The Power of System Integration

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Danfoss in brief

We engineer solutions that increase machine productivity, reduce emissions, lower energy consumption, and enable electrification.

Employees worldwide

39,360

Global sales

EUR 9.7b

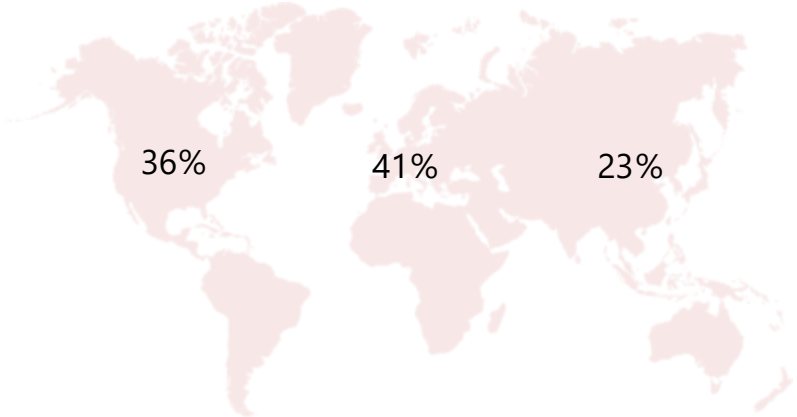
Business segments

Danfoss
Power
Solutions

Danfoss
Climate
Solutions

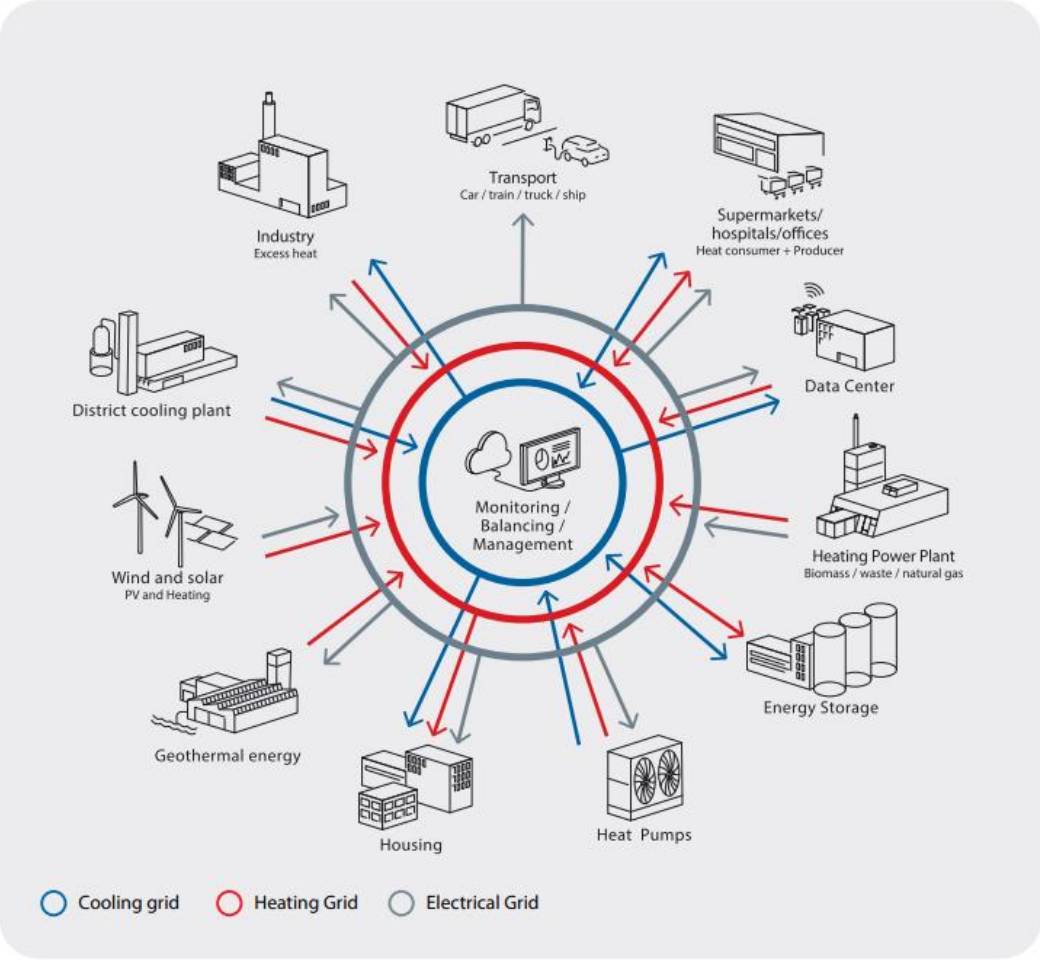
Danfoss
Power Electronics
and Drives

Global footprint



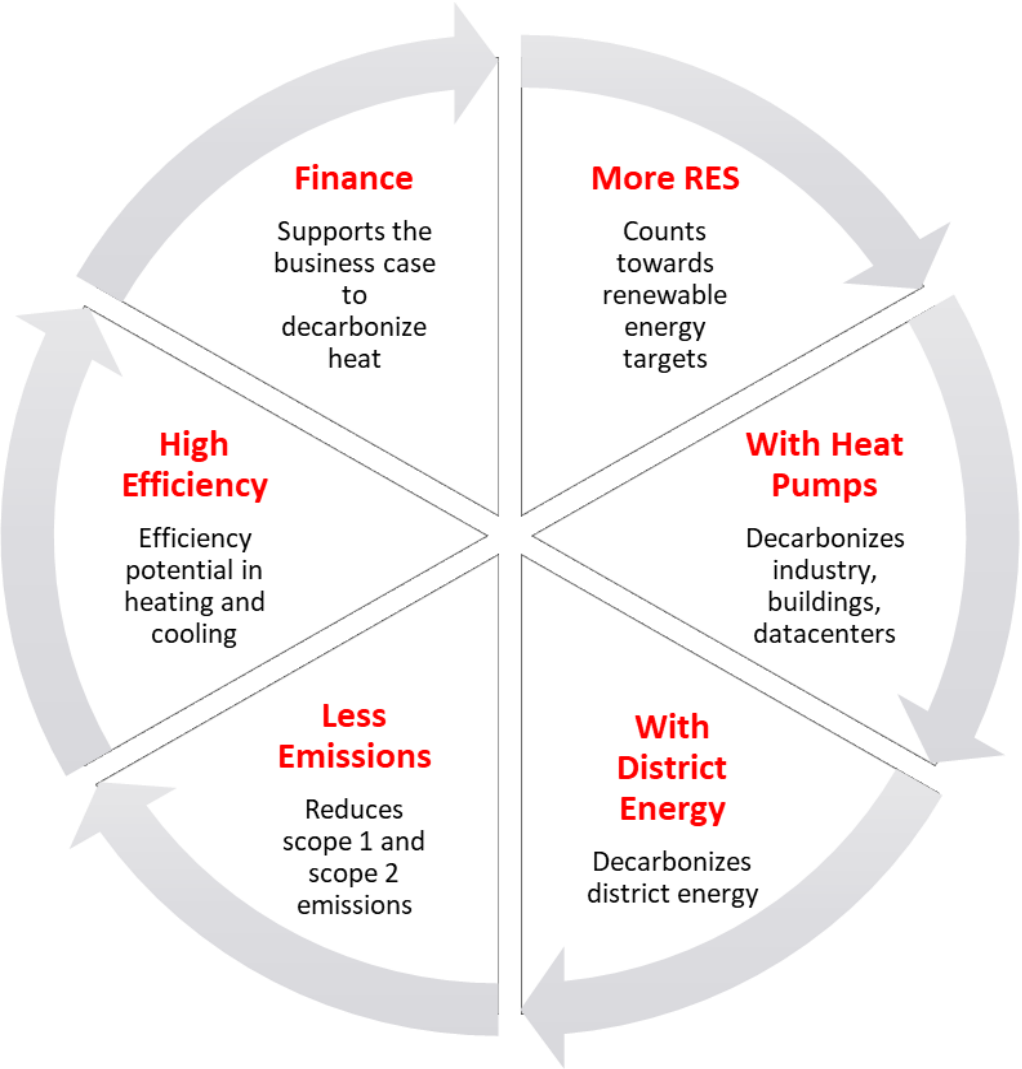
As per annual report 2024

The future energy system is smart & fully integrated



- Achieving the highest efficiency at lowest cost depends on detecting and selecting the optimal heat sources.
- Waste heat sources from industry are currently under-exploited. Yet, the potential is massive with approx. 2,860 TWh/ year.
- This corresponds to almost the total energy demand for heating and hot water in residential & commercial buildings across the EU27 + UK.
- The potential of electrification is massive, from electrification of process heat in industries to heating and cooling in commercial and residential buildings.
- Smart orchestrating of energy flows with monitoring, balancing and management enables full integration.

72% of the global energy input is currently lost*: the waste heat opportunity

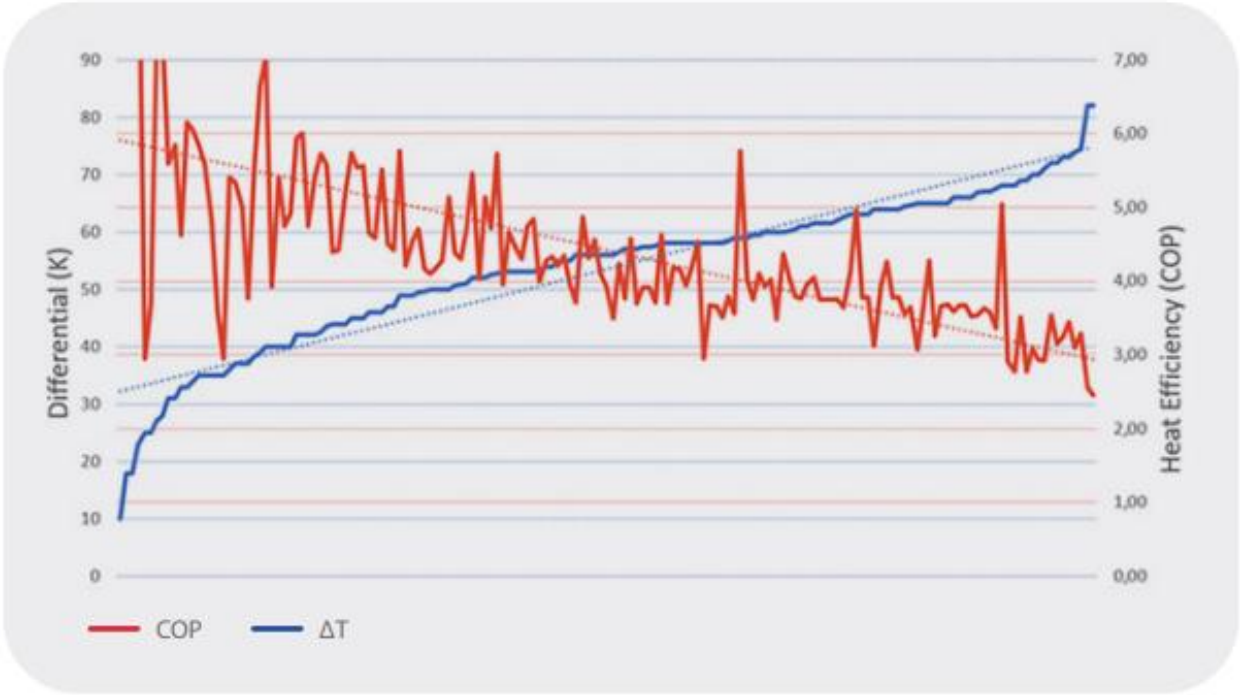


*Estimating the global waste heat potential – ScienceDirect
Consumed primary energy carriers after conversion

Waste heat from industrial processes can provide stable temperatures to boost heat pump efficiency

- Heat pump efficiency (COP) is directly linked to the energy consuming work of the compressor.
- The higher the temperature lift (ΔT) from heat source to heat consumer, the more work the compressor has to do.
- If the heat source temperature varies (ambient air or water), the ΔT will vary over time and so will the COP.
- If the heat source is waste heat generated by a process, ΔT and COP will be stable and high as the ΔT is lower compared to ambient sources.

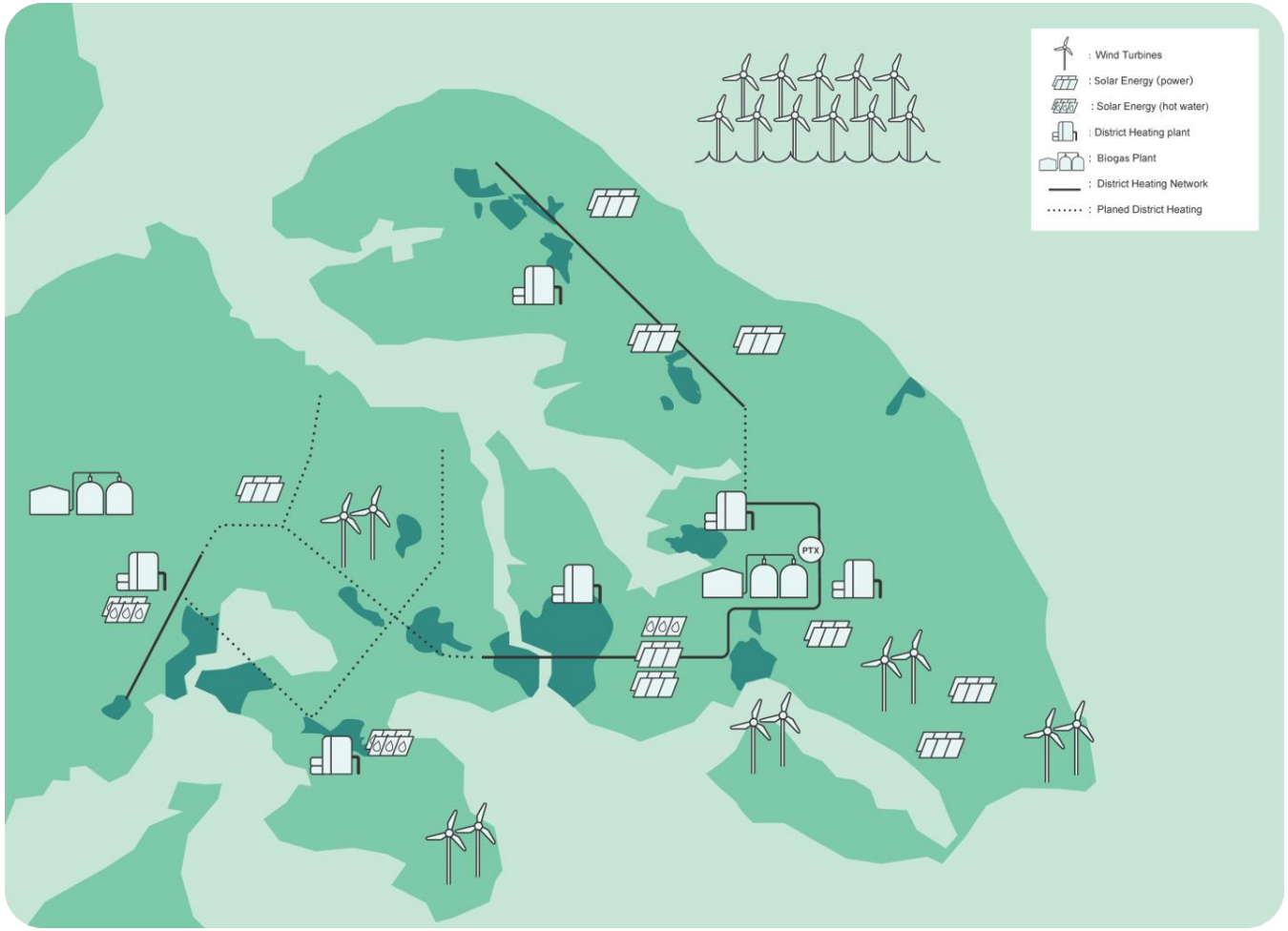
1K differential | 2% heat pump efficiency | 2% Operating Cost



Connecting and sharing with thermal networks
The example of Sonderborg

Case study

- Reduce - energy efficiency first
  - Energy-efficient buildings
  - Heat pumps in the industry, district heating, and buildings
- Reuse and integrate
  - District heating reusing excess heat from industry, supermarkets, PtX
  - Digitalization and integration of district heating networks



Total waste heat production of 87 GWh
1/3 of the municipality's residential district heating demand*

Heat Recovery Case	Heat Cap. MW	Heat prod. GWH/year	COP Cool / Heat	Total COP Cool / Heat Symbiosis	Pay back (years) with Electricity : Heat Price Ratio: 1.5-2.0
Hospital	2	18	2.7 / 3.6	6.3	2
Data Center	0.5	5	3.6 / 4.6	8.2	3
Food processing	2.6	19	3.0 / 4.0	7.0	Depreciation over 10 years
Brick yard	4.7	30	2.3 / 3.3	5.6	Under commissioning
Material Processing	1.2	9	3.9 / 4.9	8.8	2.5
Grain Drying	1.1	6	3.0 / 4.0	7.0	1.7

*Municipality population of 74.000 with 2/3 connected to the District Heating grid has a heat demand of 249 GWH per year (Country based average)

Zooming in on the Sonderborg Hospital
Selling heat instead of buying it

Case study

- Taking advantage of the renovation of the hospital to integrate heating and cooling with dedicated heat pumps.
- Heat recovery from the cooling system identified as solution with ties into district heating.
- Symbiosis between heating and cooling leads to significant increase of COP from 3.6 to 6.3.
- Payback time of only 2 years.

-> Hospital only needs to buy heat from the district heating grid during the winter months from December to February and can sell heat during the rest of the year!

Check out your potential now!
Heat recovery tool to evaluate the business case

Input
- Heat demand temperature profiles
- Capacity available
- Direct heat recovery or heat pump
- Energy prices

Output
- Energy production
- CO2 reduction
- CAPEX / OPEX
- SCOP / COP
- Payback time

Our future energy system will look radically different and will use a lot less primary energy: let's make it happen!

- It will be characterized by electricity-only renewables, electrification of processes that are currently relying on burning fossil fuels, and much improved end-use efficiency.
- Heat pumps are central to future energy systems.
- Waste heat recovery offers a reliable heat source for heat pumps, lowering temperature lift and improving efficiency.
- Coupling heating and cooling unlocks synergies, often doubling the combined COP compared to standalone solutions.
- Diverse applications deliver payback times frequently under three years.

→The upcoming Heating & Cooling Strategy is a key moment to advance system integration of waste heat recovery, heat pumps and heat networks.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