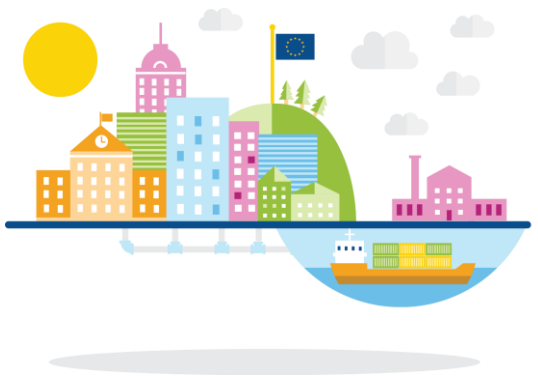
Celsius Talk:

"Heat-pumping the future of district energy"

Thursday March 28, 2019



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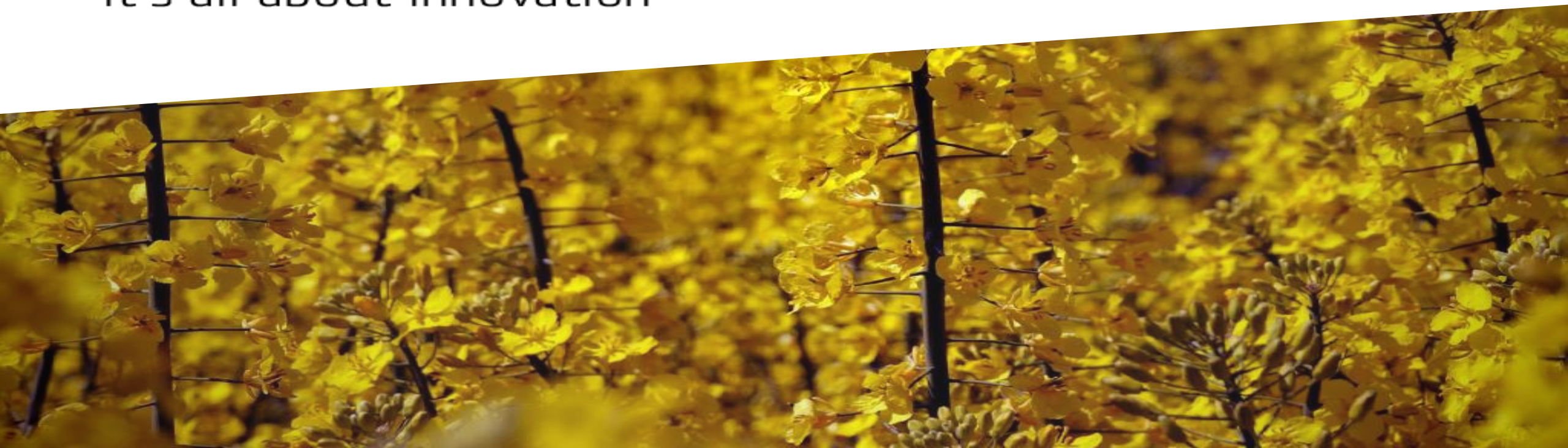
it's all about innovation



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IEA Annex 47 Heat Pumps in district heatingand cooling systems

Celcius webinar 2019

Svend Pedersen, Danish Technological Institute

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Creating value since 1906

For more than a century the Danish Technological Institute has been involved in the technological evolution, making it one of the oldest of its kind in the world.

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Technological infrastructure

- More than 1.000 specialists
- State of the art-equipment and facilities
- 80+ laboratories

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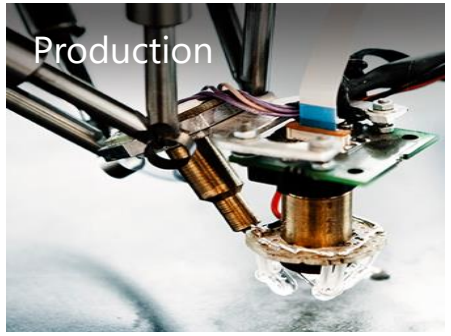
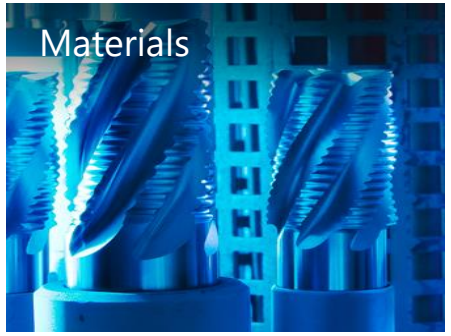
Divisions





IEA Annex 47 – Heat Pumps in DHC Systems

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- Initiated in 2015

- Participating Countries:
  - Denmark (Lead, Danish Technological Institute)
  - Sweden (RISE)
  - Austria (AIT)
  - Switzerland (HSLU)
  - Great Britain (DECC)

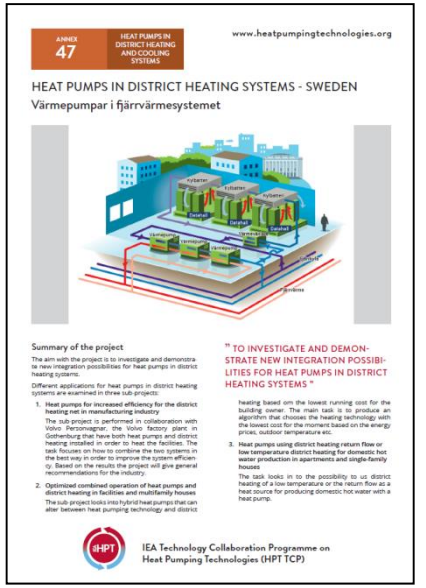
- Task 1. Market potential

- Task 2. Description of existing systems

- Task 3. Concepts/solutions

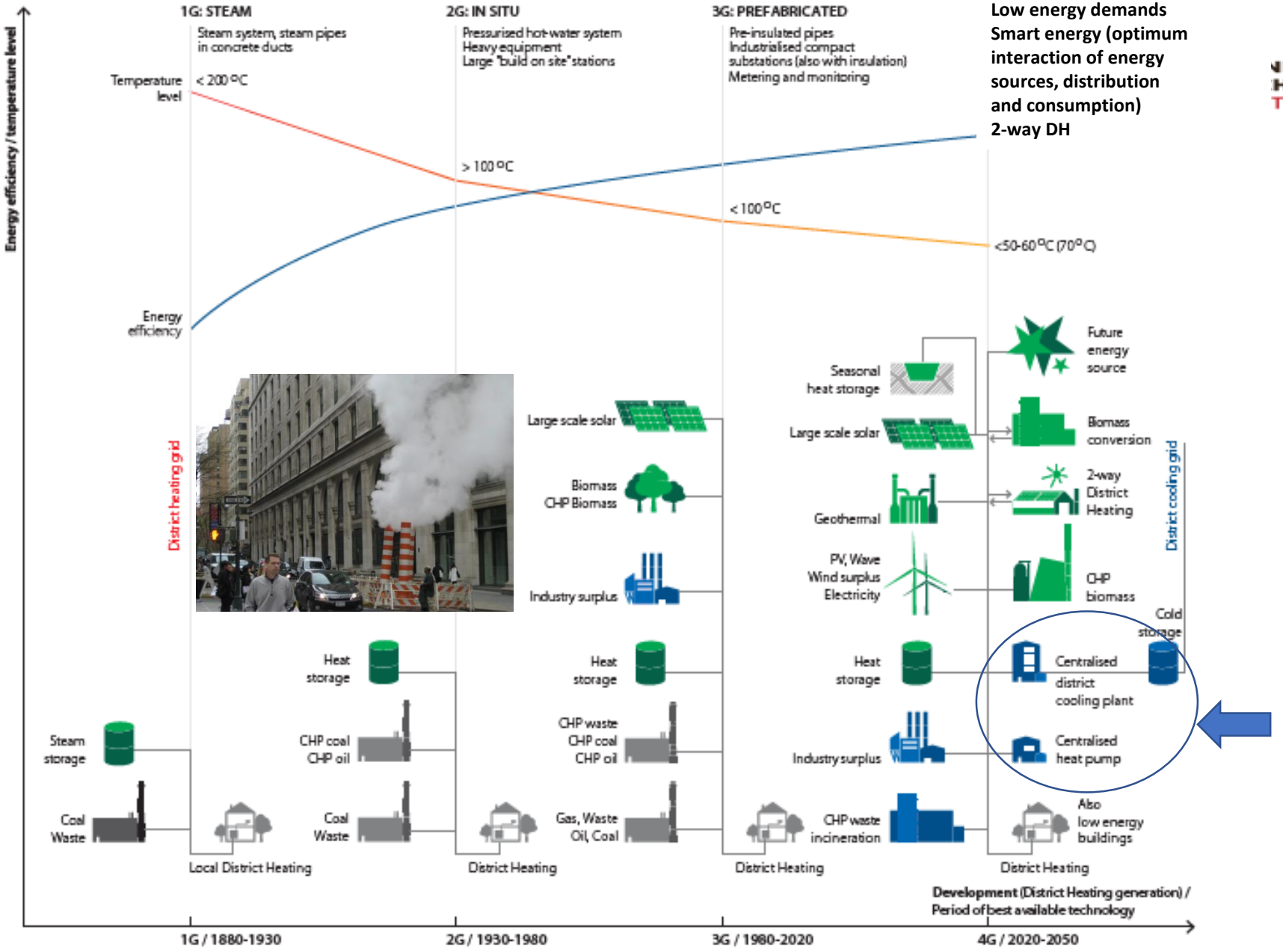
- Task 4. Implementation barriers

- Task 5. Dissemination



Source: http://heatpumpingtechnologies.org/annex47/

4G: 4th GENERATION
Low energy demands
Smart energy (optimum interaction of energy sources, distribution and consumption)
2-way DH



Coordinated with IEA DHC program

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- IEA DHC/CHP share information

- Annex 47 is presented for IEA DHC ExCo annually
- Annex 47 was presented for IEA DHC ExCo in May

- IEA DHC/CHP focus are 4 Generation District Heating and low temperature systems

IEA DHC|CHP

Classification of networks

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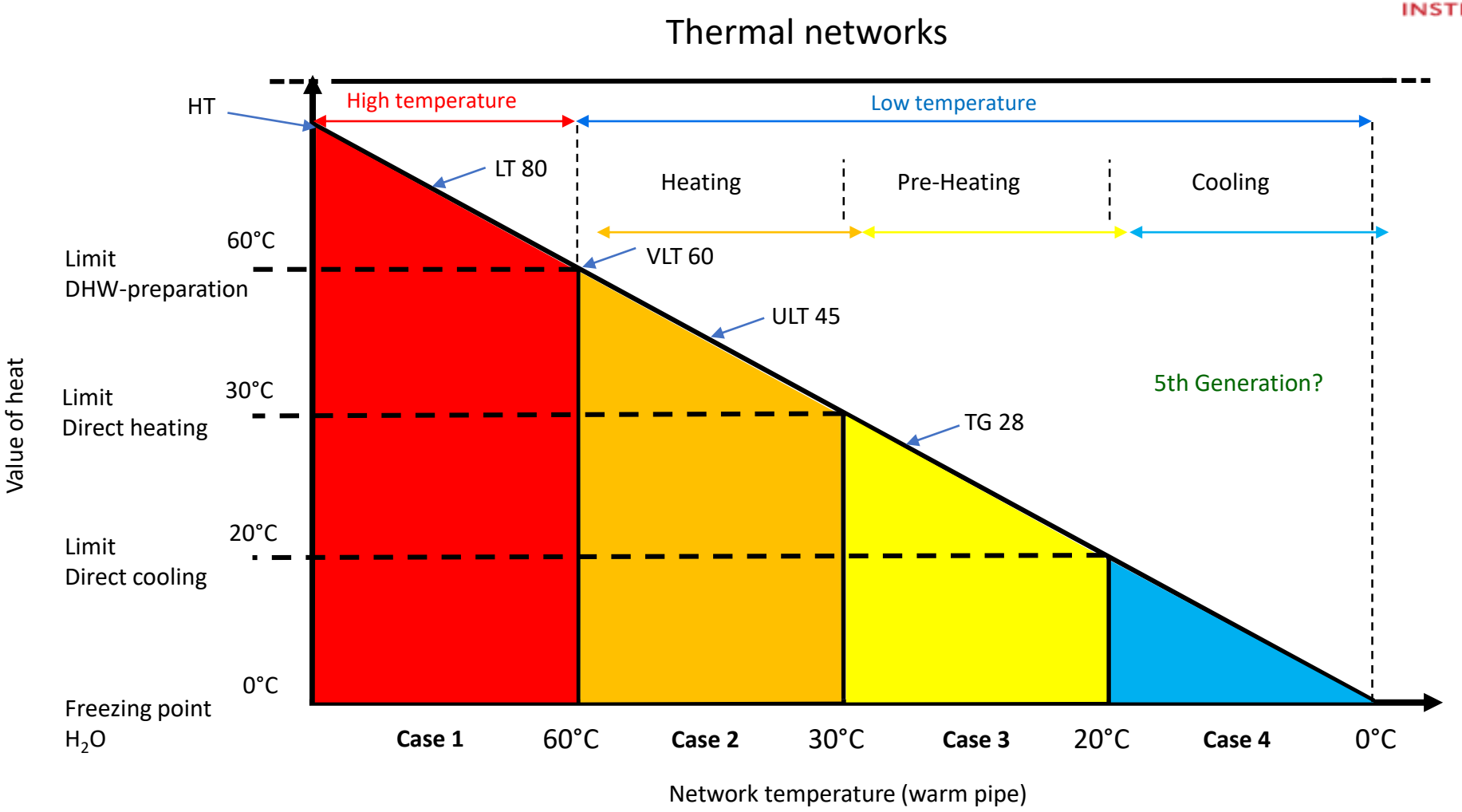

Task 2 Cases

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	High Temp. (HT)	Low Temp. (LT)	Very Low Temp. (VLT)	Ultra-Low Temp. (ULT)	Thermal Grids (TG)
Typical Temperature Supply/Return	100 °C/50°C	80 °C/40°C	60 °C/30°C	45 °C/30°C	28 °C/8°C
Task 2 cases	16	12	5	0	5
Domestic Hot water production type	Tank/ Instantaneous heat exchanger unit	Tank/ Instantaneous heat exchanger unit	Tank/ Instantaneous heat exchanger unit	Micro Booster Heat pump/electrical heater/Gas or oil	Micro Booster Heat/Decentral Heat Pump
Heating system usable	Radiator/floor heating	Radiator/floor heating	Radiator/floor heating	Floor Heating/ Air coils	Floor Heating

Task 2 cases

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Heat Pumping Technologies | About | Projects | Publications | HPT Magazine | The conference | Contact us | News | Activities | Market & technology | Member login | Disclaimer | Cookies

Annex 47 | Home | News | Activities | Publications | Team site

Publications

Task 1. Market and energy reduction potential

Task1_report_Sweden
Task1_report_Switzerland
Task1 report Austria

Task 2. Description of existing DHC systems and demonstration and R&D projects with heat pumps

Austria
Compression HP Bergheim
District heating network Flachau
Absorption HP Hallein
District heating network Krumpendorf
Compression HP Lehen
District heating network Tamsweg
DistrictBoost
BigSolar Graz
Klagenfurt
Heatrecovery

Engelsk (USA)

ANNEX 47 | HEAT PUMPS IN DISTRICT HEATING AND COOLING SYSTEMS

www.heatpumpingtechnologies.org

THERMAL NETWORK OF THE JARDINS DE LA PÂLA, BULLE - SWITZERLAND

Réseau thermique des Jardins de la Pâla, Bulle

Fig 1: 3D view of the suppy area of the thermal network in Bulle.

Summary of the project

The neighborhood of Jardins de la Pâla in Bulle currently consists of 18 buildings, primarily newly constructed residential, office and commercial buildings. The supply of space heating, domestic hot water and passive cooling is provided by an anergy network.

The concept consists of pumping groundwater (approx. 8 – 12 °C) from a depth of 50 to 65 m and supplying a low temperature network (approx. 8 – 9 °C) via a heat exchanger. The thermal energy is transported via the low temperature network to the buildings, where heat pumps generate the heat required for space heating (35 - 45 °C) and domestic hot water (60°C). In addition, decentralised heat exchangers provide passive cooling of the buildings.

" GROUNDWATER USE FOR COOLING AND HEATING BUILDINGS IN A NEIGHBOURHOOD IN BULLE "

preferred. From a practical point of view, this decentralised solution offers greater flexibility in the provision of services. In addition, a low temperature network enables the use of groundwater as a source of passive cooling, which is essential for new buildings. Therefore, the solution to exploit the geothermal resource through an anergy network and decentralised heat pumps was selected.

Task 3 Integration

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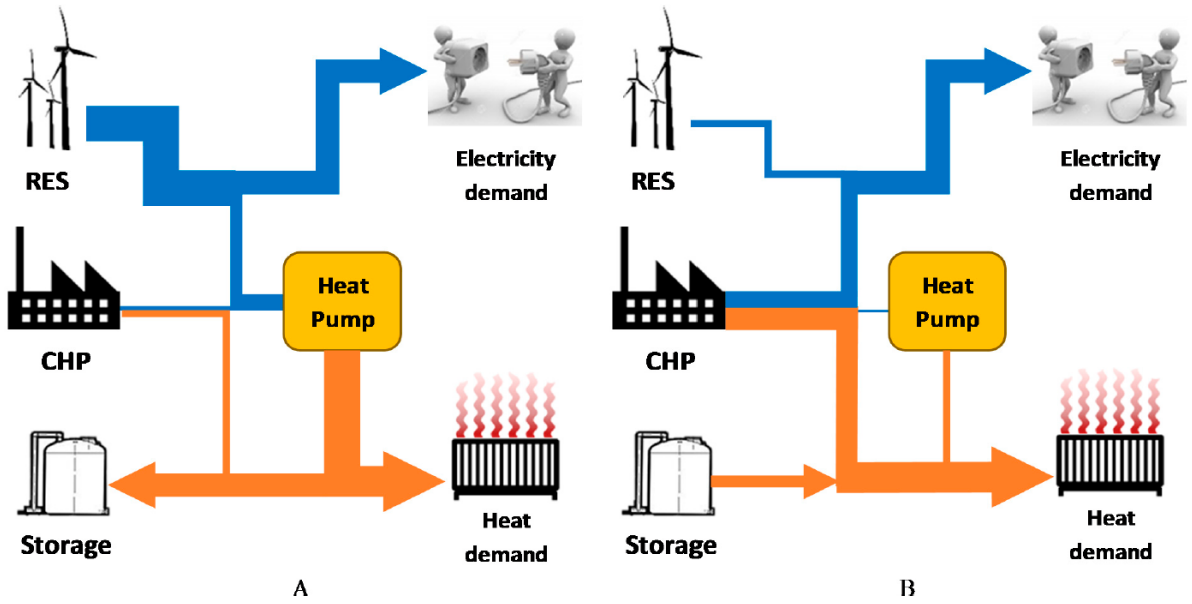

Figure 10: Large-Scale HPs used with high share of RES (A) and HPs used with low share of RES (B) [2].

Integration of heat pump in DH Grid

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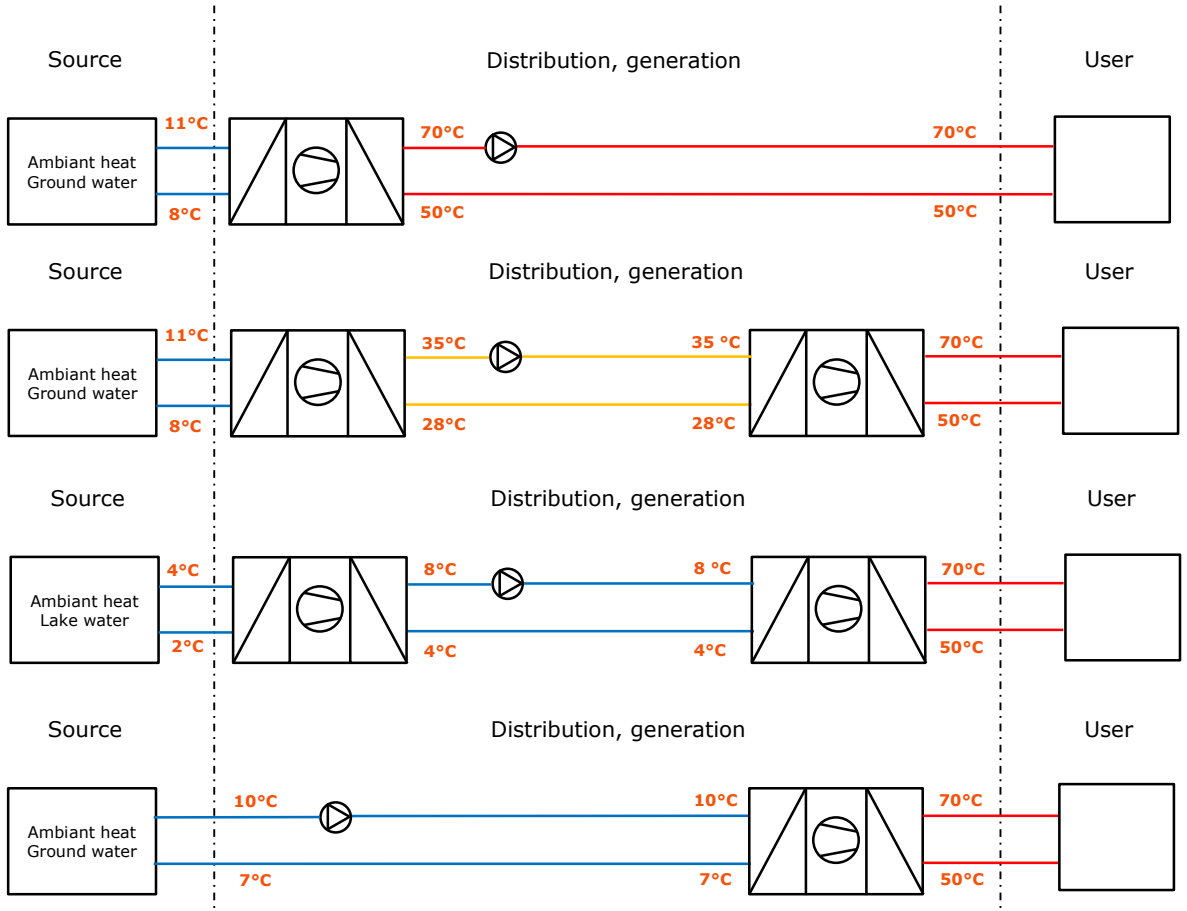


POSITION:

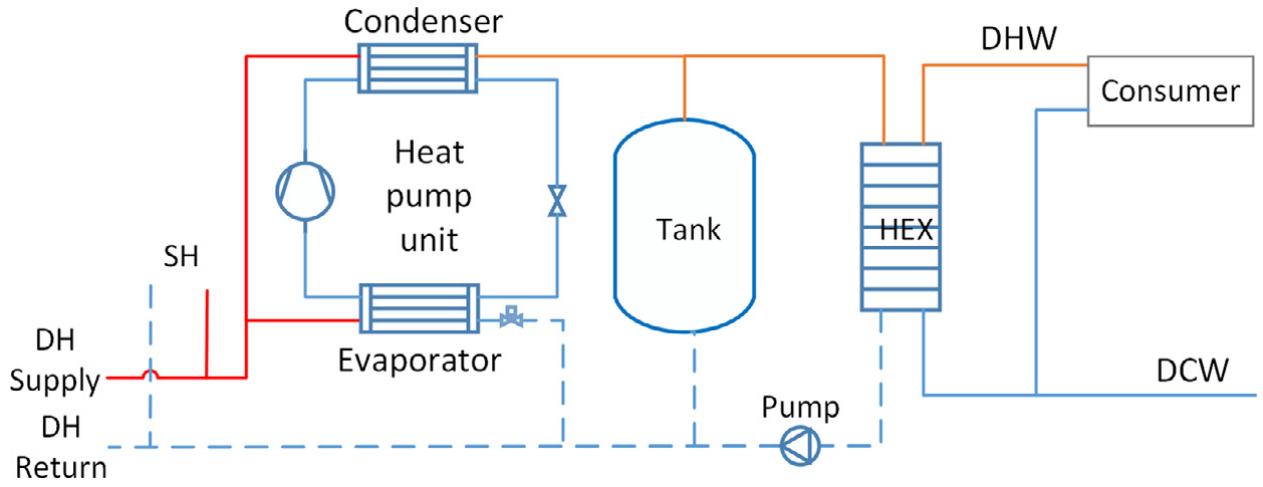
CENTRAL

CENTRAL/
DECENTRAL

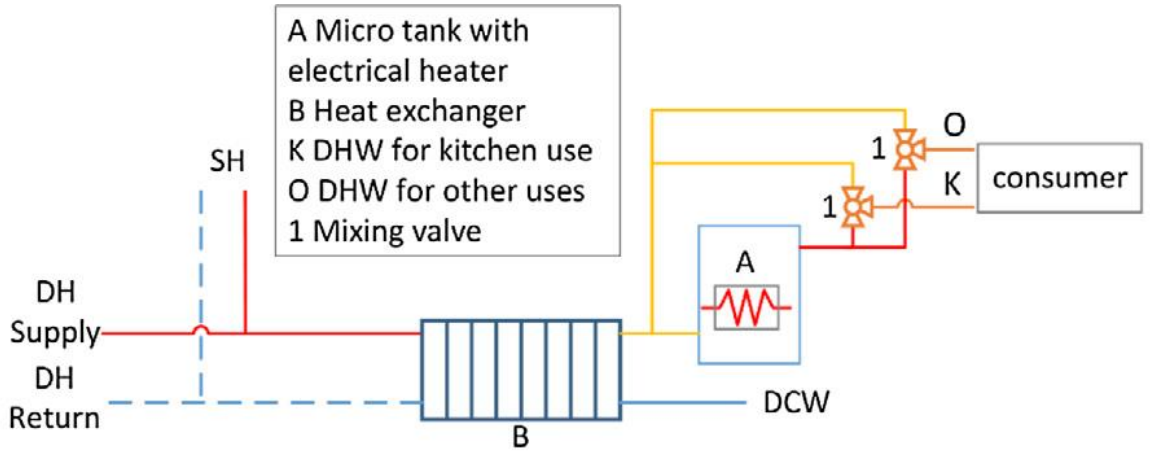
CENTRAL/
DECENTRAL

DECENTRAL

Decentral Integration



DHW system installing a central heat exchanger combined with heat pump.



DHW system with electric micro tank system.

Grid Losses versus heat density

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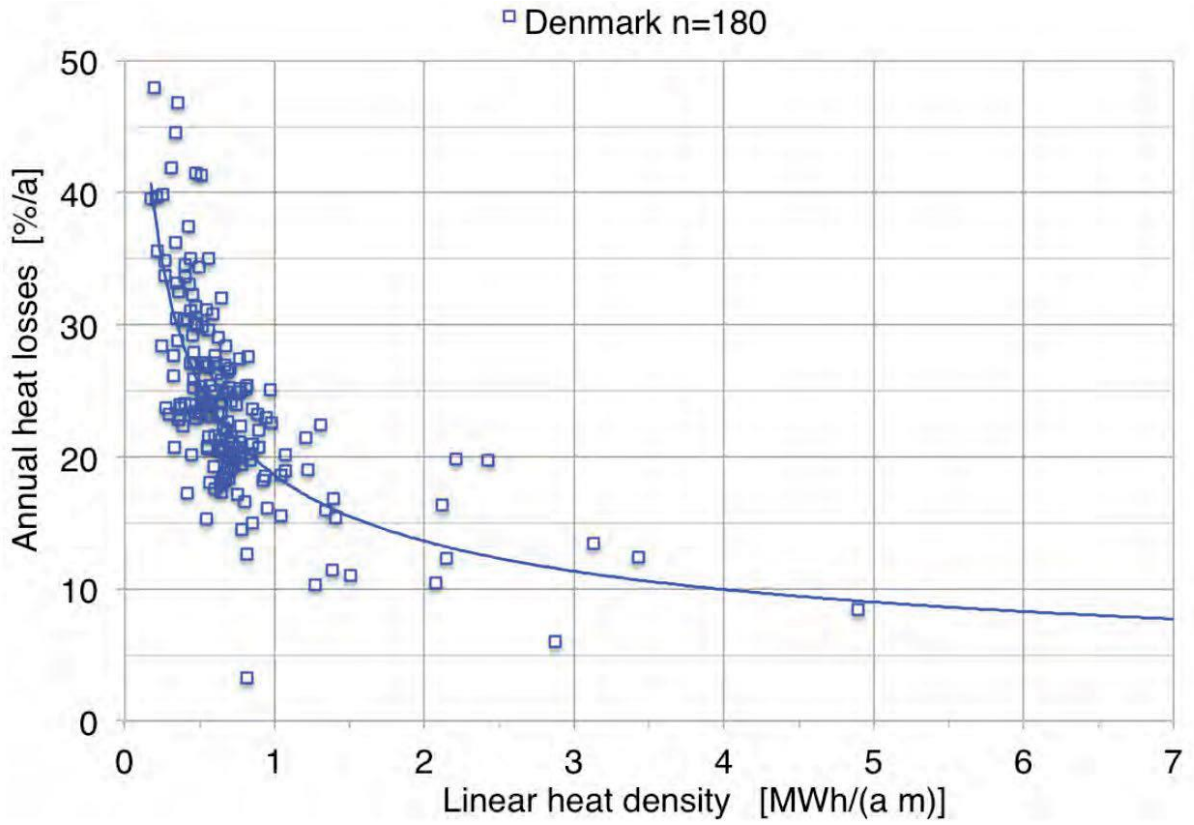

Heat distribution losses as function of the linear heat density in Denmark for plants.

Situation in Europe

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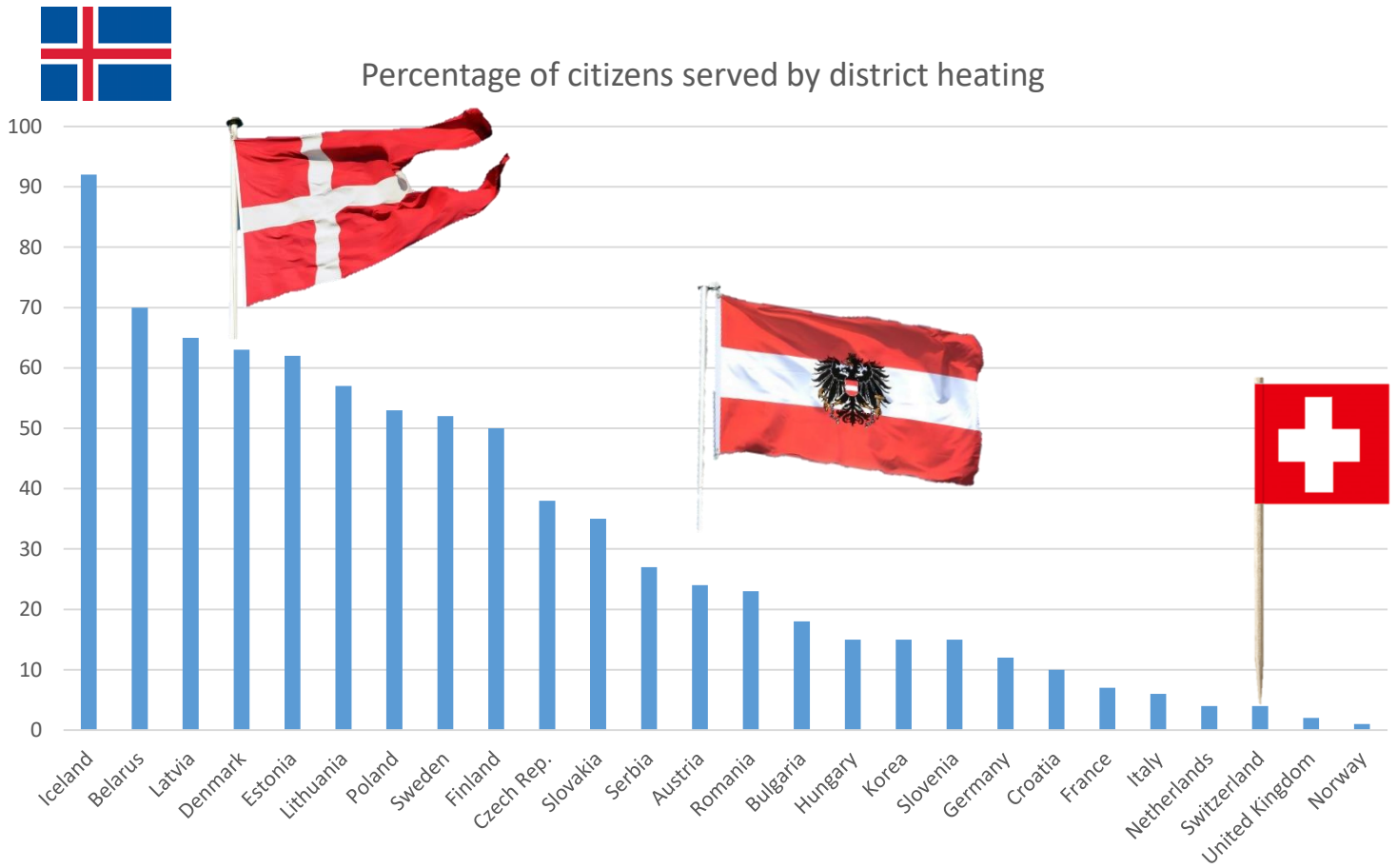
- DH heating has a share of 12% today in europe



Market potential in 2050 50% share !

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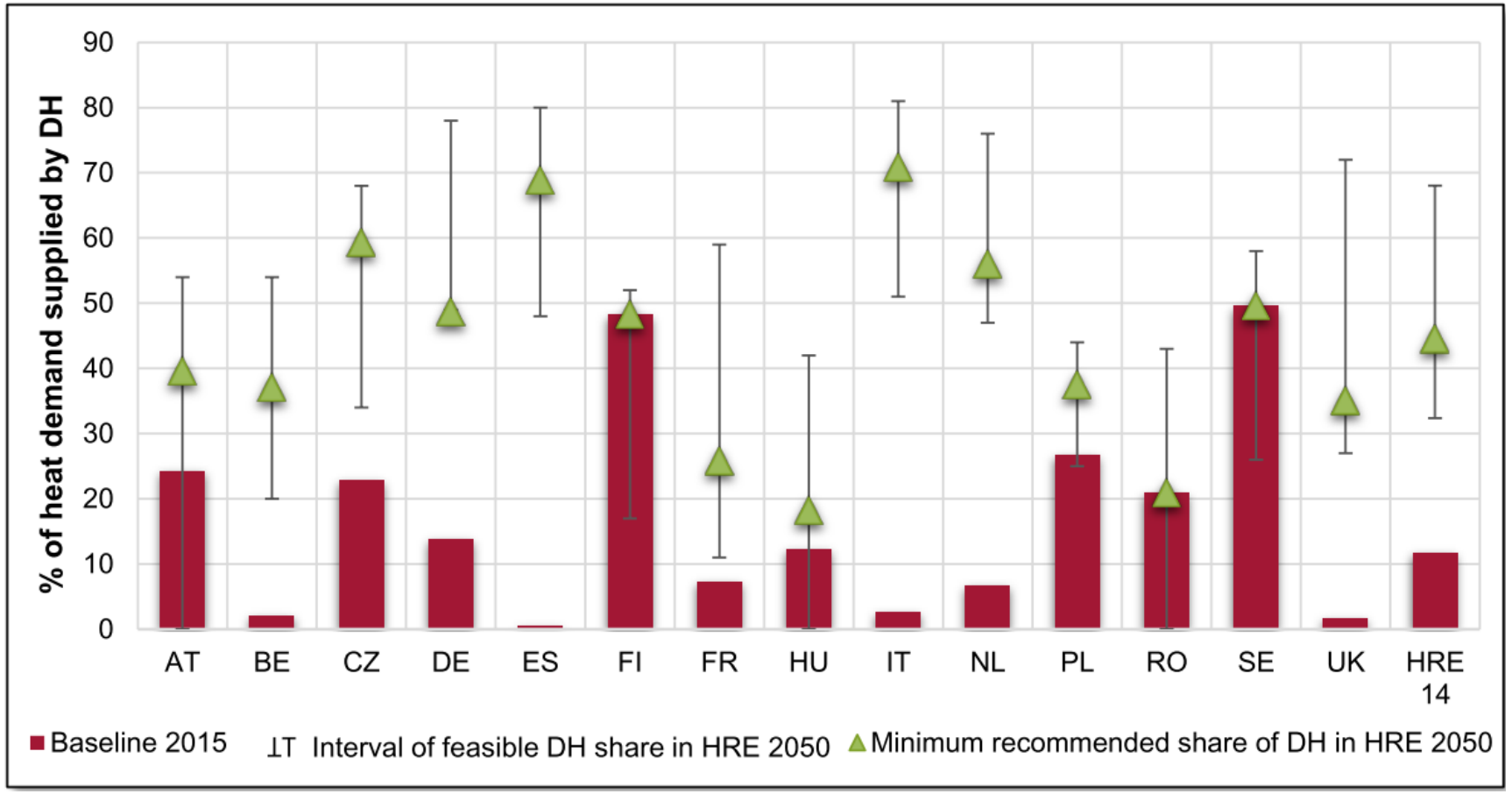

Figure 3: Share of district heating in 2015 (BL 2015), recommended level of district heating share in HRE 2050, and the range of economically feasible district heating within a 0,5% total annual energy system cost change sensitivity [1].

Potential sources

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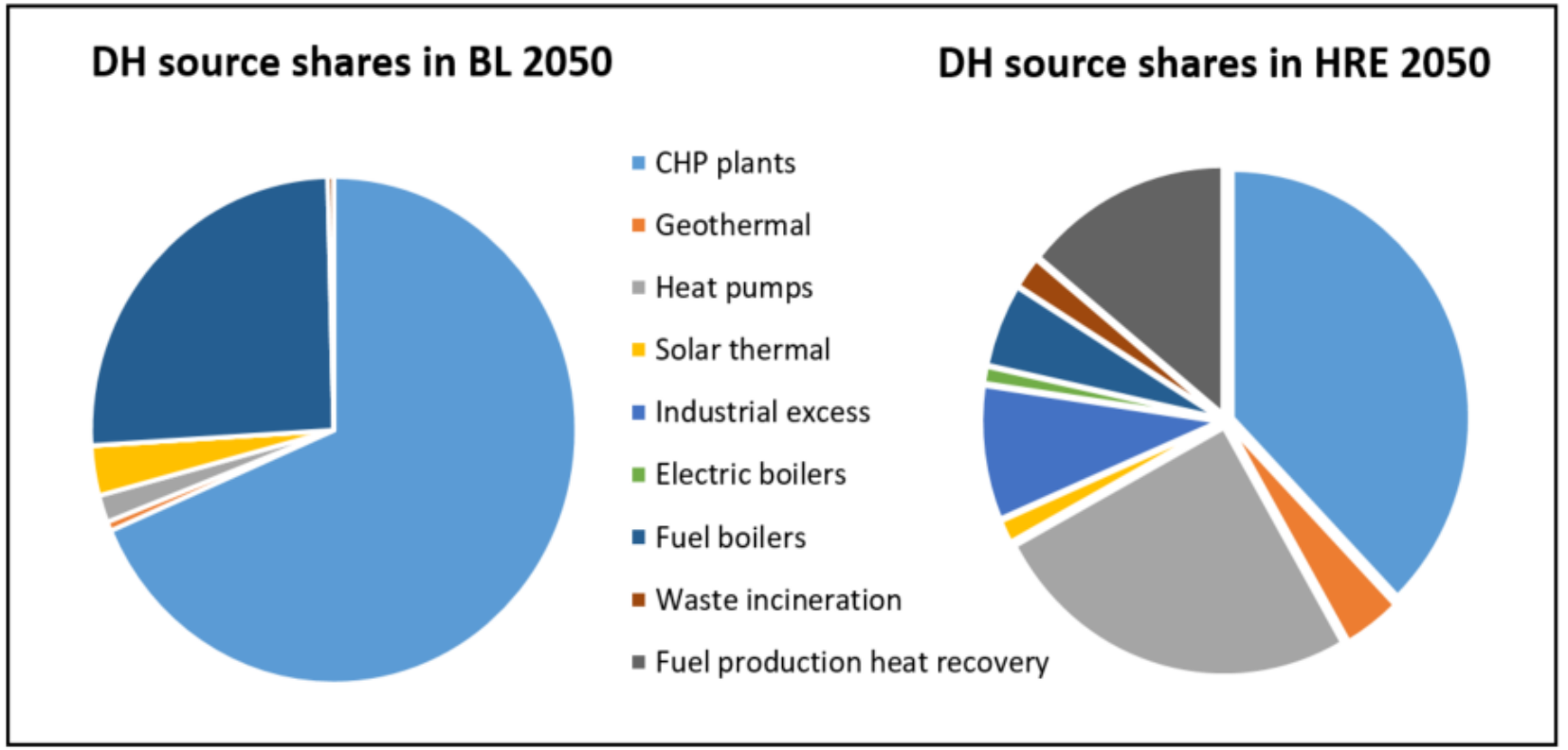

Figure 5: District heating sources share for BL 2050 and HRE 2050 scenarios (Source HRE4 project)

Heat pumps in district heating grids
Summary

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- Heat pumps key technology in the energy grid
- District Heating can cover 50 % of the Heating demand in Europe
- Heat Pumps can in the scenario cover 25 % of the DH production in 2050
- Efficiency improvement and CO_2-reductions
- More application possibilities 40 cases shown
- District Heating networks and temperature varies a lot
- Heat Pumps are known technology in District Heating networks
- Central and decentral implementation possible
- Solution depends on location and sources

Thank you!

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