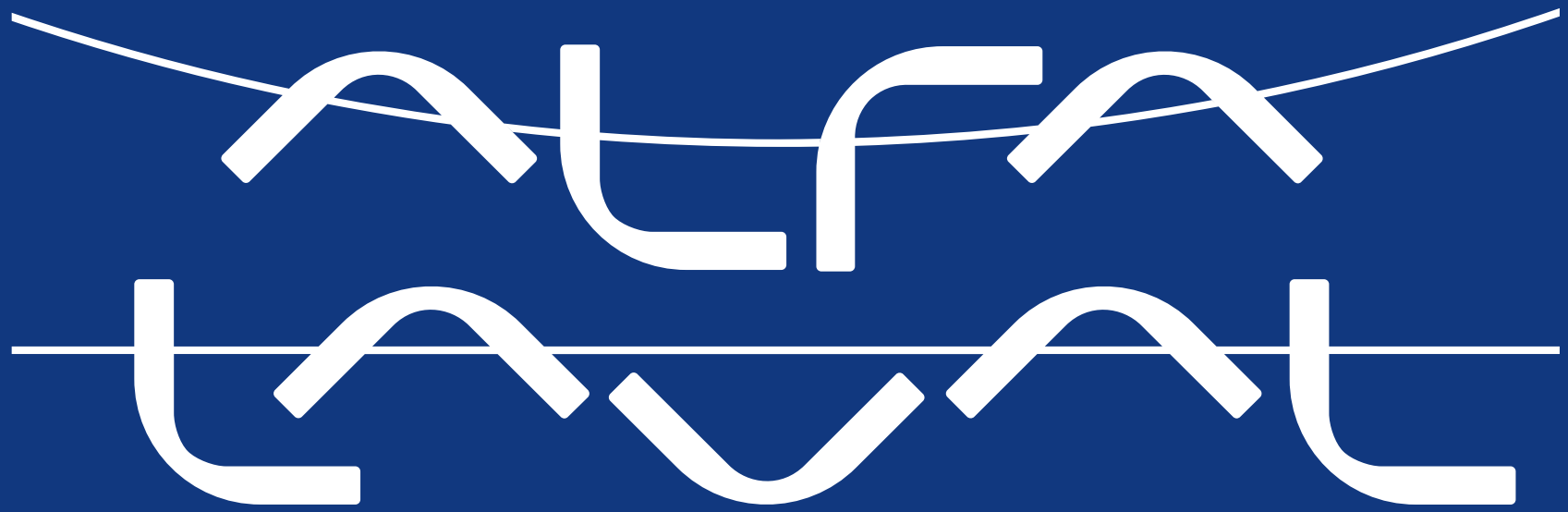

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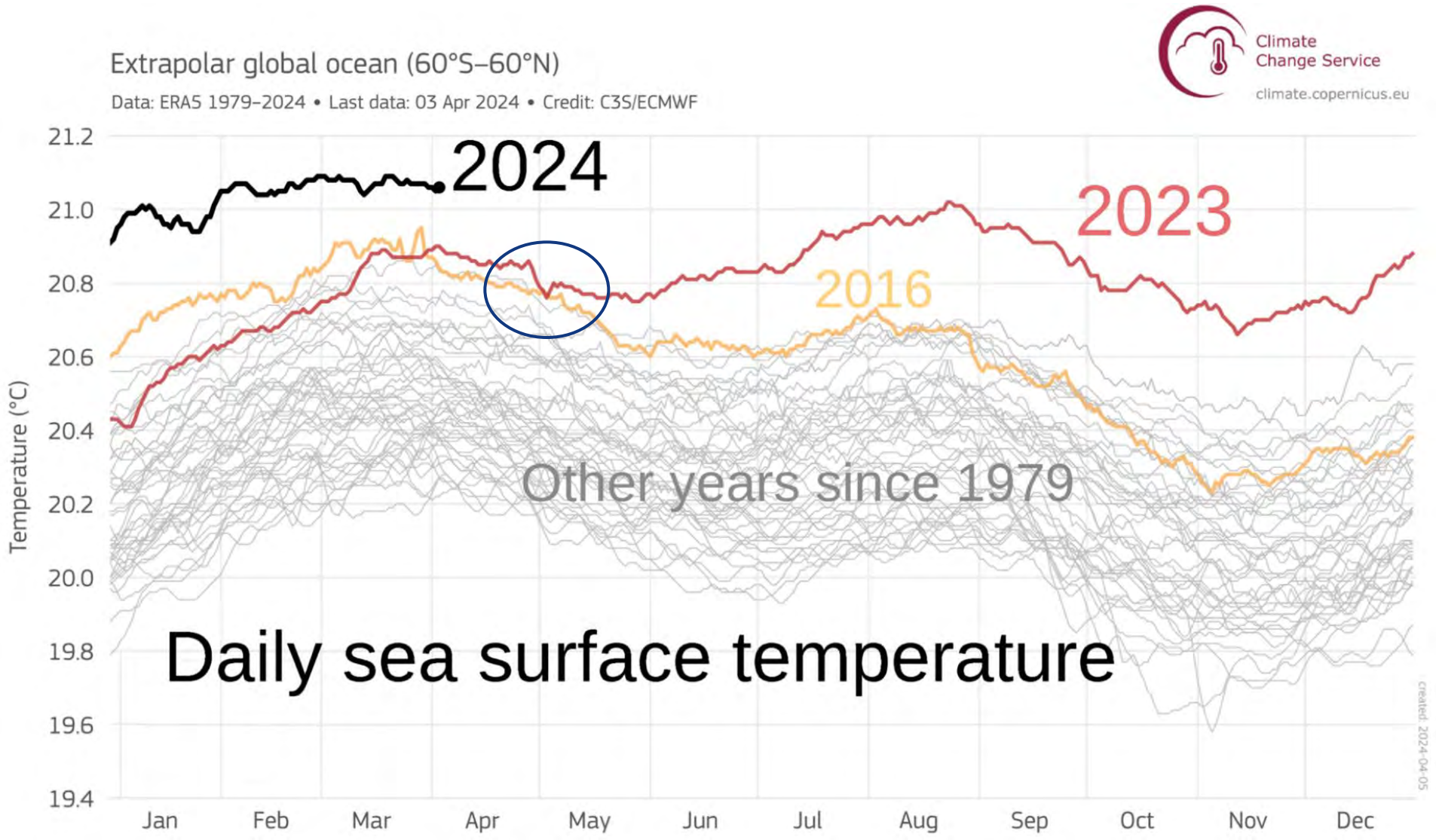
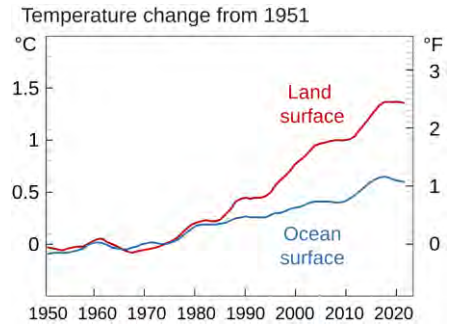
Why are you here?



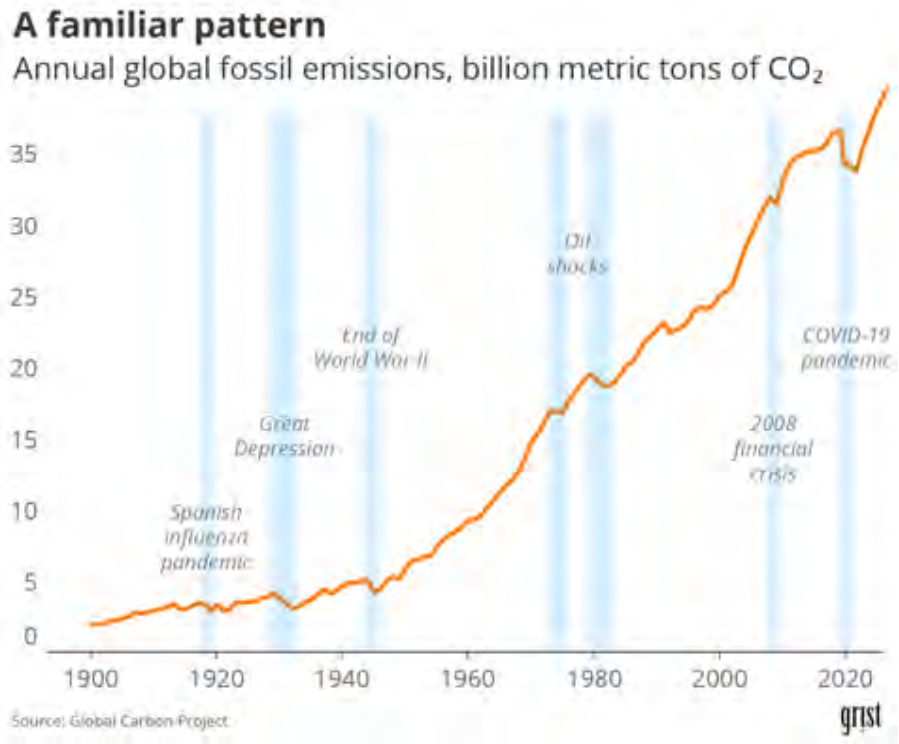
The temperatures over land are rising faster than ocean temperatures. This is because the ocean absorbs 90% of excess heat generated by climate change



We don’t know, what we don’t know.

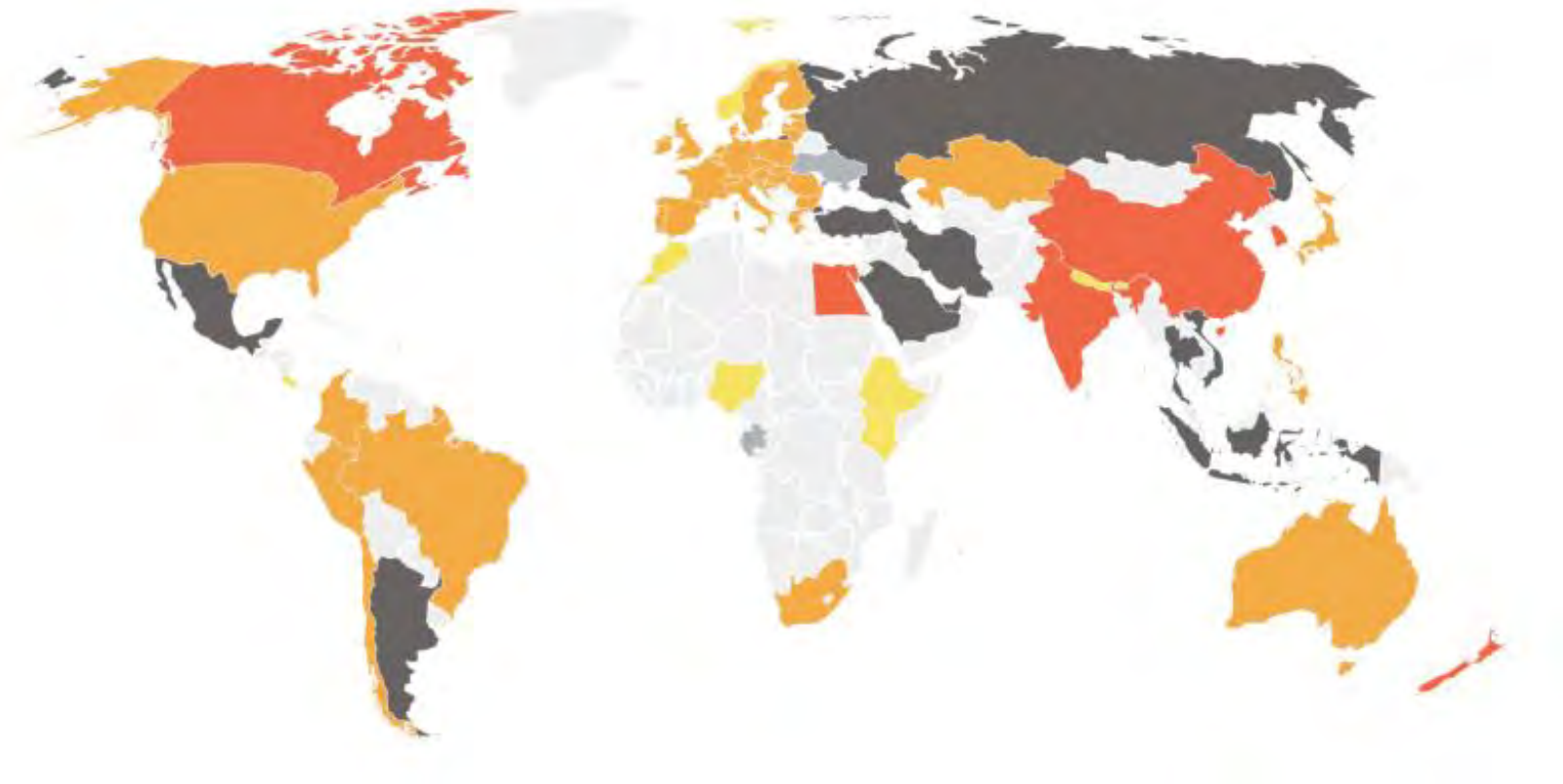
– But we can estimate the cost and human toll of climate change

- At the start of 2023, Berkeley Earth, NASA, the UK Met Office, and Carbon Brief predicted that 2023 would be slightly warmer than the previous year but unlikely to set any records. Twelve months later and all four organisations concluded that 2023 was by some distance the warmest year ever recorded. In fact, between February 2023 and February 2024 the global average temperature warming exceeded the Paris target of 1.5°C.
- The World Economic Forum 2024 report concluded that by 2050 climate change may have caused over 14 million deaths and US$12.5 trillion in loss and damages.
- Milankovitch Cycles – Even more cause for concern
- Only 6% of scientists believe that 1.5C is achievable
- Fossil fuel funding quadrupled in 2024….



‘Extreme’ is now the new normal

1.5C Paris agreement compatible countries



[Home | Climate Action Tracker](#) Updated: October 2024

CRITICALLY INSUFFICIENT	HIGHLY INSUFFICIENT	INSUFFICIENT	ALMOST SUFFICIENT	1.5°C PARIS AGREEMENT COMPATIBLE

June 2024 was the 13th month in a row to set a monthly temperature record

National and territorial weather records broken or tied this year

28 February Cocos Islands tied its all-time highest temperature with 32.8C. It tied it again on **29 February** and **7 April**.

6 March Costa Rica broke its national record with 41C at Cerro Huacalito. The record was beaten again with 41.5C on **23 March** at the same location.

12 March Comoros broke its national record with 36.2C at Hahaya airport.

13 March Congo broke its national record with 39.6C at Impfondo.

24 March Maldives broke its national record with 35.1C at Hanimadhoo. It tied it again on **11 April**.

31 March Togo broke its national record with 44C at Mango.

3 April Mali broke its national record with 48.5C at Kayes..

10 April Belize broke its national record with 42.3C at Barton Creek. This temperature was later tied on **17 May** at Chaa Creek.

24 April Chad tied its national record with 48C at Faya. This was tied again on **5 June**.

27 April Cambodia broke its national record with 42.8C at Preah Viehar and Svay Leu.

1 May Ghana broke its national record with 44.6C at Navrongo.

1 May Laos broke its national record with 43.7C at Tha Ngon.

29 May Palau tied its national record with 35C at Babelthuap international airport. On **2 June** it beat it with 35.6C.

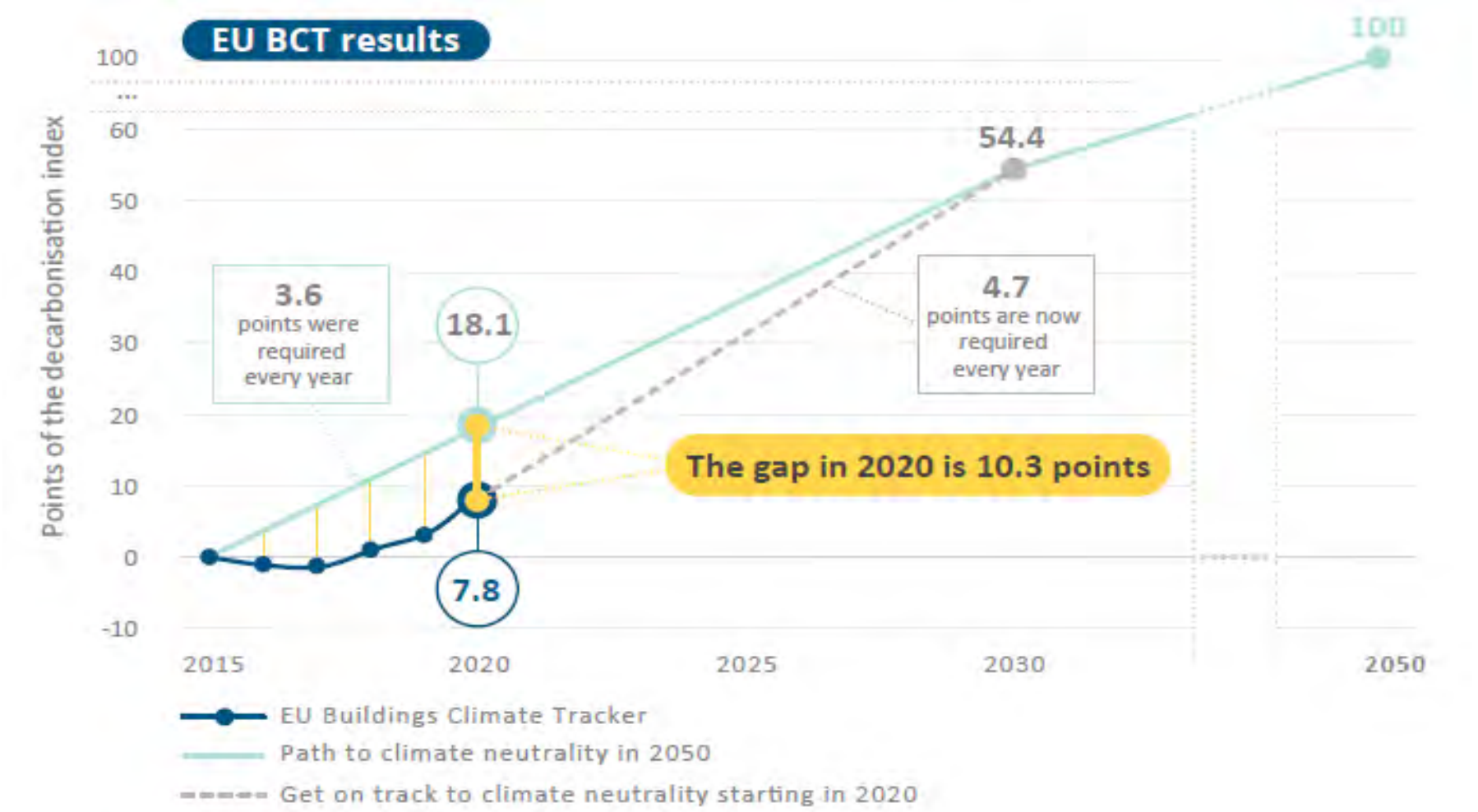
7 June Egypt beat its national record with 50.9C at Aswan.

20 June Mexico tied its national record with 52C at Tepache.

Building decarbonisation and the path to net zero

– Work needed to get back on track

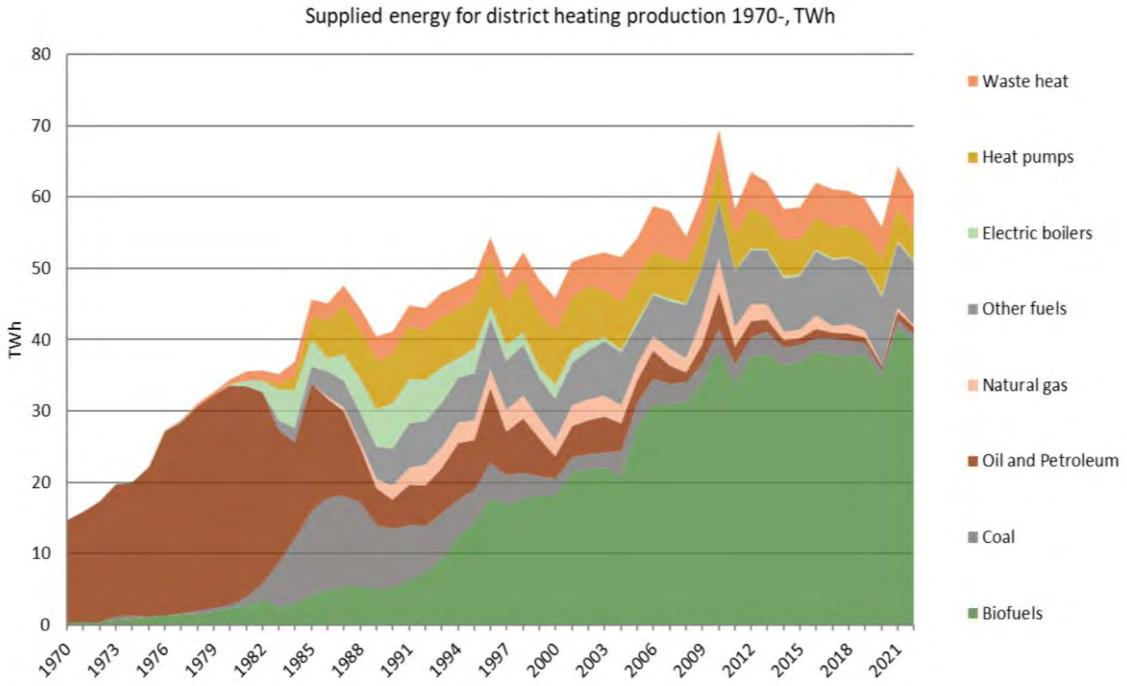
- Insulation
- Air-tightness
- Efficiency
- Fuel sources

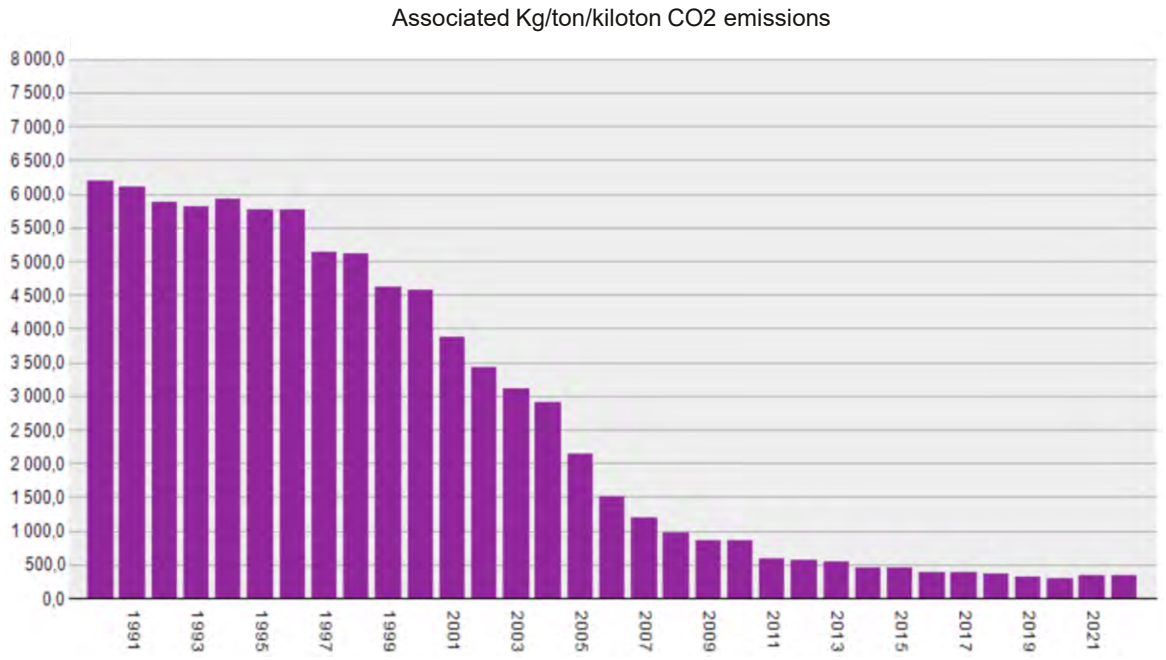


Why district energy?

– Swedish district energy networks

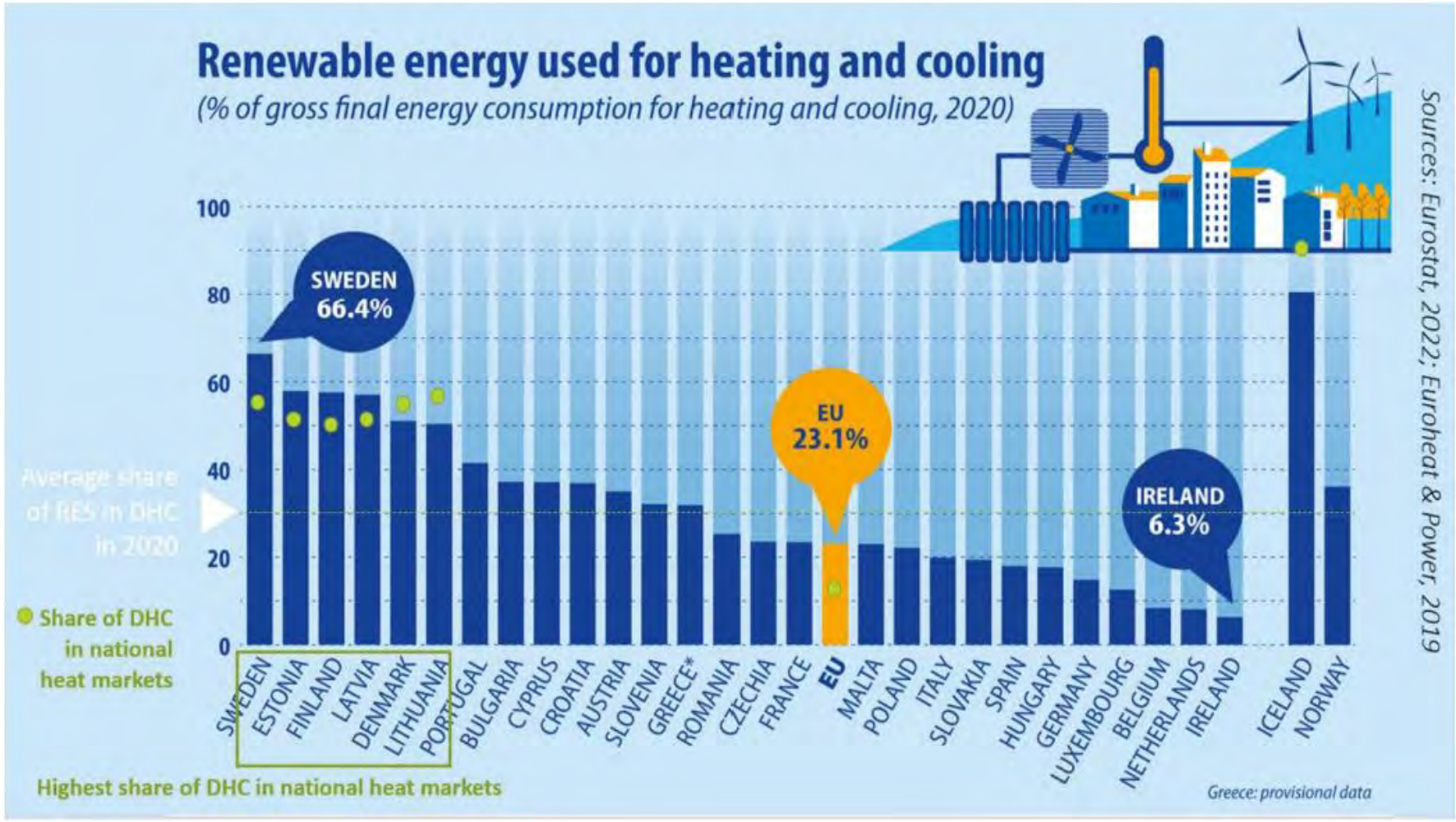
- Continuous increase in heat energy supplied
- Diversification of the heat sources
- *Dramatic* reduction in carbon emissions





RES Utilisation – All Heating and Cooling Applications

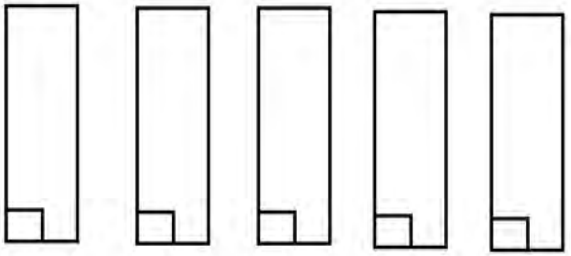
EU Comparison



Any country or government with a plan for the reduction of carbon emissions, the utilisation of waste heat, utilisation of renewable energy sources, carbon taxing etc. etc. will have to regulate strongly to promote district energy

Why District Energy

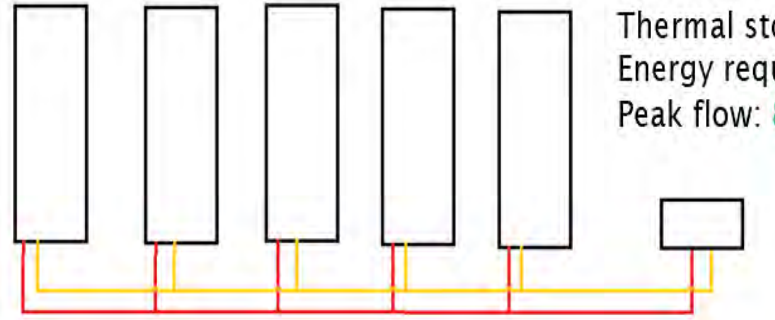
– Heating and Cooling



Thermal store size: 38,715 litres
Energy required: 5385 kW
Peak flow: 88.95 l/sec

ndividual buildings with plant-rooms

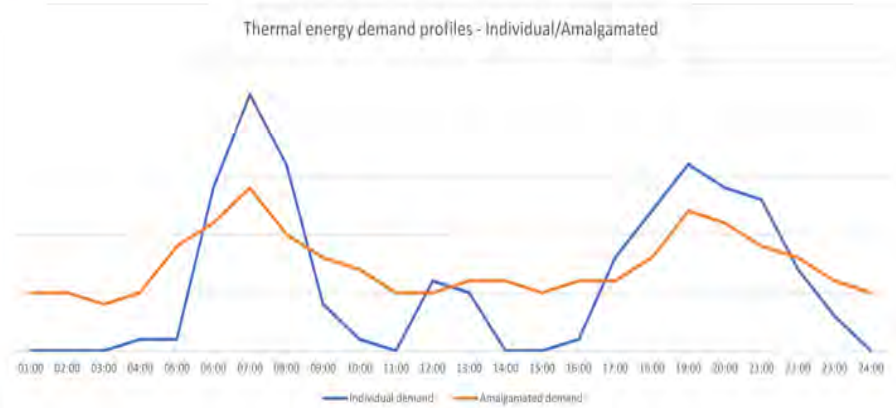
More costly plant-rooms
Greater risk
Greater FM management costs
Restricted renewable options
Less apartments
'Spiky' demand profile
No expansion capability
Less infrastructure
Reduced footprint



Thermal store size: 30,555 litres
Energy required: 5207 kW
Peak flow: 80.94 l/Sec

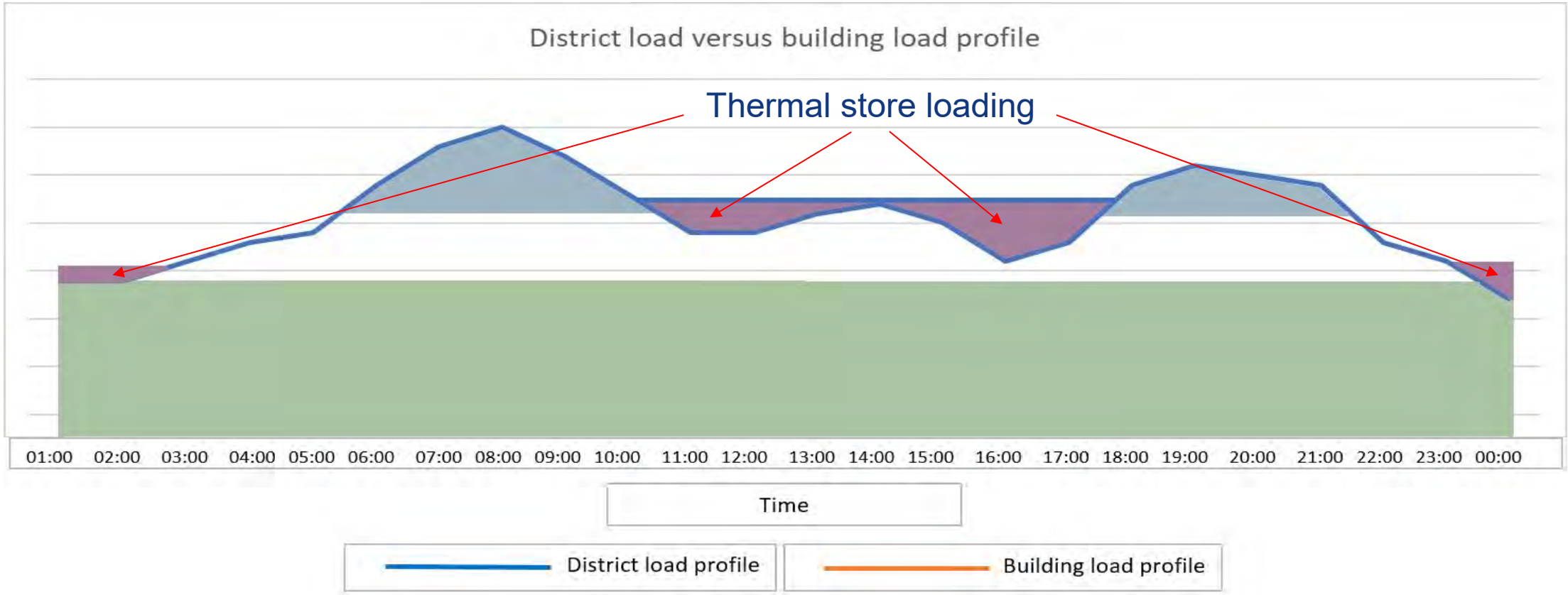
Same buildings on a district network

Lower cost plant-room
Less risk
Lower FM management costs
Greater renewable options
More apartments
Easier waste heat utilisation
Smoother demand profile
Expansion possibilities
Greater infrastructure cost
Greater footprint



Why district energy?

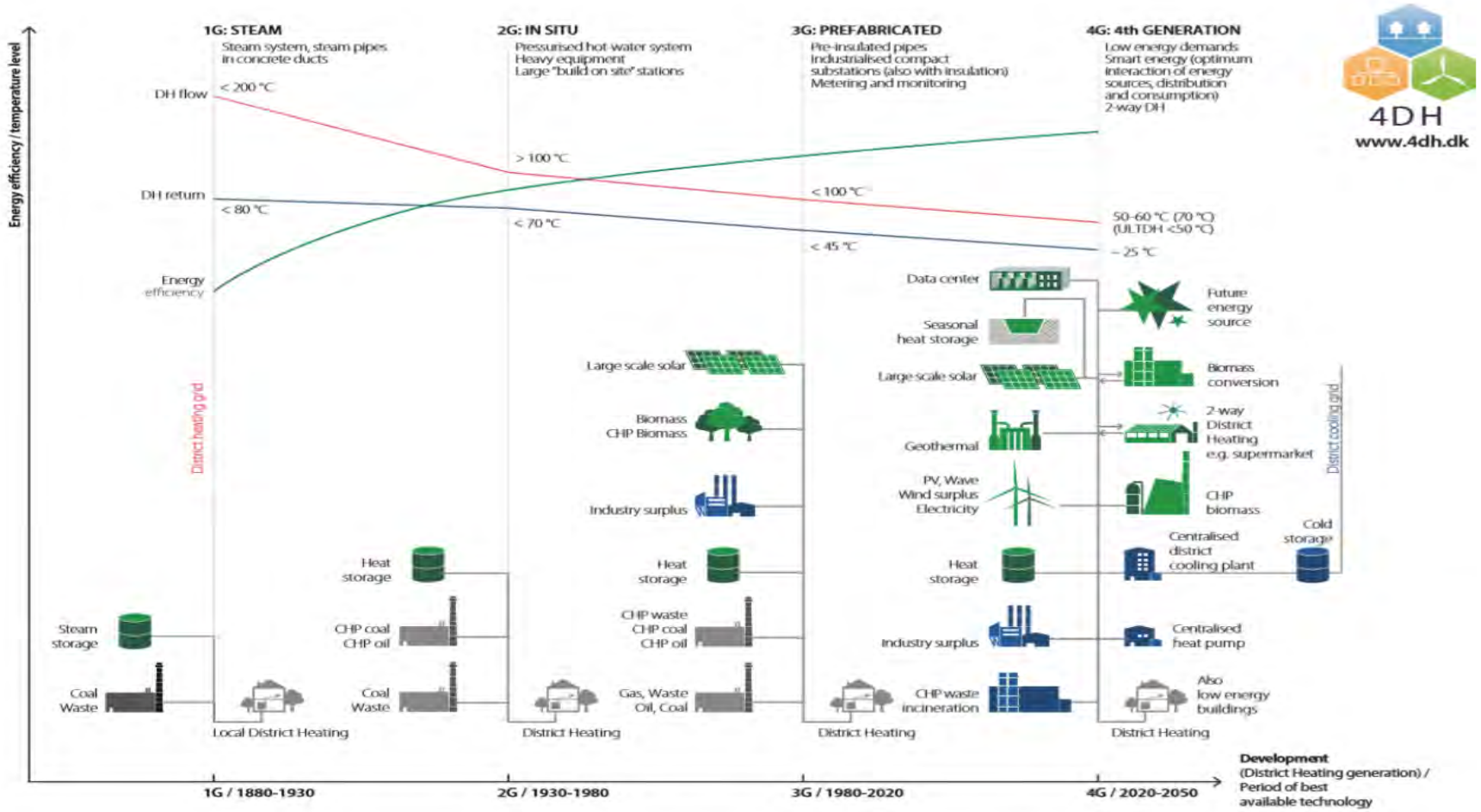
− What are the benefits?



Amalgamation of load profiles
Smoothing of peaks and troughs
Allows greater renewable energy heat integration

Heat Network Evolution

− Greater source diversification and therefore greater PHE use

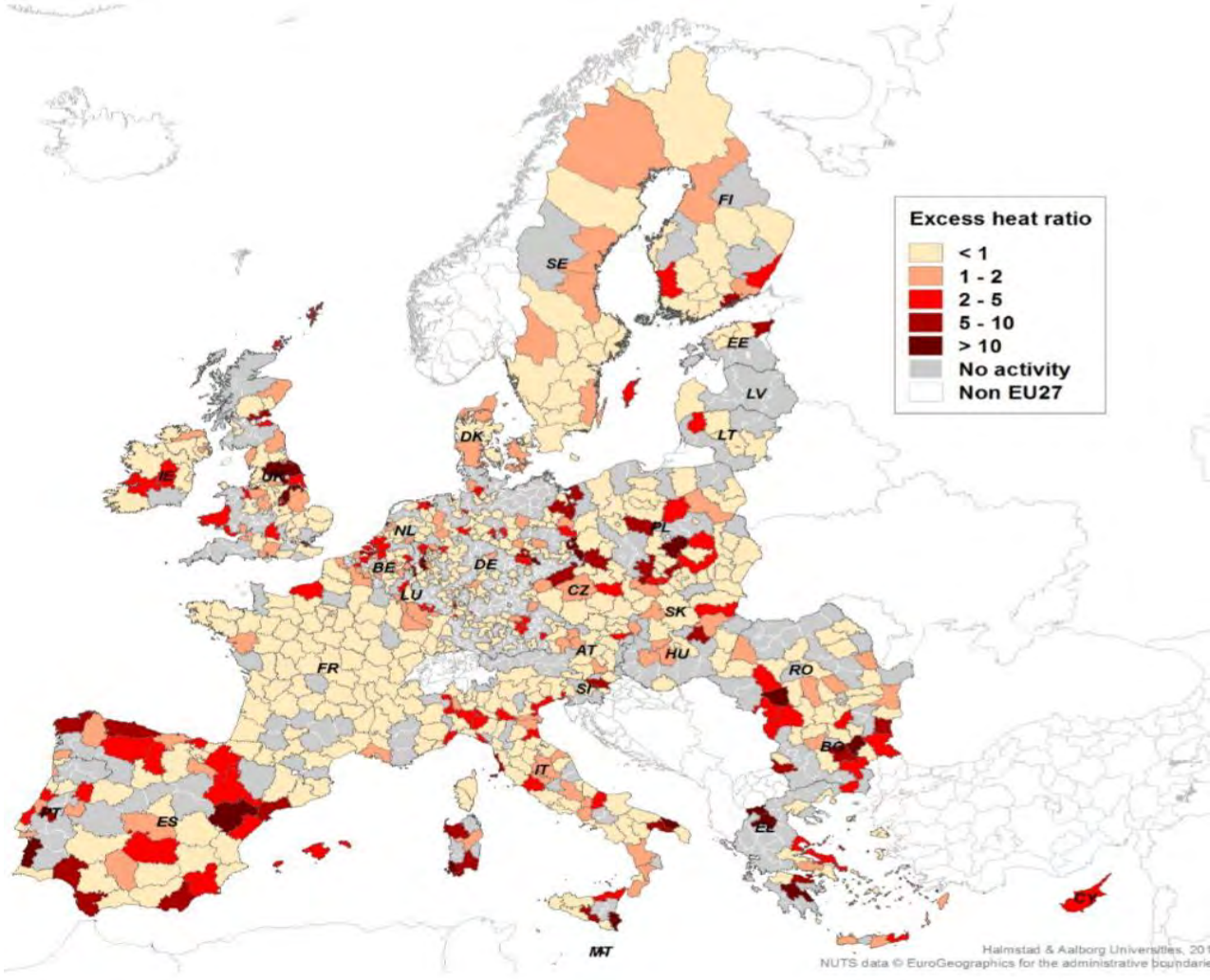


As we move to more efficient networks with lower primary flow temperatures, multiple additional energy sources become available.

Excess Heat Ratio – Heat Roadmap Europe

- Excess heat ratio
- ‘Waste’ heat from:
  - Process industry
  - Food retail
  - Metro
  - Waste water treatment
  - Datacentres
  - Etc.

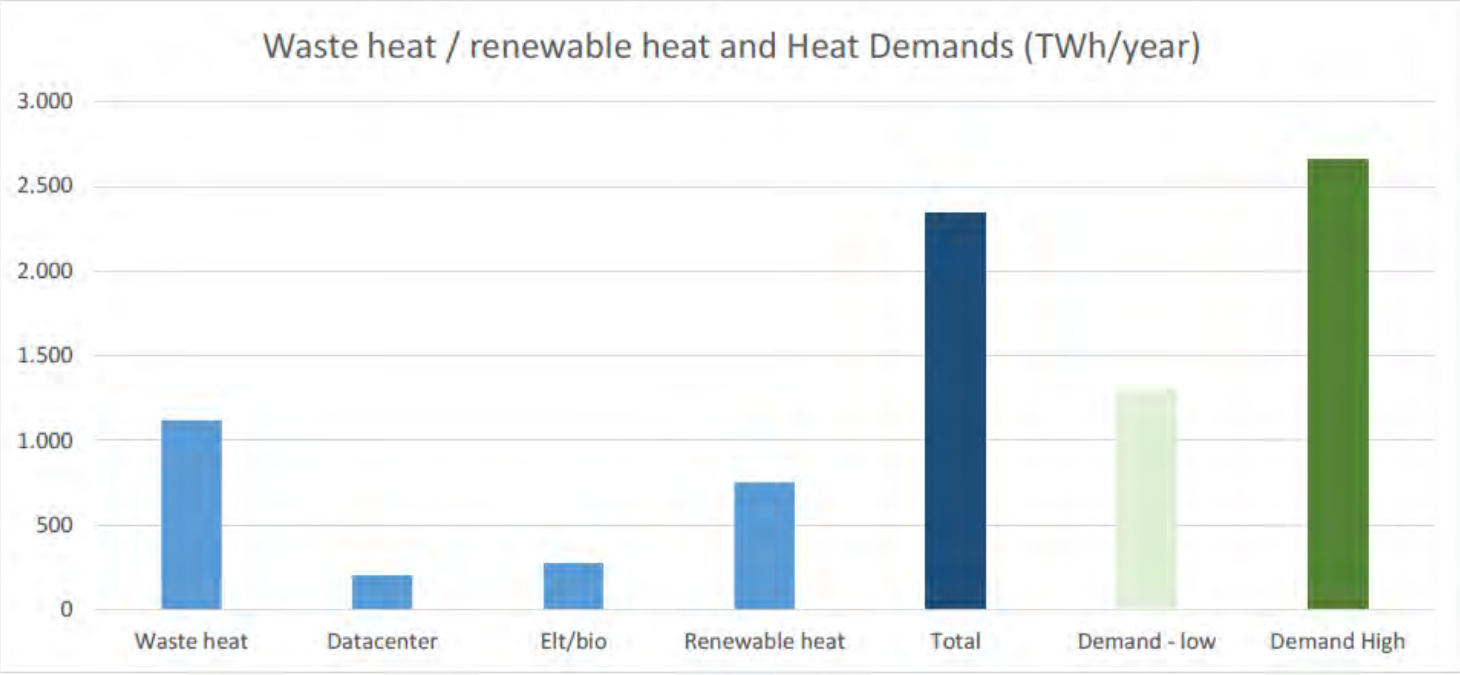
A thermal delta can provide heating or cooling



*Heat Roadmap Europe 2012

The importance of waste heat

- Currently, two thirds of the heat required to heat and cool our buildings is wasted
  - We could reduce our building energy demand to just 33% if we captured this heat
- By 2050, it is forecast that, without change, this will rise to four fifths
  - With only small efficiency improvements to our building stock, we can achieve a negative energy demand

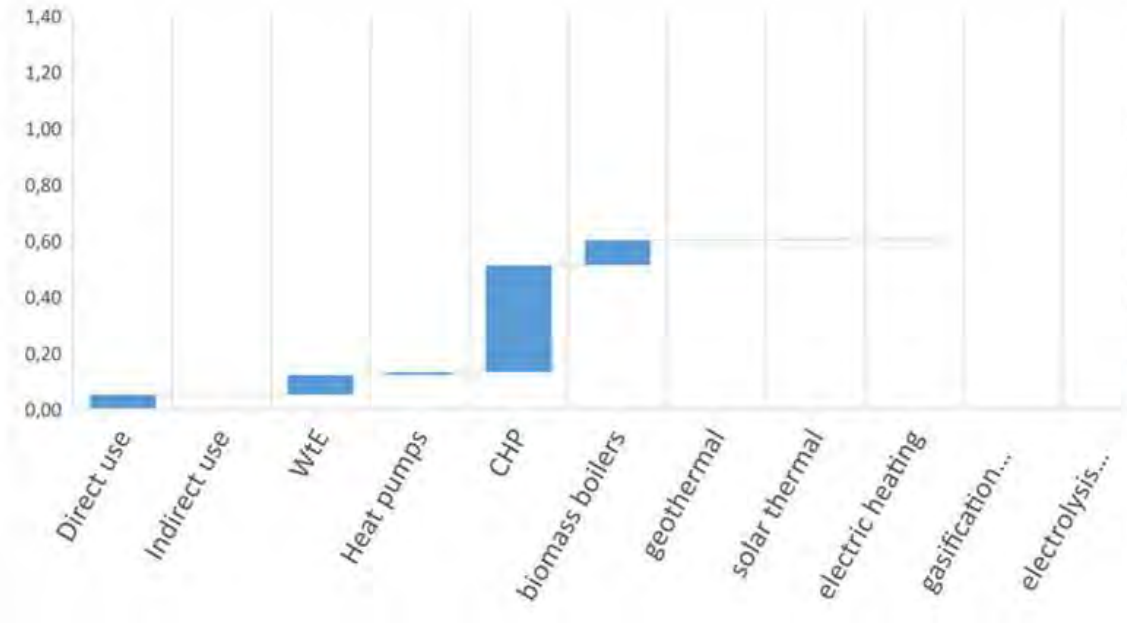


Impossible to ignore and impossible to capture without the widespread uptake of district energy

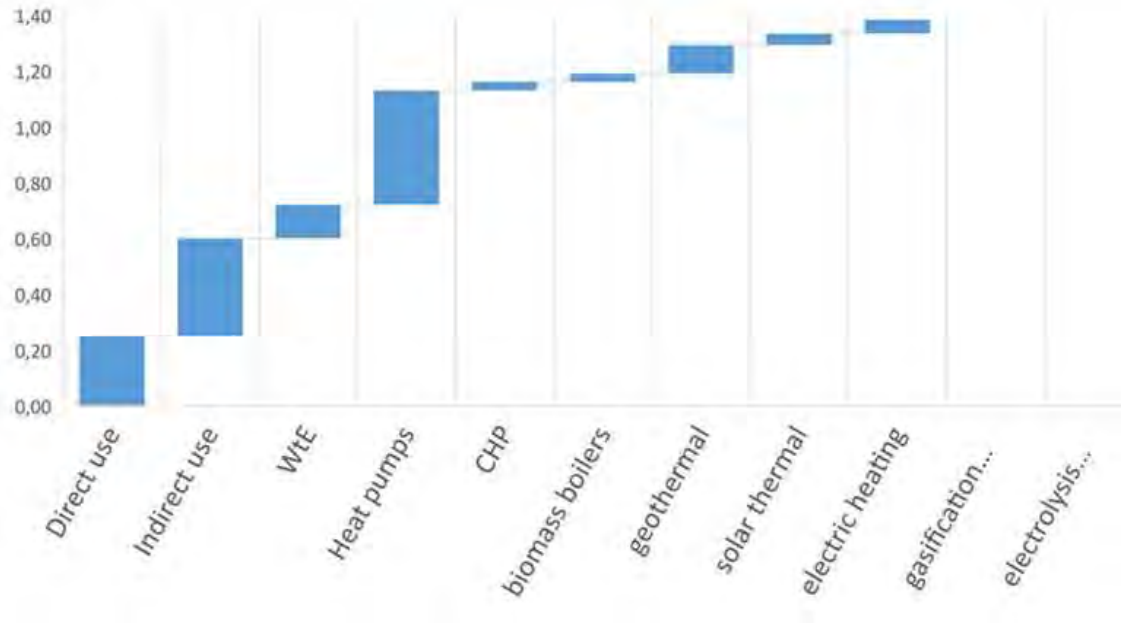
But DHC sources needs to change….

– DHC energy sources - EH&P/Aalborg report

Current energy sources



2050 energy sources

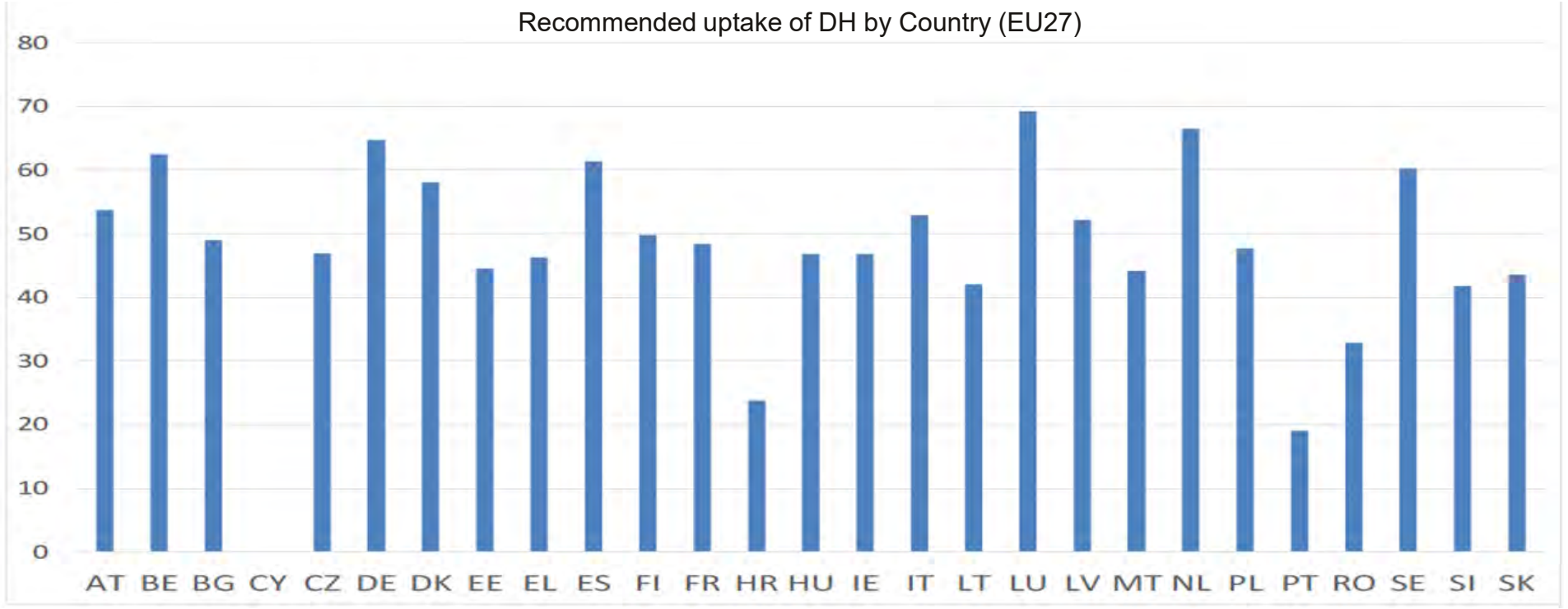


- Direct use: increased waste energy capture at source temp’.
- Indirect use: increased waste energy captured at low temp (Datacentre/WTW/DH return) and boosted by HP.
- Greater heat pump, geothermal, solar thermal and direct electricity use.
- Reduced CHP and biomass use.

Recommended uptake of district energy

– HRE 4 - EH&P/Aalborg report

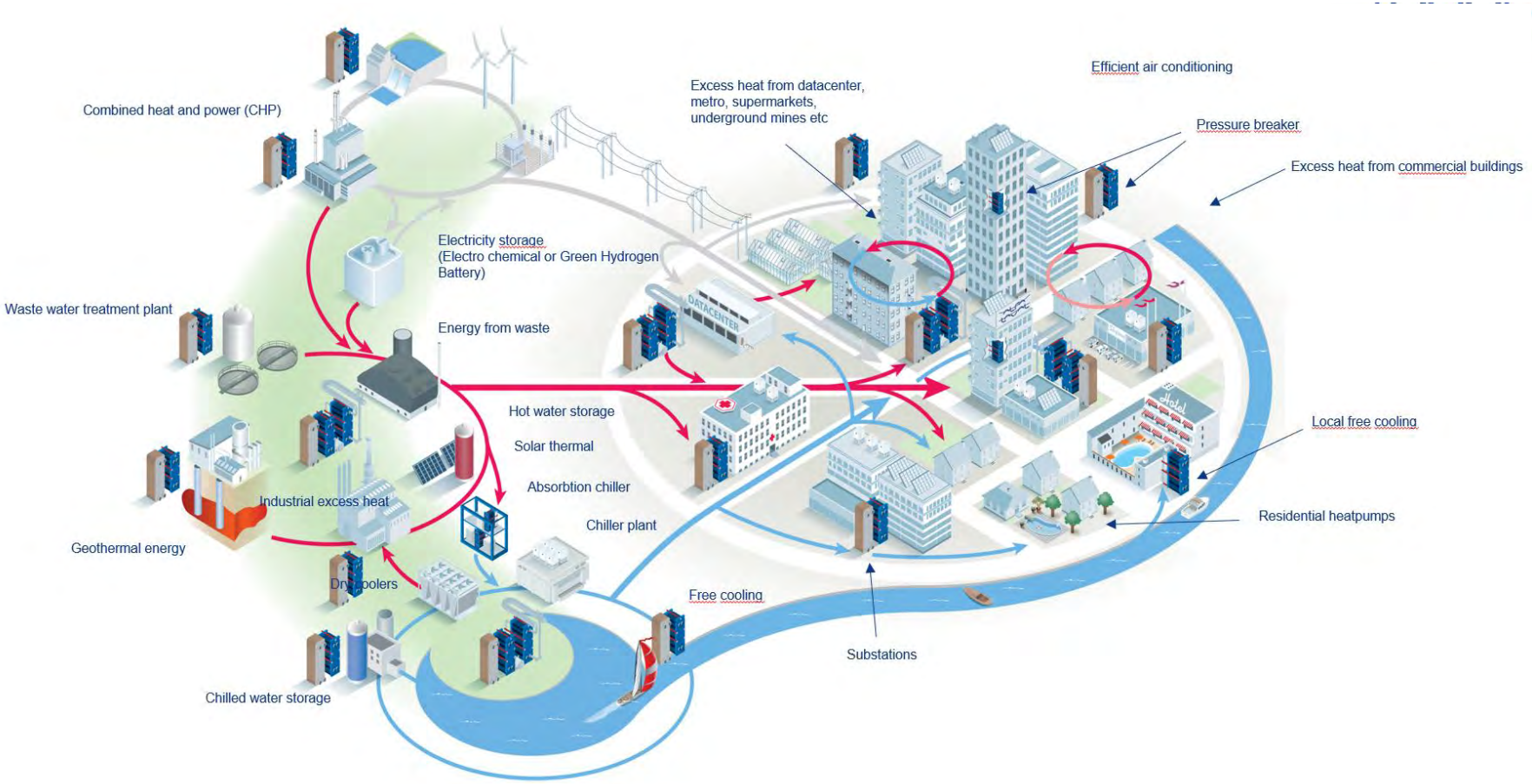
- Heat Roadmap Europe (HRE 4) – 50% (Feb 2019)
- Euroheat and Power/Aalborg – 55% (previously 48%) (Nov 2024)
- UK GOV – Aiming for 19%



What does it look like in real life?

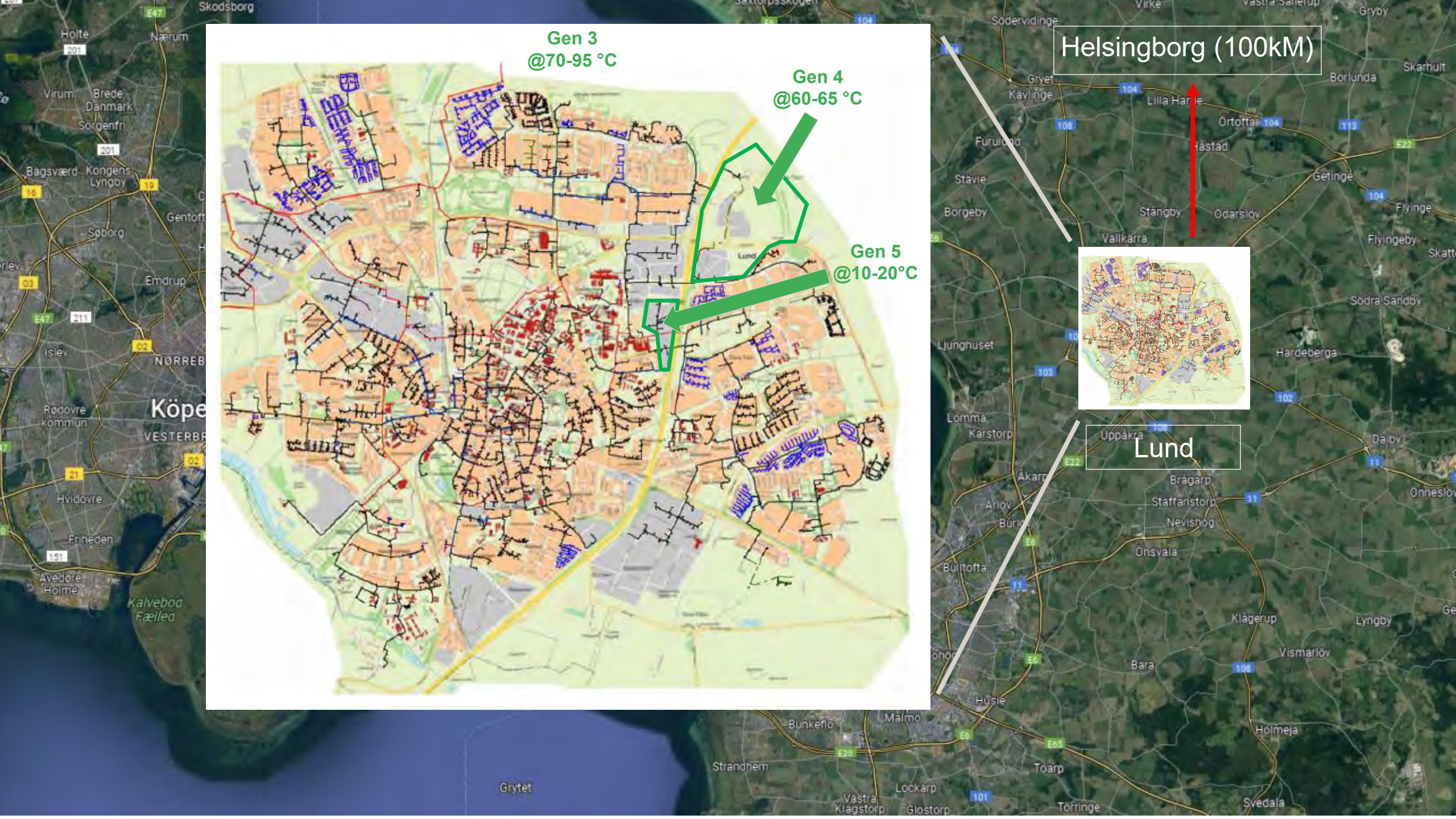
– Sector coupling for a truly sustainable city

Approximately two thirds of all energy is wasted



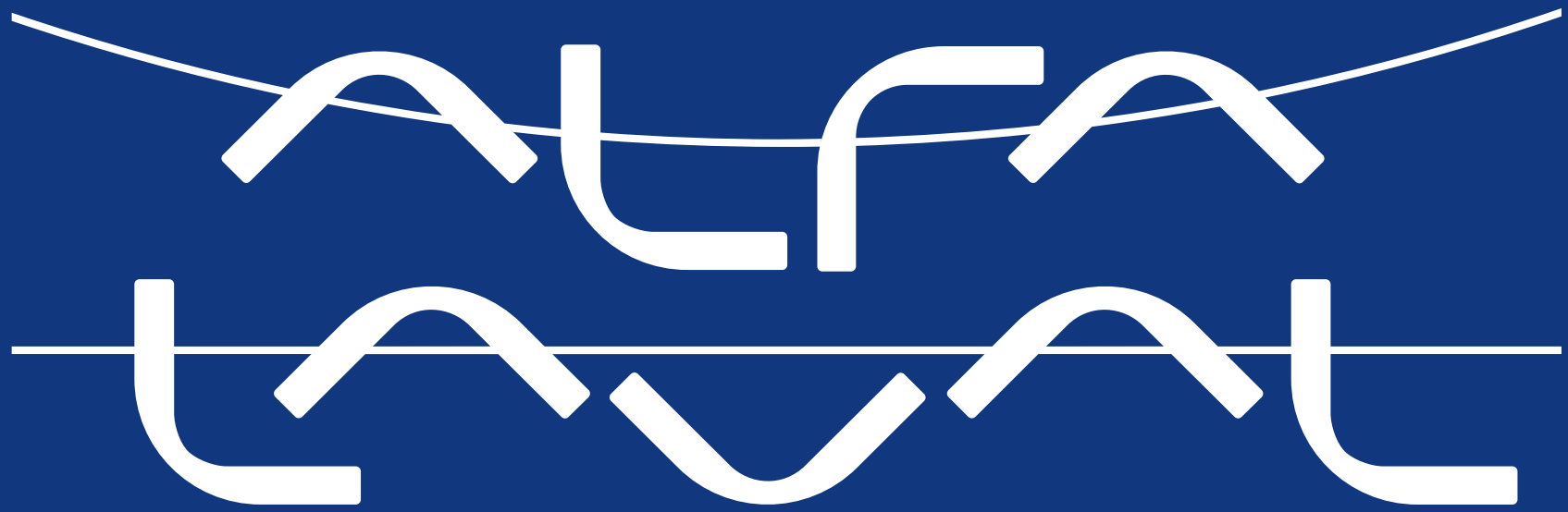
How sector coupling can assist in reducing electrical demand

- Waste heat can provide cooling
- Waste heat can provide electricity via ORC
- District heating and cooling can reduce electricity demand
- District heating and cooling systems are **thermal batteries**
- District cooling and heating are two of the four energy grids required for sector coupling


Gen 3
@70-95 °C
Gen 4
@60-65 °C
Gen 5
@10-20°C
Helsingborg (100kM)
Lund

District Energy – The great facilitator

- District energy is completely energy source agnostic and facilitates the use of a variety of energy sources
- District energy Facilitates the capture and utilisation of waste energy.
- District energy's 'thermal battery' can reduce electrical demand
- District Energy allows for step changes in the reduction of carbon emissions
- District heating and cooling are two of the four 'power grids' required for sector coupling
- Without District Energy sector coupling cannot work
- District Energy future proofs the supply of heating, DHW and cooling
- District Energy reduces the peaks and troughs of thermal demand allowing greater renewable utilisation
- District Energy facilitates the easy integration and utilisation of large scale thermal storage



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