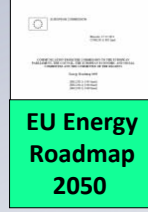
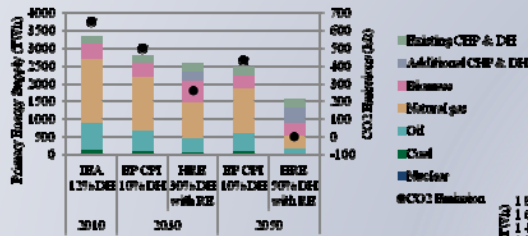


## Pre-Study 1 (2012)

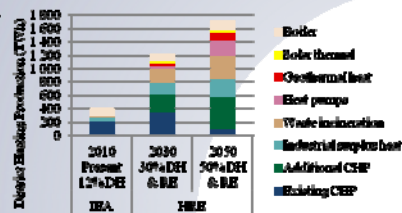
Is DHC beneficial for the EU energy  
system in a business-as-usual  
scenario?



**Primary Energy Supply & CO2 for Heating Buildings from 2010 to 2050**  
EP CPI vs. HRE RE

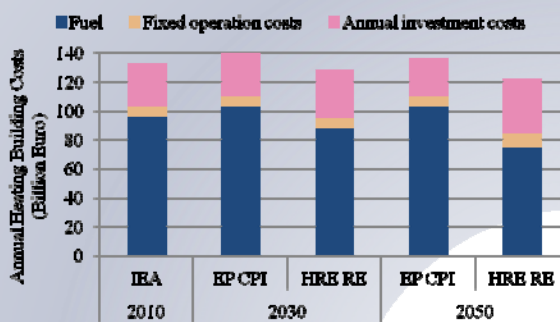


**District Heating Production for Heating Buildings from 2010 to 2050**



- ↳ Saved fuel costs of annual approx. 30 Billion EUR in 2050
- ↳ In total cost are reduced by 14 Billion EUR in 2050
- ↳ Additional investments of a total of 500 billion EUR
- ↳ Additional jobs from to 2013 to 2050: 8-9 million man-year in total  
Approx. 220,000 jobs.

**Annual EU27 Costs for Heating Buildings from 2010 to 2050**



## HRE1 Conclusion: 50% DH and CHP



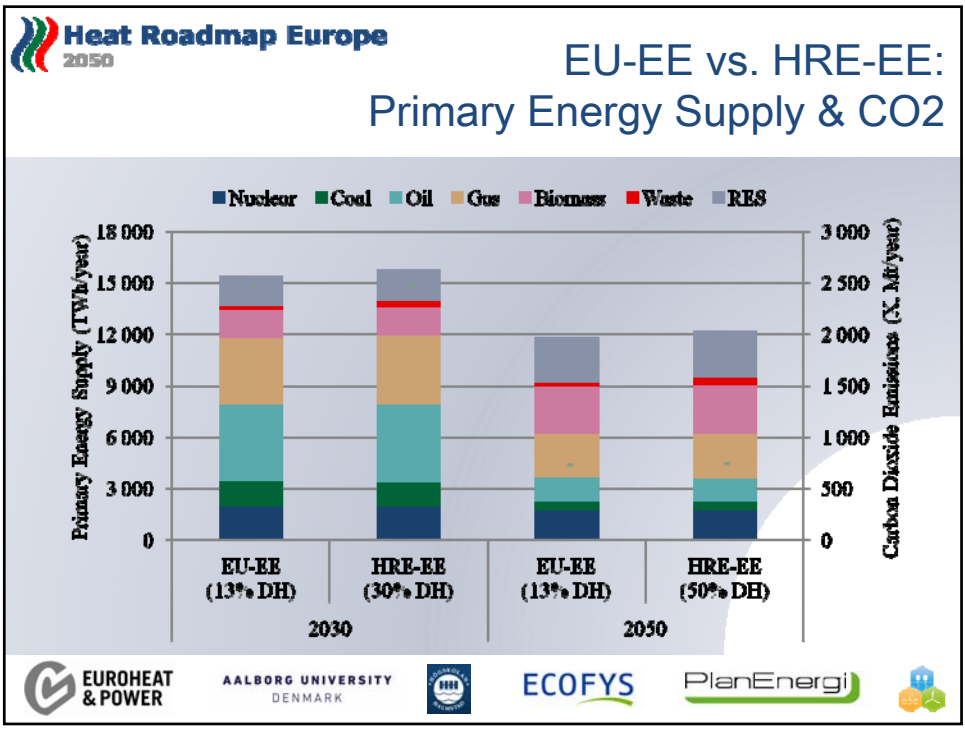
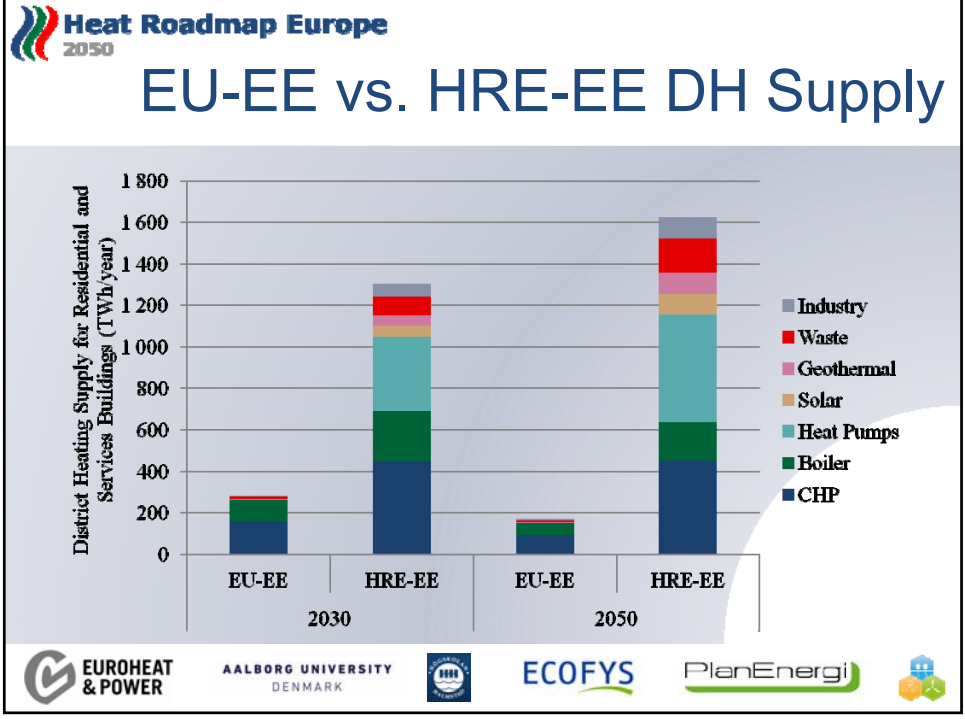
- Decrease primary energy supply and especially **LESS FUEL** CO<sub>2</sub> emissions
- Decrease annual costs of energy in Europe **LESS MONEY** 14 Billion in 2050
- Create **MORE EU JOBS** jobs over the period 2013-2050
- Further **MORE RE**



## Pre-Study 2 (2013)

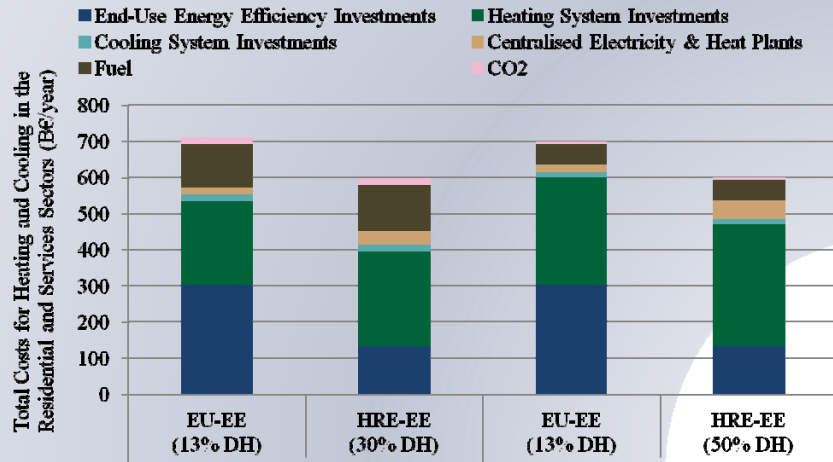
Is DHC beneficial for the EU energy system in a low-heat demand scenario?







## EU-EE vs. HRE-EE: Heat & Cooling Costs -15%

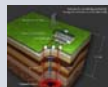


## Renewables and Energy Efficiency

### Additional Renewables

- ↳ 100 TWh Geothermal
- ↳ 100 TWh large-scale solar
- ↳ 65 TWh wind (due to a smarter energy system)

Context: 2050 total heat is 2600 TWh



### Energy Efficiency

↳ Demand side is extremely important, but eventually it will become expensive



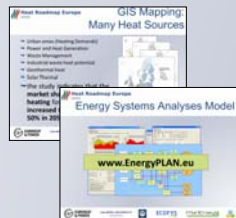
↳ Supply side also has many options:



- ↳ PP converted to CHP
- ↳ 100 TWh surplus industrial heat
- ↳ 200 TWh heat from waste incineration

# Main Conclusions

# HRE1 Conclusions



- ↳ If we continue under a business-as-usual scenario, then district heating can:
  - ↳ Reduce the PES
  - ↳ Reduce the CO2 emissions
  - ↳ Reduce the costs of the energy system
  - ↳ Use more renewable energy

## HRE2 Conclusions



- ↳ If we implement a lot of energy efficiency measures, then district heating will:
  - ↳ Meet the same goals:
    - ↳ Utilise the same amount of fossil fuels
    - ↳ Enable the same CO2 emission reductions
  - ↳ BUT, Cost approximately 15% less

## Study 3? (20??)

Is DHC beneficial for the EU energy  
system in a ??? scenario?

## Research To Be Continued...

- Develop national plans that connect the local (mapping) and EU (modelling) results.
- Optimise the EU energy system by reducing baseload electricity and developing more smart energy system technologies
- 4<sup>th</sup> Generation District Heating:  
<http://www.4dh.dk/>
- Create an electric heating scenario for the EU27



## Thank you

- Need a copy of the report?
- [www.heatroadmap.eu](http://www.heatroadmap.eu)
- [www.4dh.dk/hre](http://www.4dh.dk/hre)

