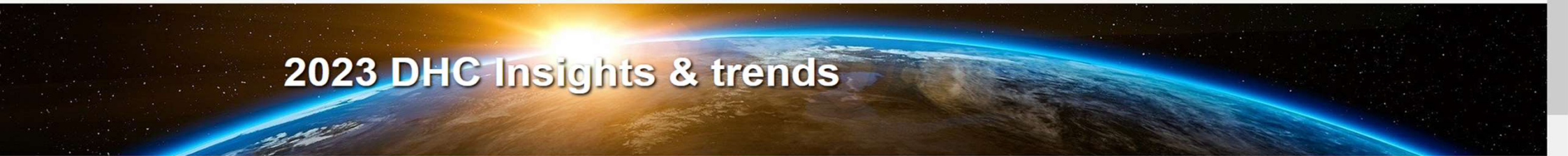


District Heating in the Energy Transition: State of play and outlook

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2023 DHC Insights & trends

Introduction	Forewords	District Heating	Policy	District Cooling	Innovation & trends	Conclusions
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The 2023 Insights & Trends are also available in PDF format. [Click here](#) to view and/or download it.

The war in Ukraine has exposed the dependence of Europe on fossil fuels and created a new impetus to decarbonise the heating sector. Space heating and hot water heating represent roughly half of Europe’s final energy demand, with over 60% coming from fossil fuels¹.

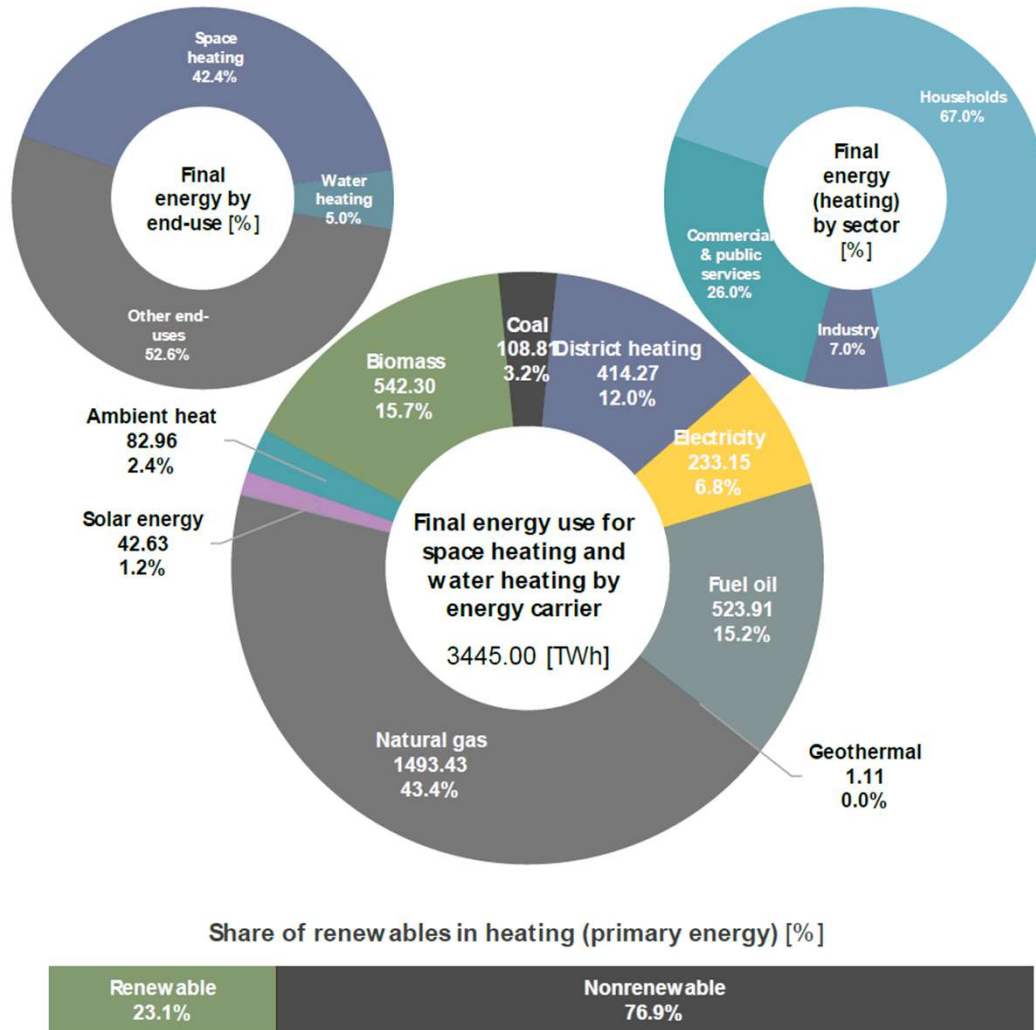
The momentum for clean heat technologies has come, unleashing new opportunities for the District Heating and Cooling (DHC) sector. As an energy infrastructure DHC is a Swiss army knife for decarbonisation enabling the combined use of local renewable heat sources (e.g. sustainable bioenergy, geothermal, solar thermal), renewable electricity, and the recovery of excess heat from industrial and urban sources.

District Heating currently meets about 12% of final energy use for space and water heating for households, service and industry sectors². The Heat Roadmap Europe³ project highlighted the significant potential of District Heating to cut imported fossil fuels by using renewable energy and waste heat sources: the sector could grow to meet 50% of demands for space and water heating from the service and residential sectors!

DHC is also a critical infrastructure to provide energy storage enabling thereby the deployment of a greener and more resilient energy sector. Large-scale thermal storage is 100 times cheaper⁴ than battery storage and the only proven and available energy technology to provide monthly and even seasonal storage.

The current survey shows that in 2021, 43 % of European District Heat is supplied⁵ from renewable and waste heat sources, highlighting the capacity of District

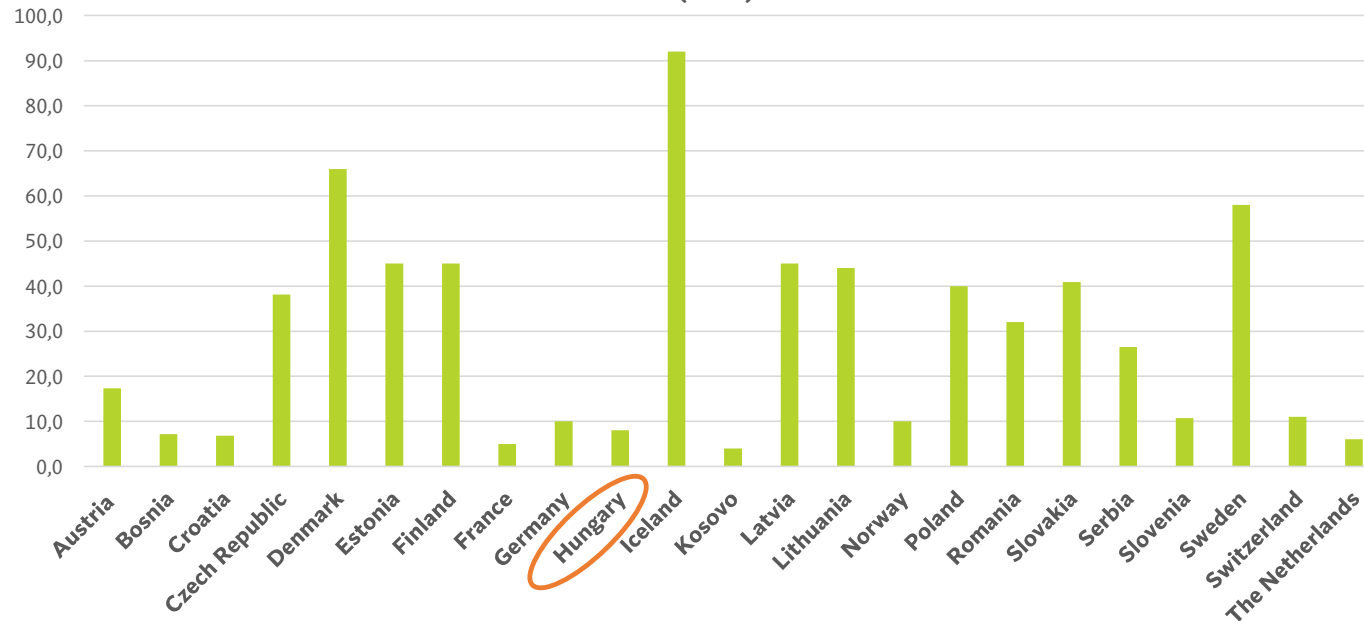
HEAT MARKET: THE CHALLENGE AHEAD



- Heating \approx 50% of final energy consumption
- Large share of Direct Fossil use
- Low RES share
- Lack of diversified RES
- Untapped potential for efficiency in building sector
- Gas imports feed the heat market
- European Green Deal implies full heat market decarbonisation

DISTRICT HEATING - A PROMINENT EUROPEAN ENERGY INFRASTRUCTURE

District Heating market share in heat demands from residential and service sectors
(2021)

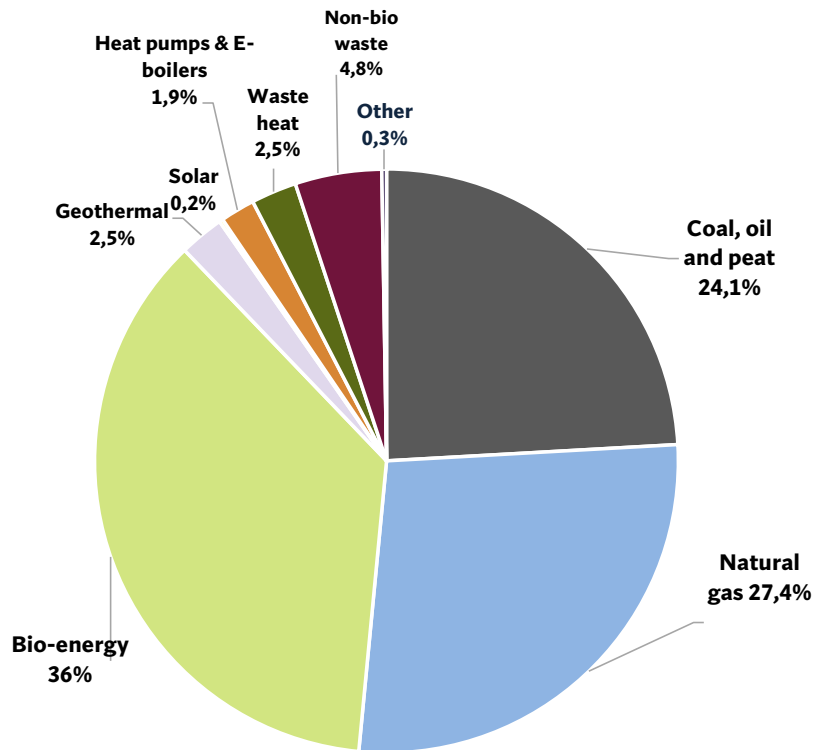


- > 70 million citizens supplied in Europe
- 17 000 District Heating networks
- 187 000 kilometers of infrastructure (one-way)
- Capacity: >300 GWth*
- Heat sales: 500 TWh (2021)

*Austria, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Italy, Latvia, Lithuania, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Spain and Switzerland.

THE EU DHC SECTOR HAS ALREADY STARTED ITS ENERGY TRANSITION

Heat sources for District Heating in Europe



- Renewable and waste heat: >40% of District Heat supply (2021)
- Key contribution of Combined Heat and Power (CHP) production
- Robust diversification pathways - waste heat, renewable heat sources (geothermal, solar thermal, sustainable bioenergy)

Fuel mix refers to the following countries: Austria, Belgium, Bulgaria, Bosnia, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Serbia, Slovenia and Sweden.

THE KEY ROLE OF COMBINED HEAT AND POWER



Share (%) of CHP in DH



- Key role for CHP: 2/3 of heat supplies for the top 6 DH markets
- A new role in the context of a changing energy sector

DISTRICT HEATING: A GROWING SOLUTION IN EUROPE



- European context: Green Deal + REPowerEU
- As a response to the energy crisis, an increasing number of countries have developed ambitious strategies to deploy District heating & Cooling before 2030
- New measures in particular in countries with high share of natural gas heating (FR, DE, UK, NL..)
- **> 6 million households** to be connected by 2030
- **Cites with at least one system = > 140 million population = large potential for expansion**

Countries	Expected growth (selected countries)	Source
France	+215k households/year	Estimate by the national association
Scotland	+ 650k households by 2030	Heat Network (Scotland) Act, (2021)
The Netherlands	+ 500k households by 2030	Climate agreement between government and sectors - Klimaatakkoord (2019)
Germany	+ between 300 and 600k households/year	Estimate by the national association
Denmark	+250/300k new households by 2028 (Phase out of 400k gas boilers to be replaced by District Heating and individual heat pumps)	Estimate by stakeholders
Austria	+ 350k new households	Forecast of Austrian Energy agency (2022)

[Link: Heat Roadmap Europe](#)

DISTRICT HEATING PATHWAYS 2030-2050



The national DHC Roadmaps

- Greening of heat market goes with increasing shares of DH on various markets
- Increasing shares of Renewable and Waste heat
- Increasing role for District Heat Pumps
(capacity + 100% by 2030)
- Reinvented role for Combined Heat and Power
- **Potential for District Heat market share from 12 to 50% by 2050**

[Link: Heat Roadmap Europe](#)

Case Germany

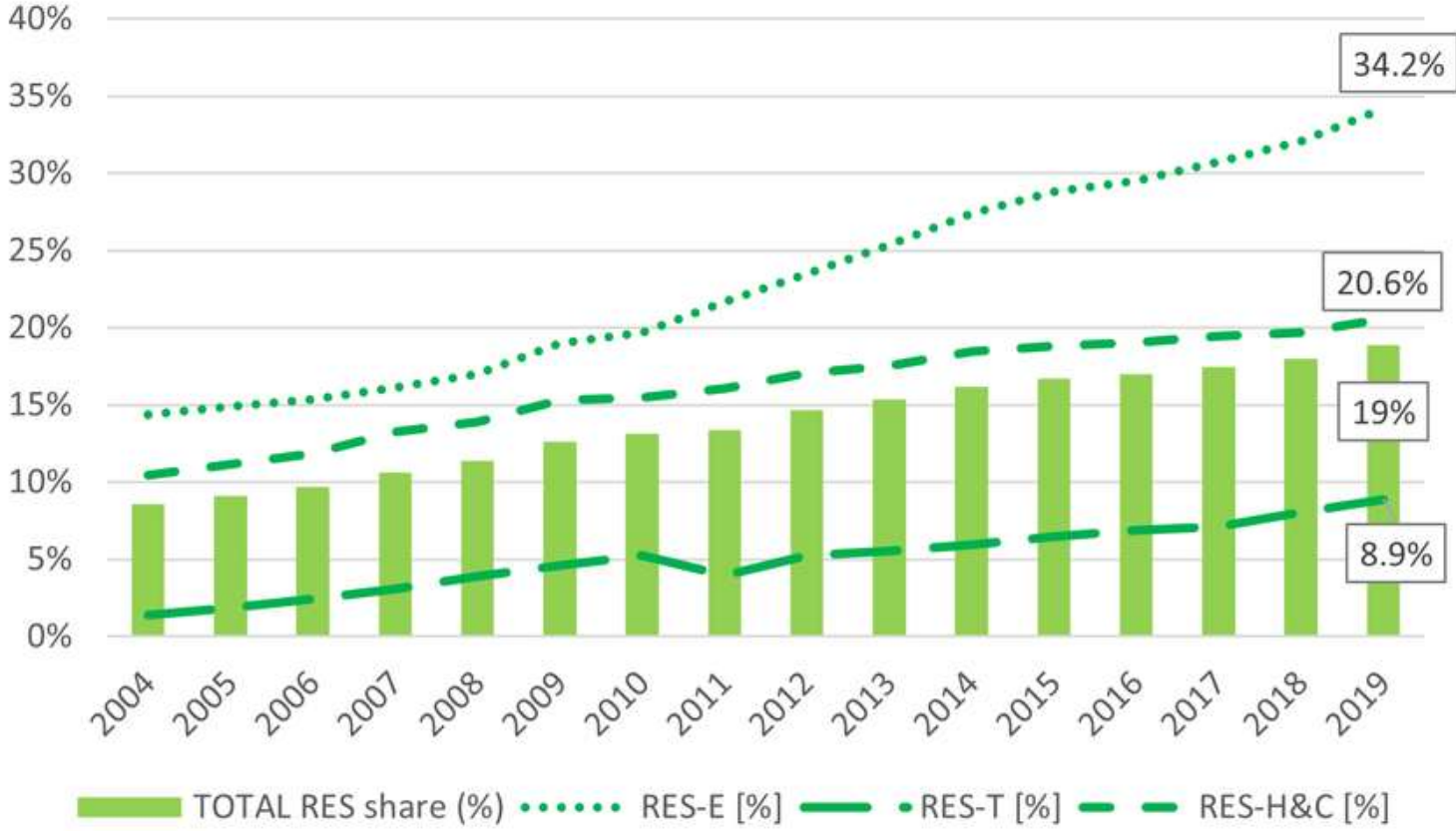
- Market share of 14% of DH (buildings connected to DH) to grow to 26% by 2040
- Changing fuel mix with drastically reduced shares of natural gas and coal towards higher shares of Renewable and Waste heat
 - Geothermal from 10 TWh in 2030 to 18 TWh in 2045
 - Solar thermal from 6 TWh in 2030 to 13 TWh in 2045
 - Industrial waste heat from 5 TWh in 2030 to 13 TWh in 2045
 - E-boilers from 3 TWh in 2030 and 6 TWh in 2045. (Pre-crisis scenario)
- Recent measures to boost growth (e.g. investment aid scheme)

DISTRICT HEATING: NEW TARGETS, NEW PROVISIONS, NEW OPPORTUNITIES in EU LEGISLATION



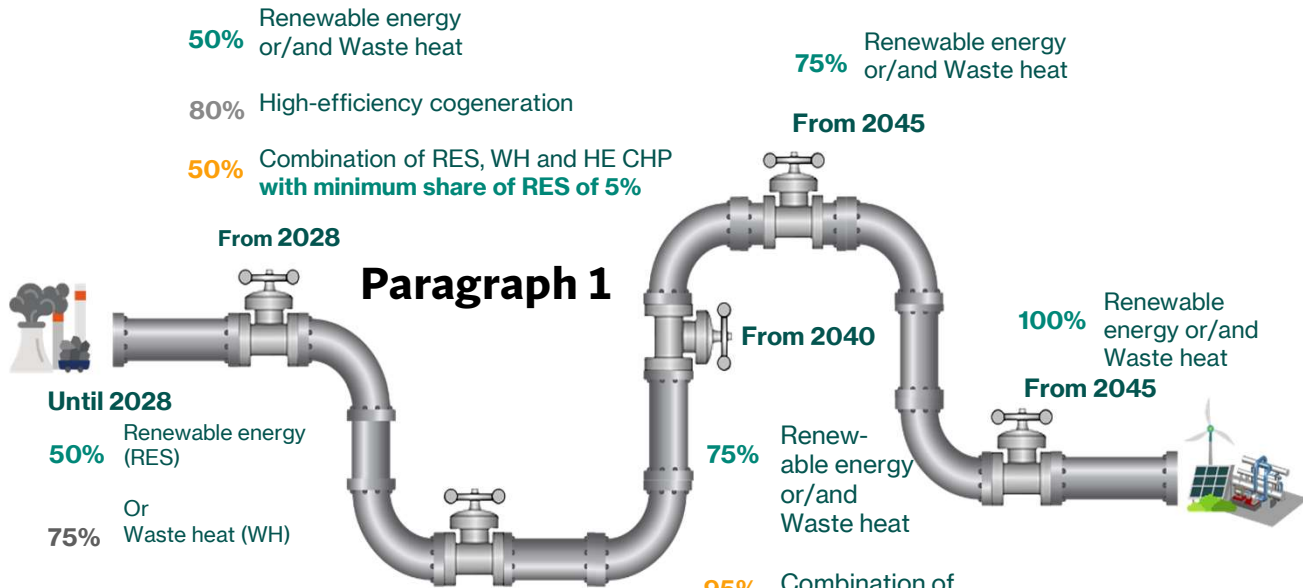
- **Fit for 55 package** provides binding and indicative targets
- **REPowerEU** context calling for acceleration of heat transition: opportunities to seize for the DH sector
- European framework: **target on RES**, including a sectoral target on the deployment of Renewable and waste heat (binding) + target on District Heating (indicative) within RED III
- **Waste heat** recognized as a source to decarbonise the heat market + new ‘coordination framework’ to organise discussion on Waste Heat projects
- Energy Efficiency Directive defines **efficient district heating** and cooling systems in EED and request **cities > 45k inhabitants to engage into heat planning** (Energy Efficiency Directive)
- New **State aid Framework provides more possibility for aid to Efficient DH and transition** from ‘non efficient’ to efficient status – State Aid Guidelines (2022) an GBER (2023)

RENEWABLES SHARE IN ELECTRICITY, HEATING & COOLING AND TRANSPORT

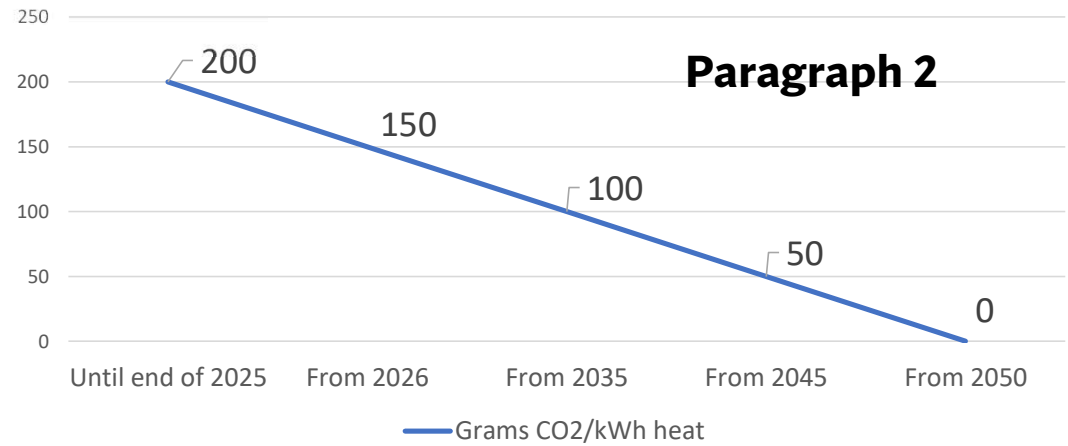


Renewable shares in the electricity (RES-E), transport (RES-T) and heating and cooling (RES-H&C) sectors, Source: Eurostat data.

ENERGY EFFICIENCY DIRECTIVE, ART. 26

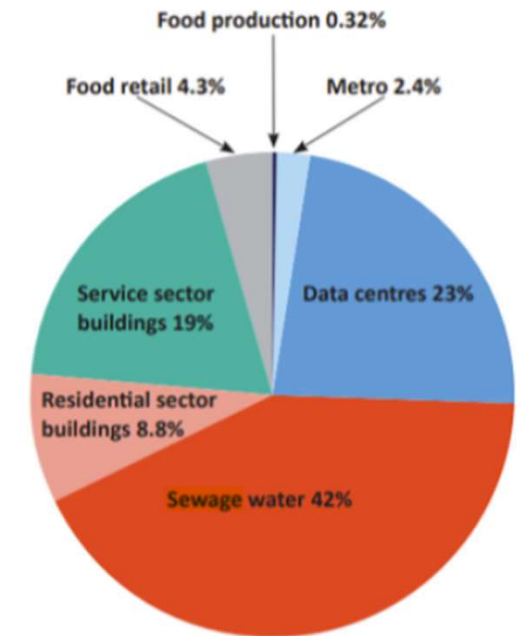
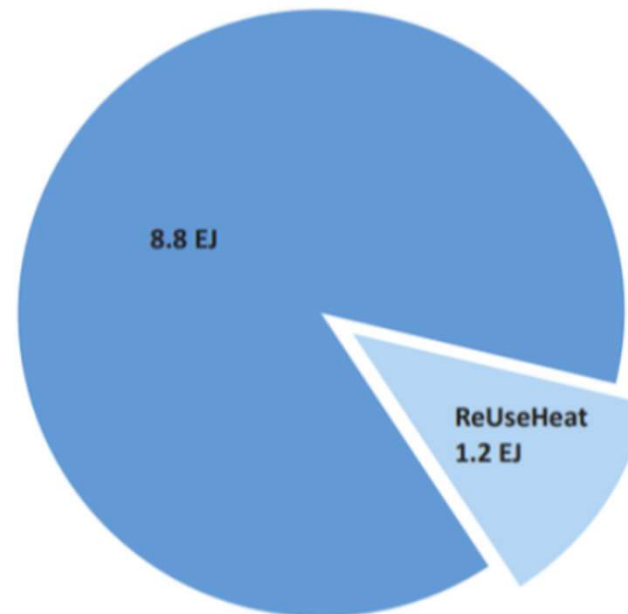


95% Combination of RES, WH and HE CHP with minimum share of RES or WH of 35%

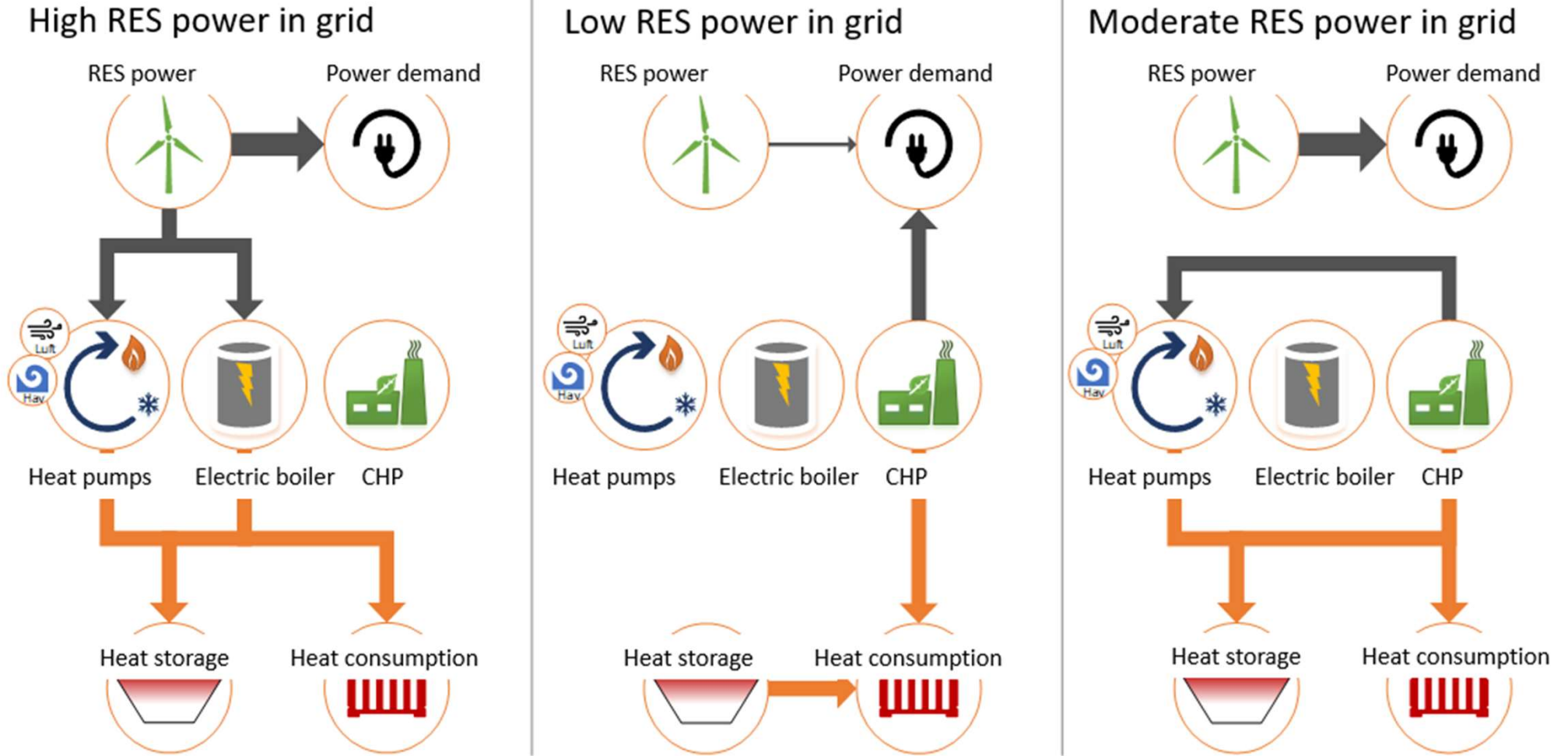


URBAN WASTE HEAT : A POTENTIAL STILL TO REALISE!

- Key sectors: Data centers, metro stations, food production, food retail, service and residential sectors, waste water treatment
- Temperature levels below 50 °C
- ‘accessible’ sources of low-temperature waste heat located ‘inside or within 10 kilometres’ of existing District Heating areas could represent over >300 TWh/y



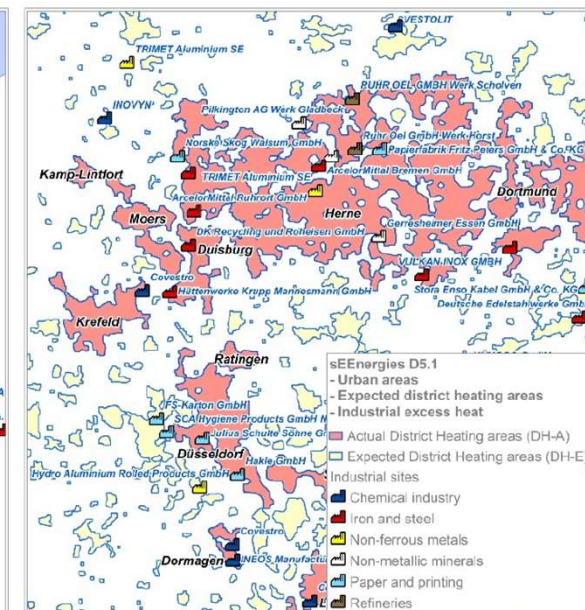
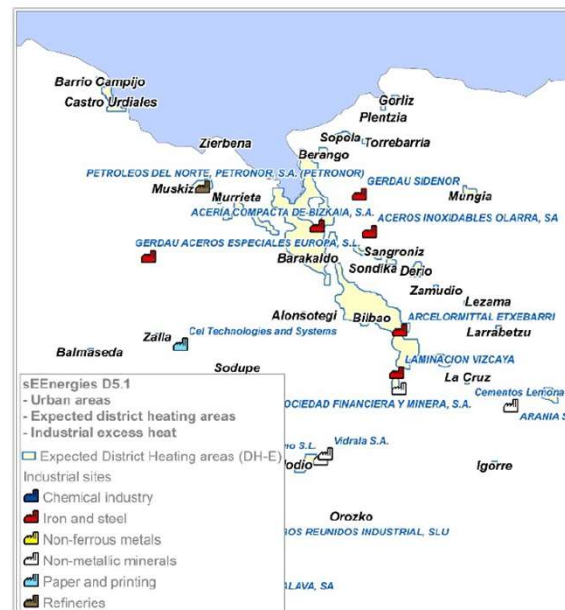
SYSTEM INTEGRATION: POWER-TO-HEAT SOLUTIONS KEY TO REALISE ENERGY TRANSITION



INDUSTRIAL WASTE HEAT: SYNERGIES WITH INDUSTRY EFFICIENCY



- Potential of waste heat (2,860 TWh/y in EU) almost the size of demands for space and water heating from residential/service sectors buildings (Heat Roadmap Europe 2, 2013)
- Key sectors: Glass, cement, Iron & steel, aluminium, pulp & paper, chemical & refineries
- **High potential available: 64 TWh of excess heat** could be used within a 10km range at a temperature of 95°C (>10% of EU 28 DH)
- With expansion of district Heating to cover new areas, almost all potential for this temperature range could be used **(415 PJ or 115 TWh at 95°C)**



[Link: sEnergies Project \(2022\)](#)