


Why to change the mindset to secure sustainable DH transformation?

TOPS – Zlatibor 11th of June 2024



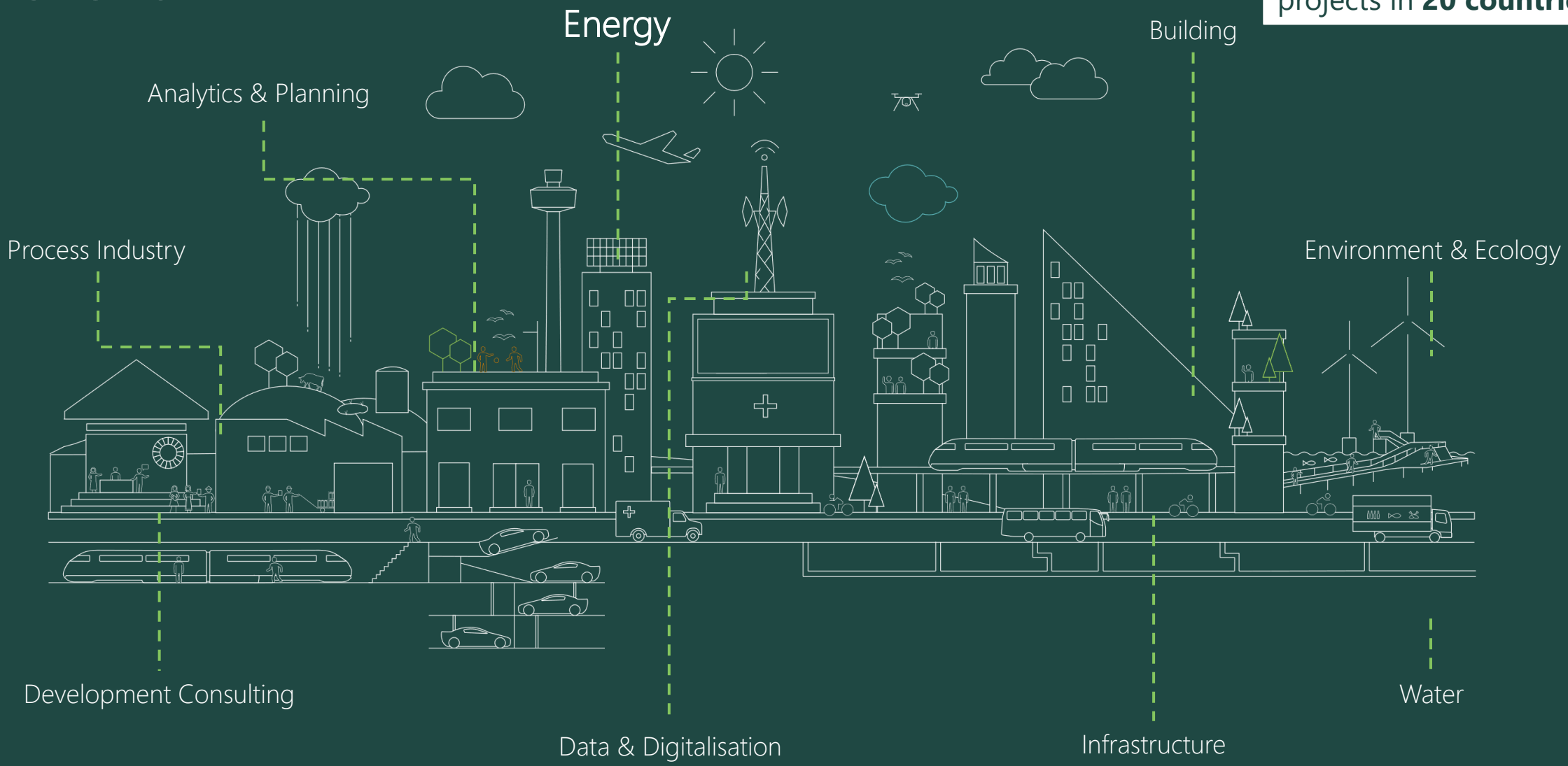




Who is NIRAS?

Sectors

NIRAS ENERGY has more than **100 experts** and projects in **20 countries**



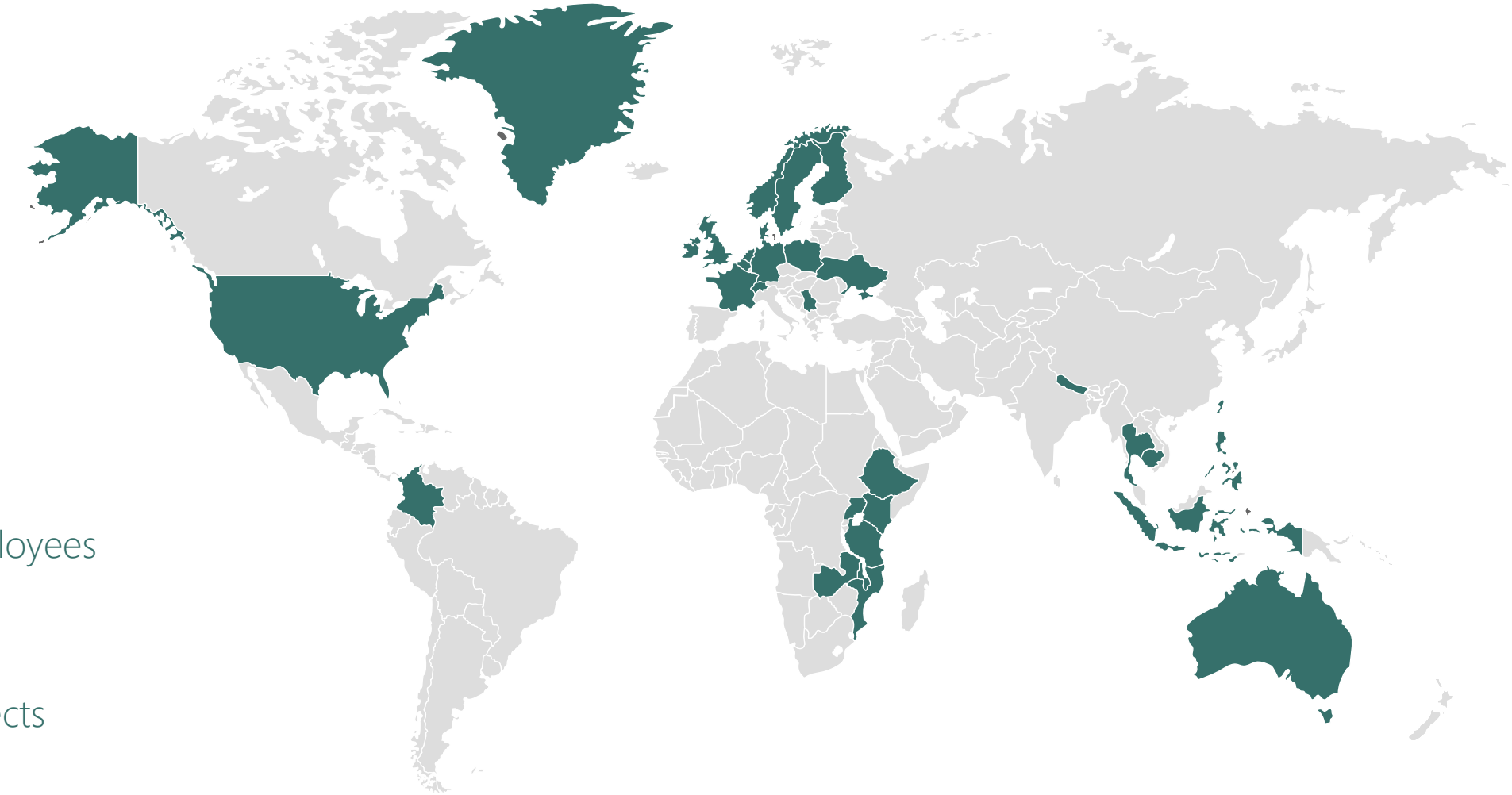
Global presence

30 countries

52 offices

3000 employees

7000 projects



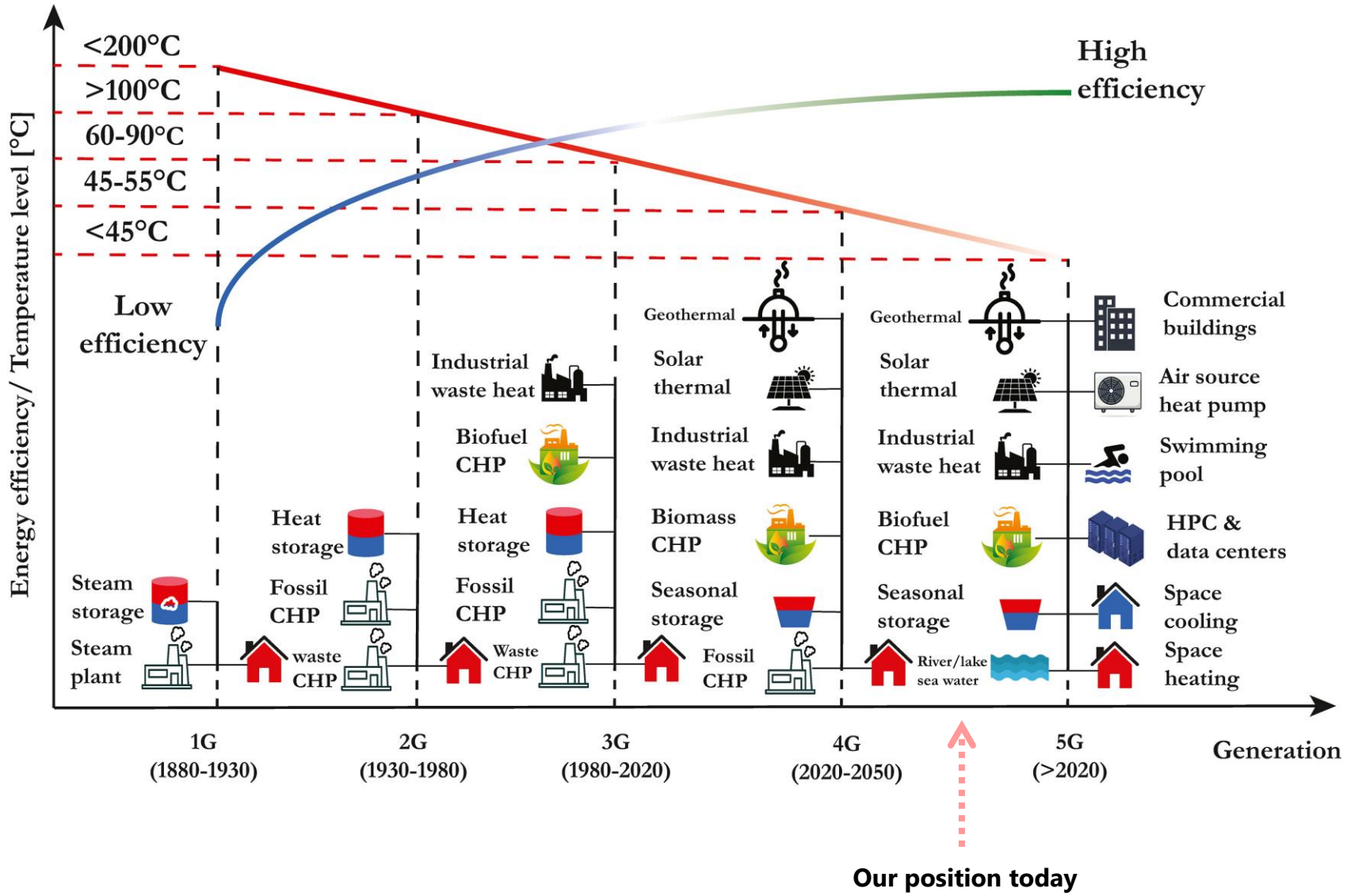
Why changing the mindset?

- Due to **EUs CLIMATE ACT** we are all obliged to reduce the greenhouse gas emissions by phasing out fossil fuels and reaching the goal **CLIMATE NEUTRALITY by 2050**
- This transition requires a shift in our traditional business approach regarding both energy systems and sources
- Focus must be on utilization of more renewables such as solar, wind, and geothermal energy, storage capacity and building up a new intergrated energy system, which can provide us with a stable and reliable supply of sustainable heat and power.

Therefore we must change the mindset

to a holistic approach to energy systems and energy sources.

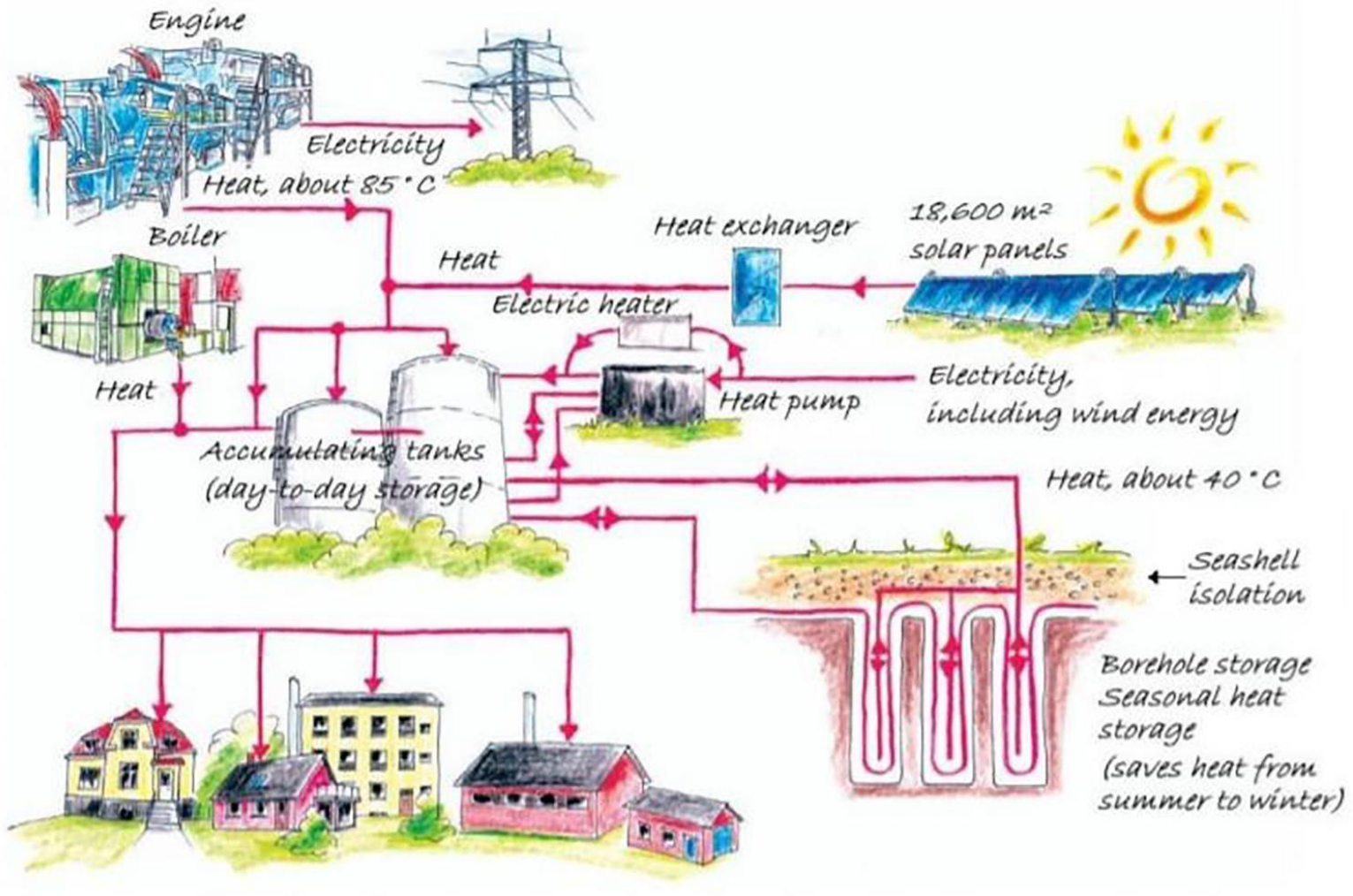
Evolution of District Heating



Source: H. Sadeghi et al.
A review of borehole thermal energy storage and its integration into district heating systems.

Evolution of District Heating

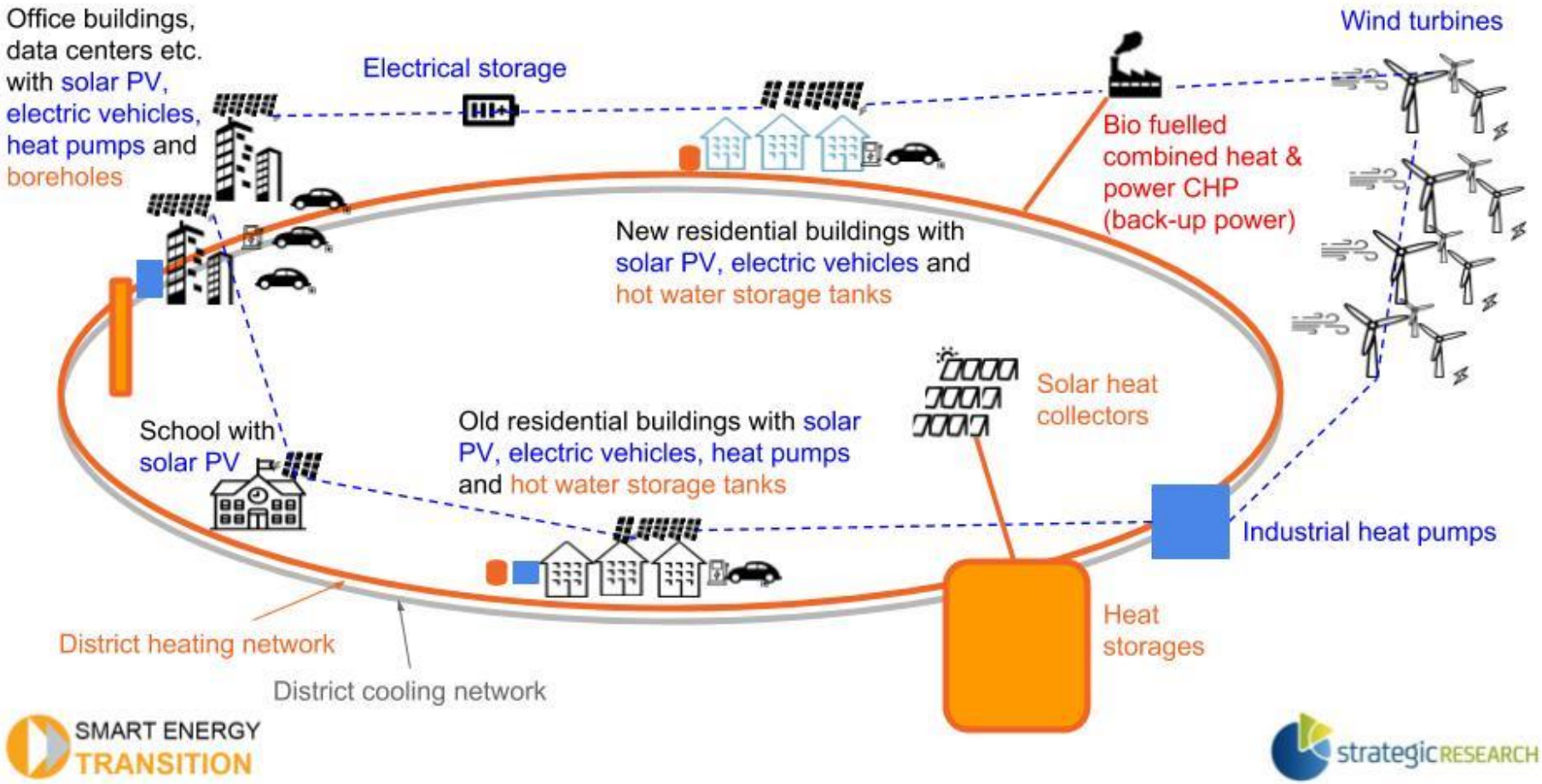
4 th. generation district heating and cooling system



Source: Z. Tian et al.
Large-scale solar district heating plants in Danish smart thermal grid: Developments and recent trends

Evolution of District Heating

5 th. generation green district heating and cooling system



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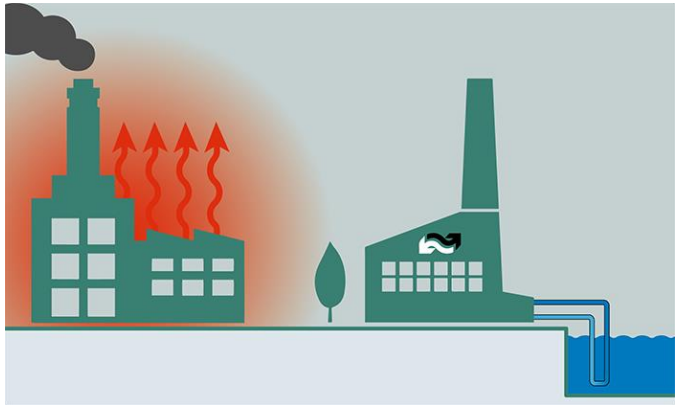
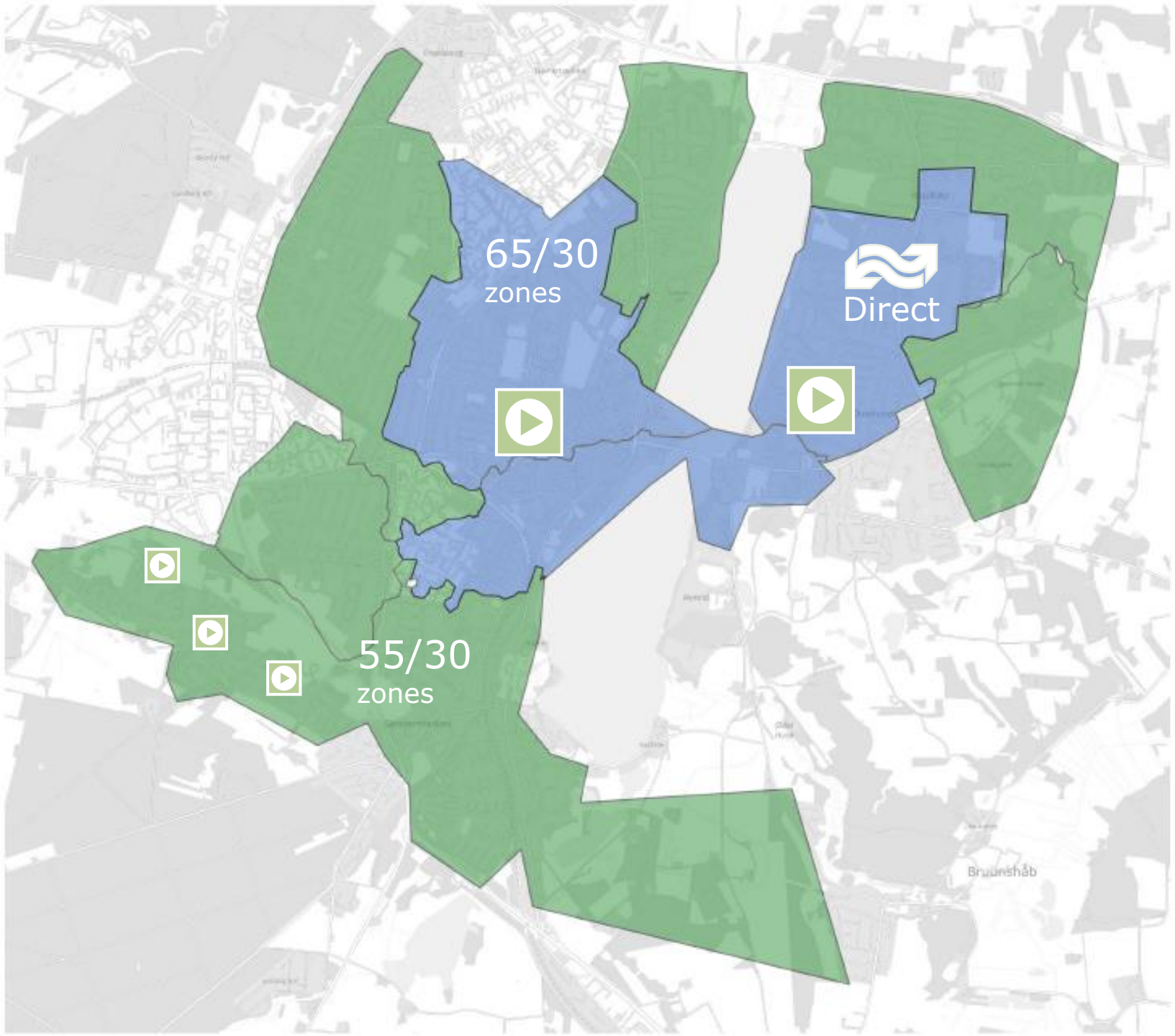
Evolution of District Heating

Surplus heat from industry

- Data centers
- Industries who use heat for production
- Process industry
- PtX
- Refinery
- Shopping centers
- Also, surplus heat from smaller industries has great value for district heating.





CASE

Balanced district heating

Viborg Fjernvarme

Optimization of distribution network

- Two zones (65/30 and 55/30)
- Local heat pump boosts the inner city
- Local mini heat pump boosts larger consumers
- Change from indirect to direct heat connections of building blocks
- Limited changes to city transmission network
- Limited changes to supply pipelines, pumps and flow measuring for one sub-zone

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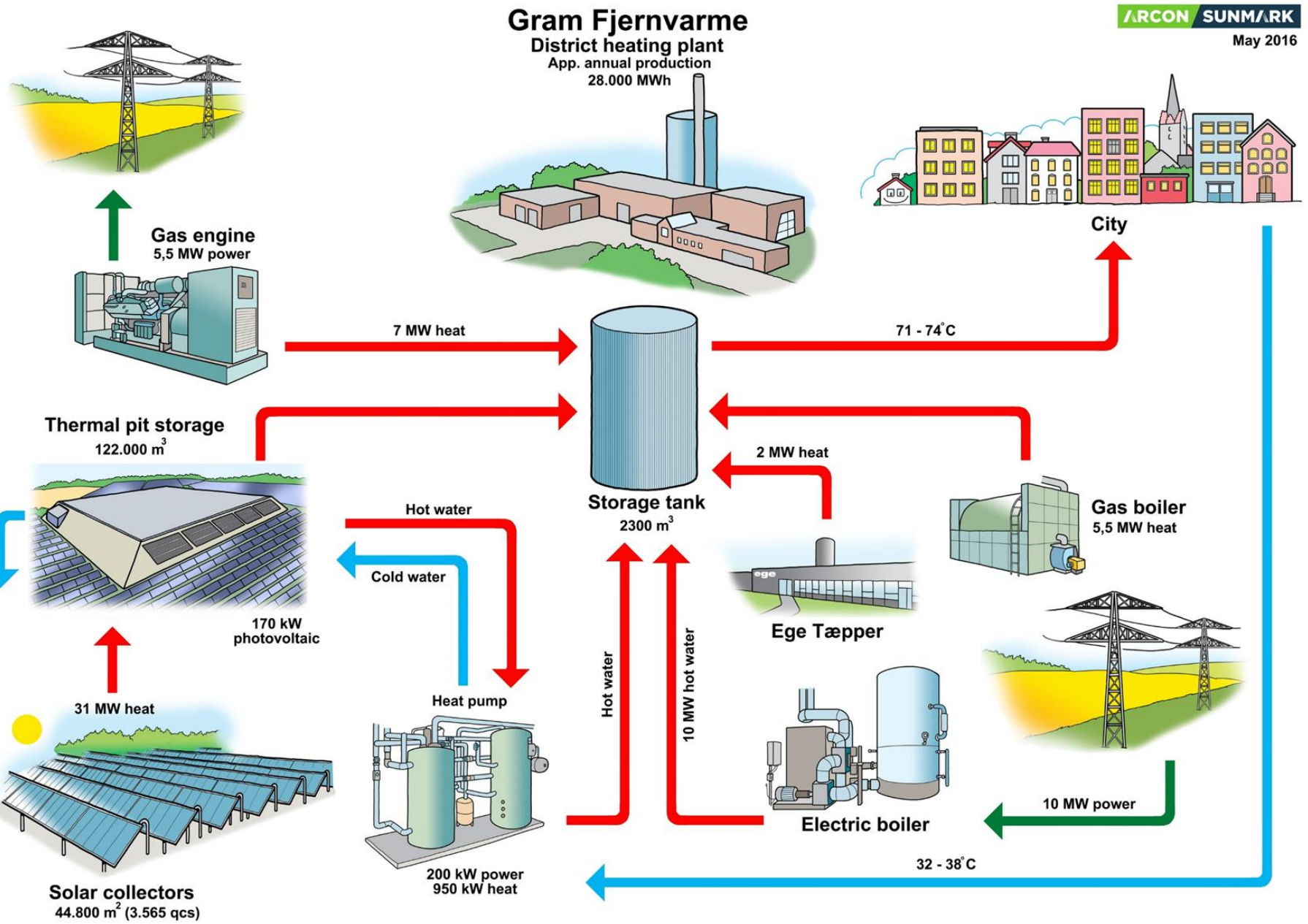
CASE

Sustainable production mix

Gram Fjernvarme



Solar heat in Gram

The thermal solar heating system in numbers

- 10,073 m^2 established in 2009
- 34,727 m^2 established in 2015
- 44,800 m^2 solar collectors and 3556 panels in total

Pit storage capacity

- 122,000 m^3
- Measurements at the top: 110 x 125 m
- Depth: 16.5 m

31 MW power, in total

- Estimated annual heat production: 18,000 MWh
- Corresponds to 50% of the annual heat production
- CO2 savings of 3,700 tons less CO2 emissions

Solar photovoltaic system

- 170 kW solar cells for the production of electricity for the pumps

Top efficient CHP Production

CASE

Brønderslev Forsyning

The plant has one of the worlds most energy efficient CHP production based on both biomass and solar energy.

- 22 rows of Combined Solar Panel: 5 km, 17 MW
- Two biomass boilers: 2x10 MW
- ORC-plant (Organic Ranking Cycle): 4 MW electricity
- Electric driven heat pumps (flue gas condensation of 15 degrees),
  2,5 MW (exploited heat from the heat production)
- Heat storage (8000 m3)
- 20 MW electric boiler
- 35 MW natural gas boiler (supplying heat)
- 7 gas engine (28 MW heat, 22 MW power)

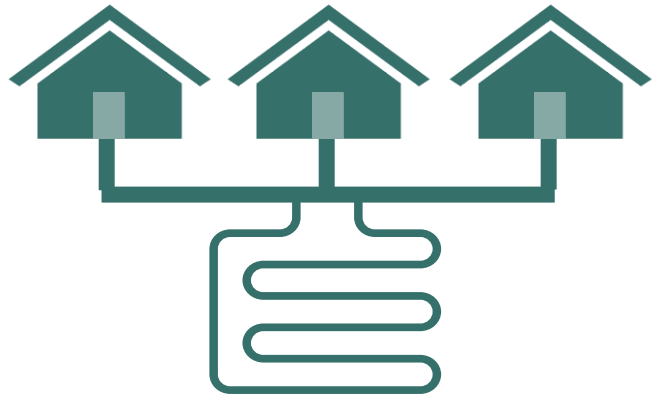
90% of the heating demand is covered by non-fossil fuel.

FACTs and FIGURES	
Construction of the first DH plant in Brønderslev	1919
DH market share	Population in city: 12.600 DH Consumers: 4800
Heating capacity	DH: 130 MW

Cool District Heating

Technical installation

- Installation of heat pumps at each consumer
- Electricity connection of heat pumps at each consumer
- Metering system at each consumer
- Length of total network depends on consumer density and number of consumers
- Network of terrestrial heat is placed horizontally or vertical in boreholes, length depends on source and heat load
- Possible landowner compensation for the establishment of the terrestrial heating system
- Pumping station
- Common horizontal non-insulated grid
  or boreholes down to 100 m
- Temperature in network between 5 and 8 degrees C°
- Surplus heat



Cool District Heating is typically used for smaller villages.

Conclusion

- In Denmark as well in few other countries, we have succeed in changing the mindset at different DH companies.
- But the journey has just started, more success stories remain to be told in future.

From NIRAS' point of view, this lecture shows combined energy systems of the future including district heating og district cooling. (SYNERGY SYSTEMS)

Thank you for your attention

Get in touch with us

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