

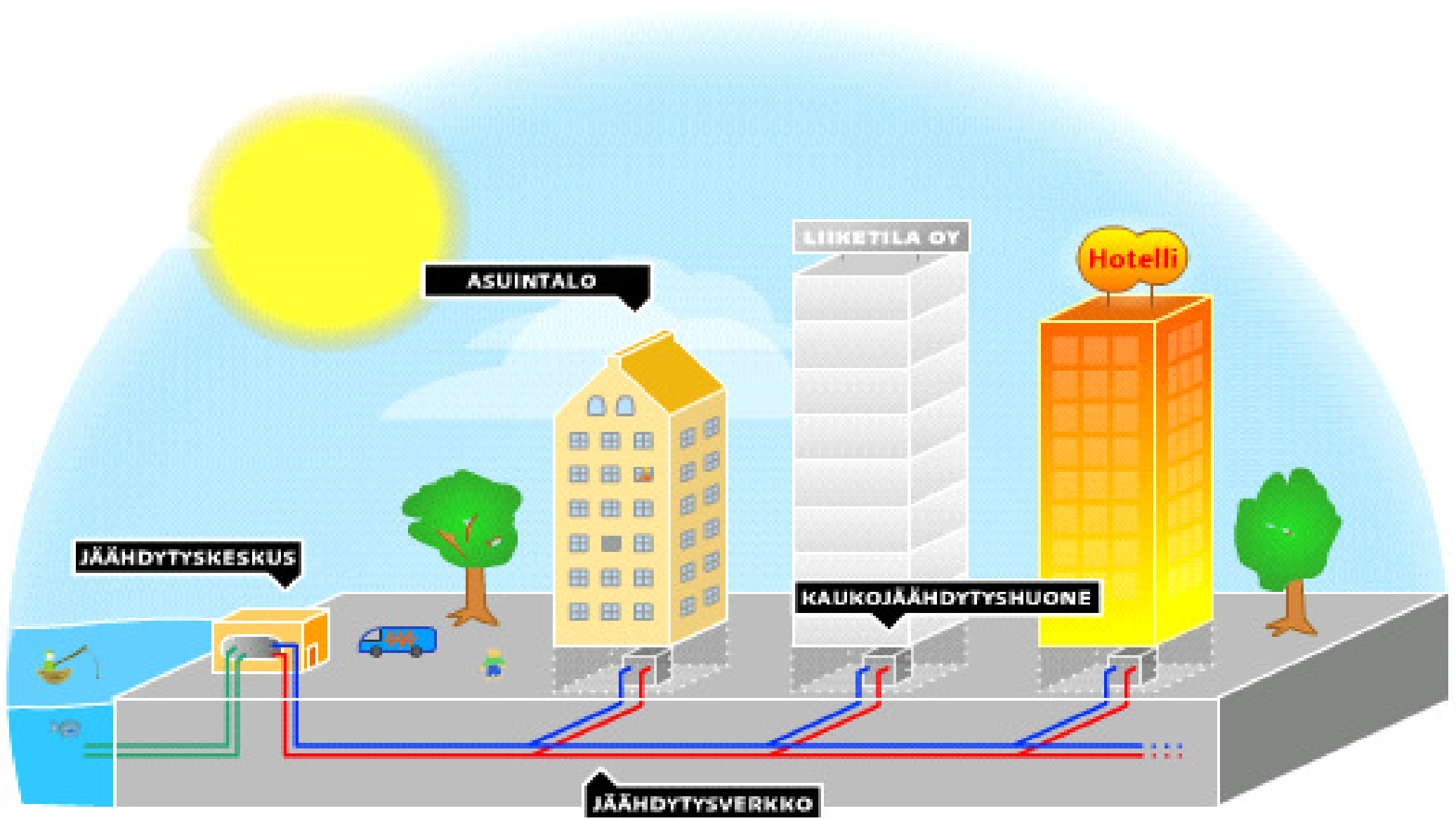
***Sustainable and Energy Efficient
District Heating and Cooling***



DISTRICT COOLING IN FINLAND

BASREC
20.-21.5.2014 Helsinki

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Presented by Turo Eklund



DISTRICT COOLING IN FINLAND

District Heating suppliers offer District Cooling in seven cities:

Helsinki (1998), Turku (2000), Lahti (2000), Vierumäki (2002), Tampere (2012), Pori (2012) and Espoo (2013)



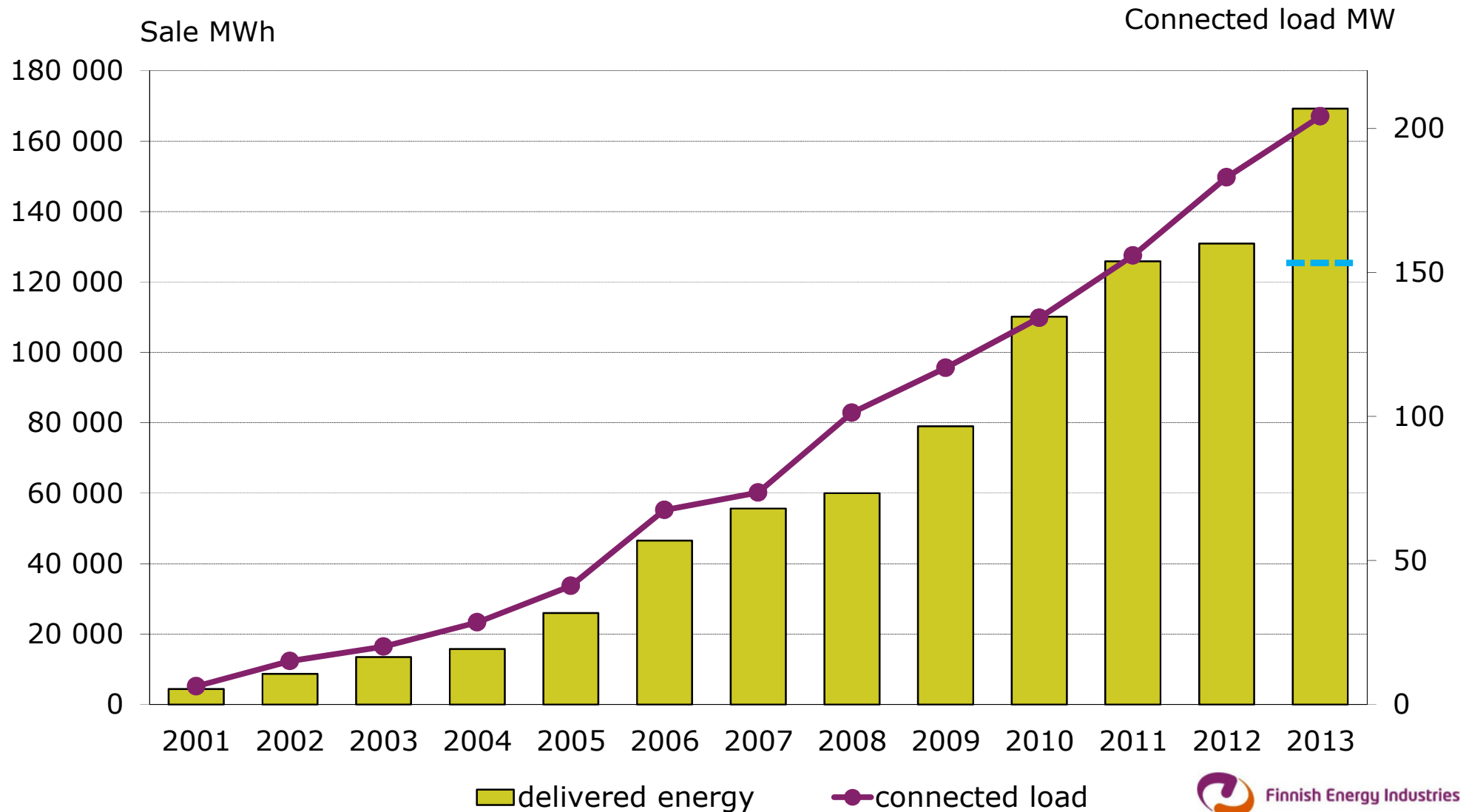


DISTRICT HEAT AND COOLING – MOST WANTED ENERGY SOLUTIONS

- Customers are willing to outsource heating and cooling production to the energy company
- At the same time harms and risks of own production are avoided
- Energy systems are reliable and cost efficient solutions for the whole life-cycle

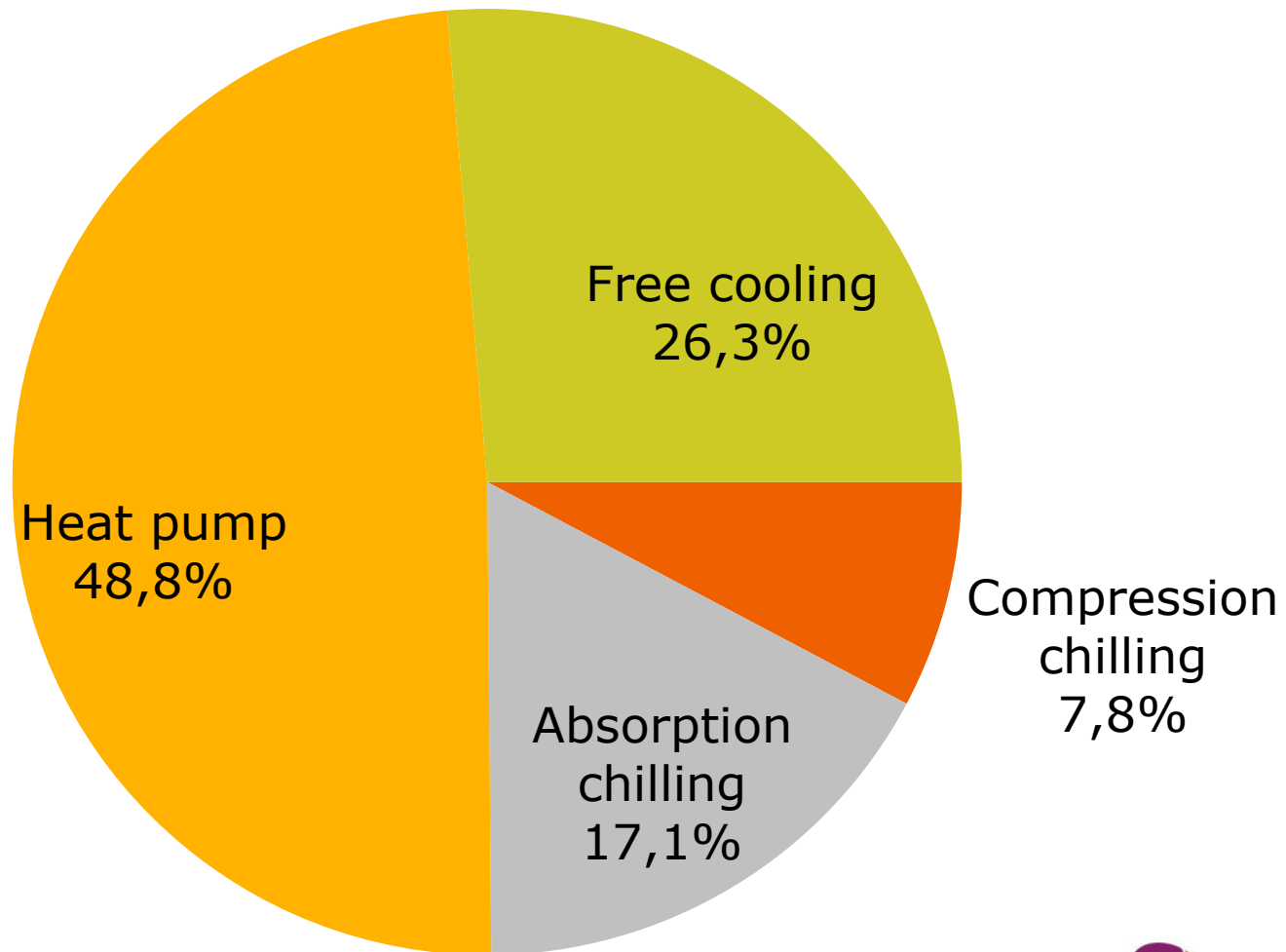


Delivered District Cooling energy and connected load



District Cooling production 169 GWh (2013)

District Heating production 31600 GWh (2013)



DISTRICT COOLING PRODUCTION

- Production methods must be combined according to local conditions
- District Cooling energy can be produced in several alternative ways:
 - Free cooling (utilization of nature's own energy resources)
 - Absorption chillers
 - Compressor chillers
 - Heat pumps
- In absorption technology, the operating energy is industrial waste heat or heat produced together with the electricity generation of a power plant, which cannot be sold as District Heat during the summer due to low consumption levels
- The storage of District Cooling energy is essential even in smaller systems to improve the profitability of operations
- Storage also brings flexibility and extra reliability in the supply of cooling energy

PRODUCTION FREE COOLING



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PRODUCTION ABSORPTION CHILLERS



PRODUCTION HEAT PUMPS



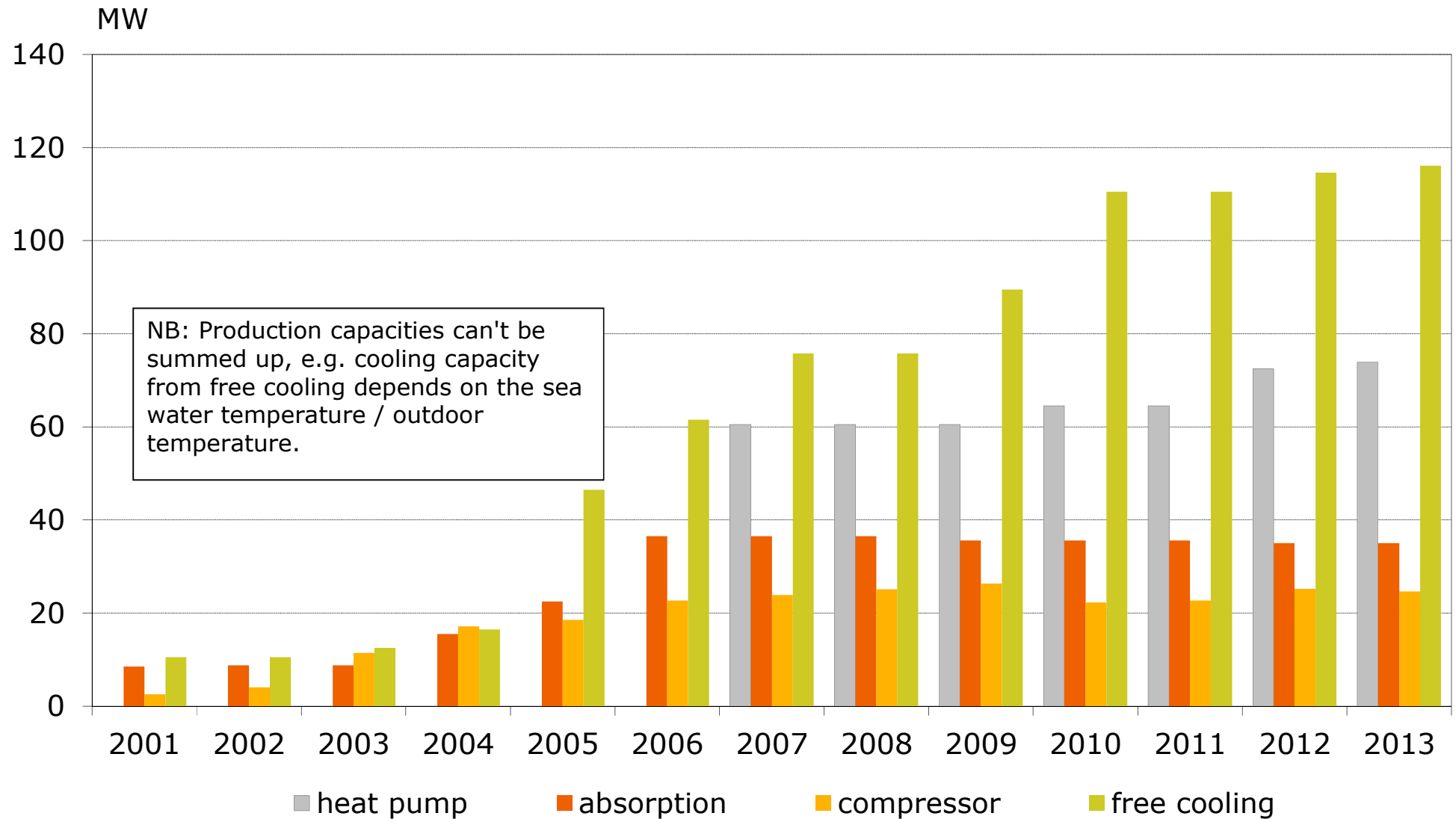
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Production capacity in District Cooling



DISTRIBUTION

- Cooling energy is delivered to customers in the flow pipes with chilled water
- Cooling water is treated in the same way as district heating water
- The temperature of cooling water delivered to the customer varies in different district cooling systems
 - When producing cooling energy with absorption technology or free cooling, the temperature of cooling water is, for example, 8 °C
 - When producing energy with compressor cooling equipment, the water temperature may fall to 6 °C
- Water heated in the customer's heat exchanger is transmitted in the return pipe back to the cooling plant where the same water is cooled again
- In the measurement situation, 8-10 °C is used as the temperature difference between flow and return water



CITY OF HELSINKI

- The capital city of Finland
- Approx. 605 000 inhabitants
- Heat market totally ca. 8 000 GWh
- Thermal energy demand is greater than electricity demand



The highest temperature ever recorded in the city centre was 33.1 °C on July 1945 and the lowest was -34.3 °C on January 1987.

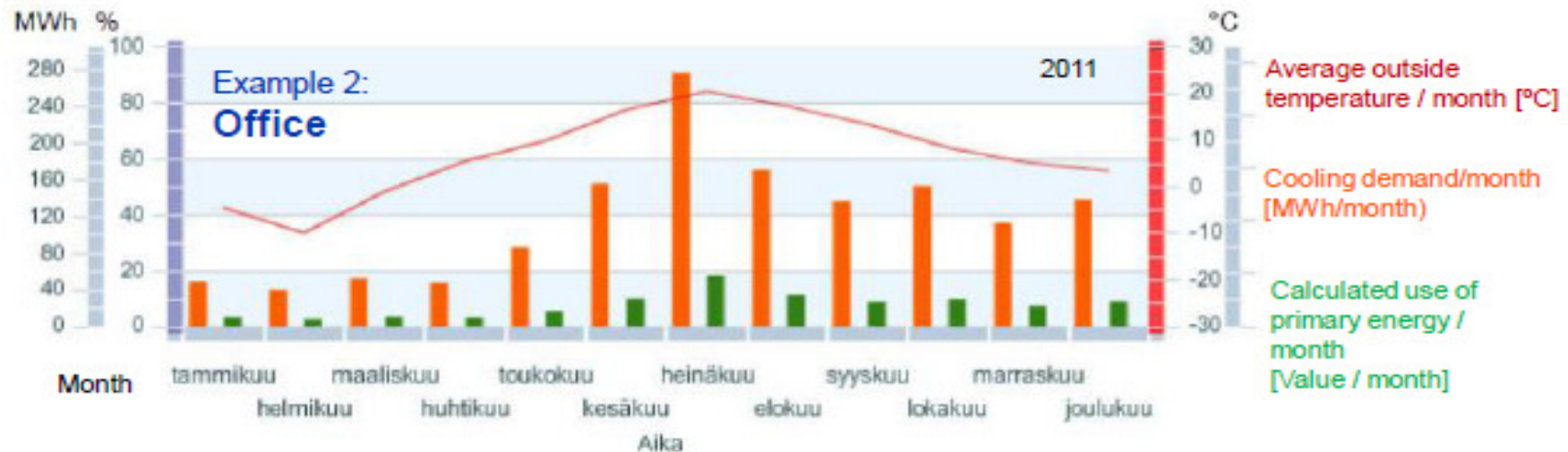
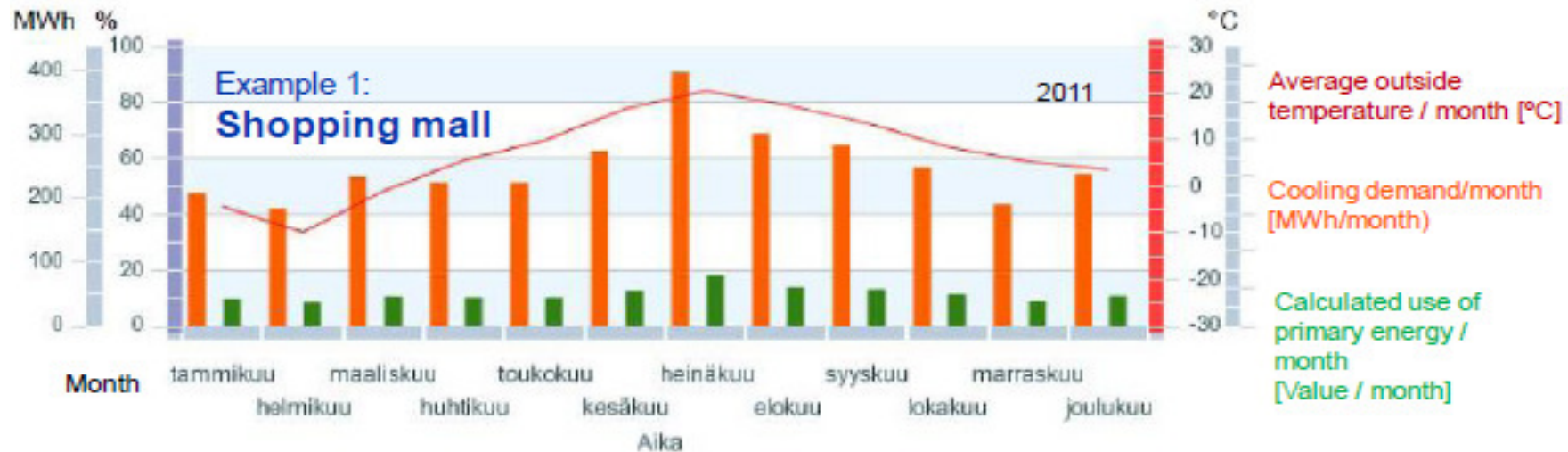
DISTRICT COOLING IN HELSINKI

Rapid growth is based on customers own will to choose District Cooling in a free market

- More than 80 % of production is based on free energy sources or energy that otherwise would be wasted
- Large primary energy and CO₂ savings compared to alternative cooling solutions.



Cooling demand in Helsinki

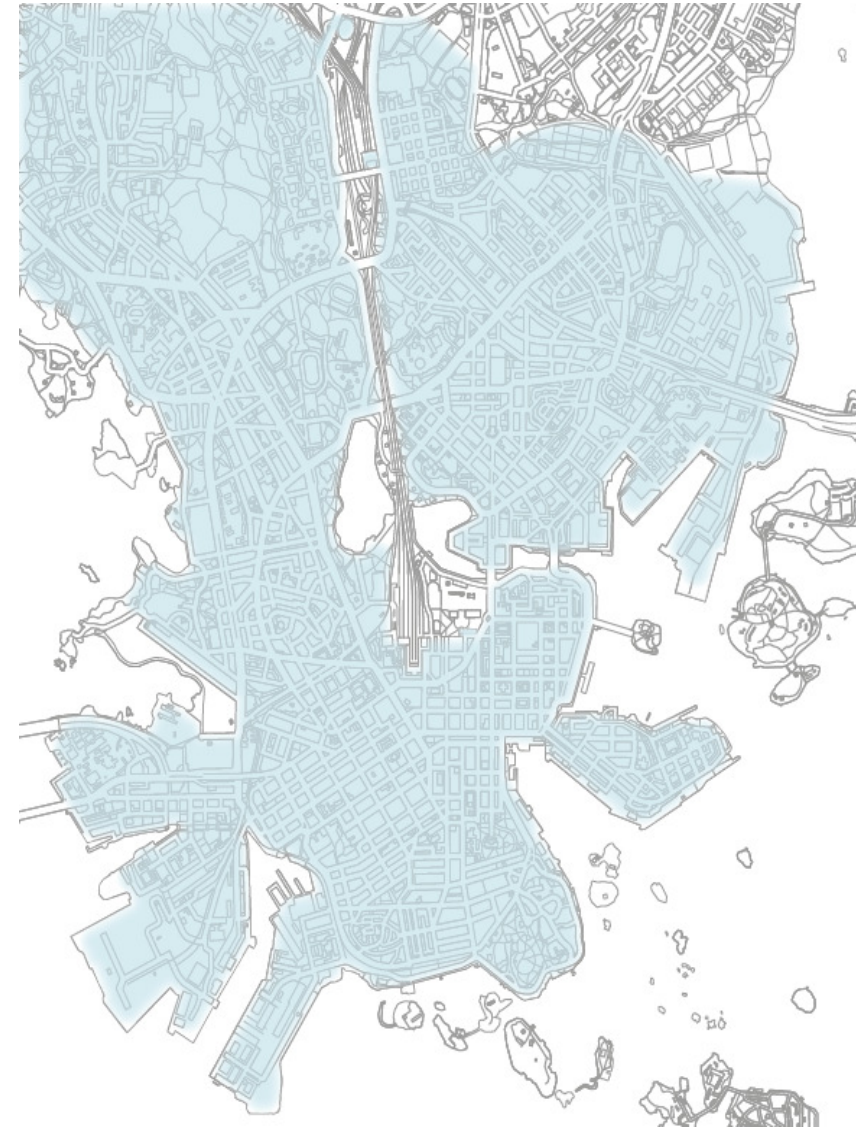


DISTRICT COOLING IN HELSINKI

- District cooling is expanding rapidly
- System is already covering a volume of buildings of 13.6 million m³
- It saves energy and conserves the environment
- It is produced in an environmentally benign way
- Europe's 3rd largest supplier of District Cooling

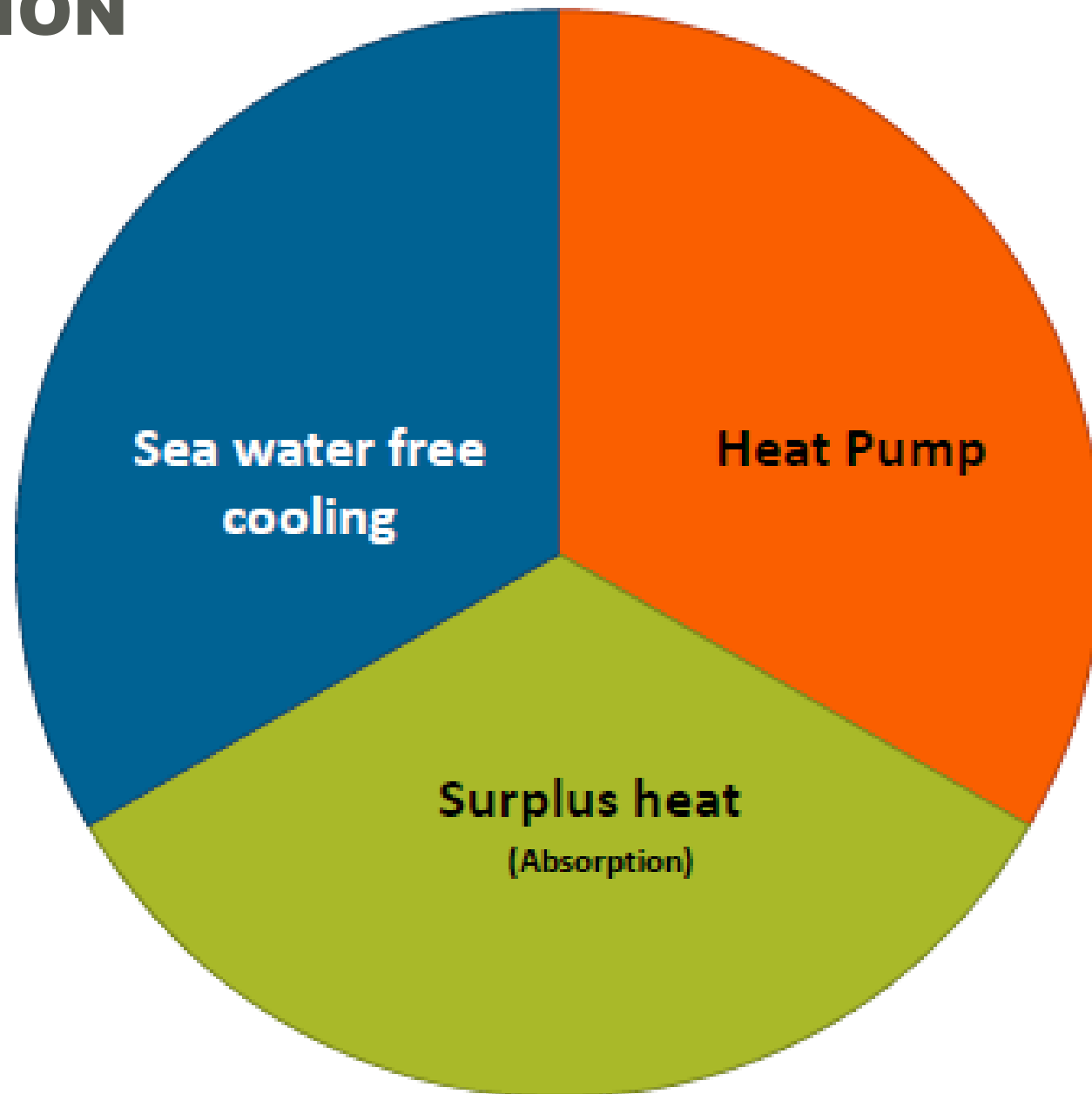
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- *Customers: 257 connections (about 300 buildings)*
- *Connected cooling load: 154 MW*



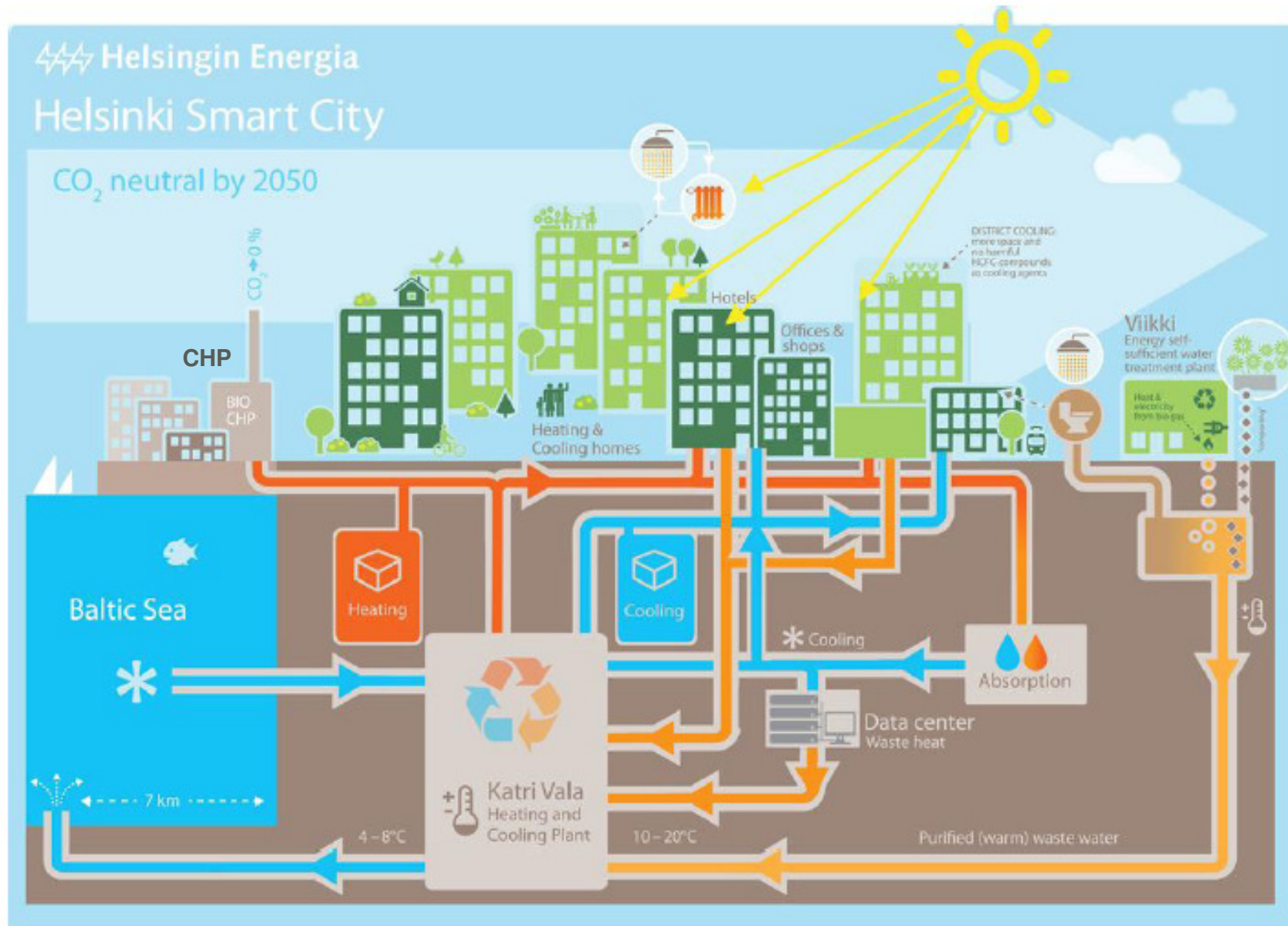
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PRODUCTION

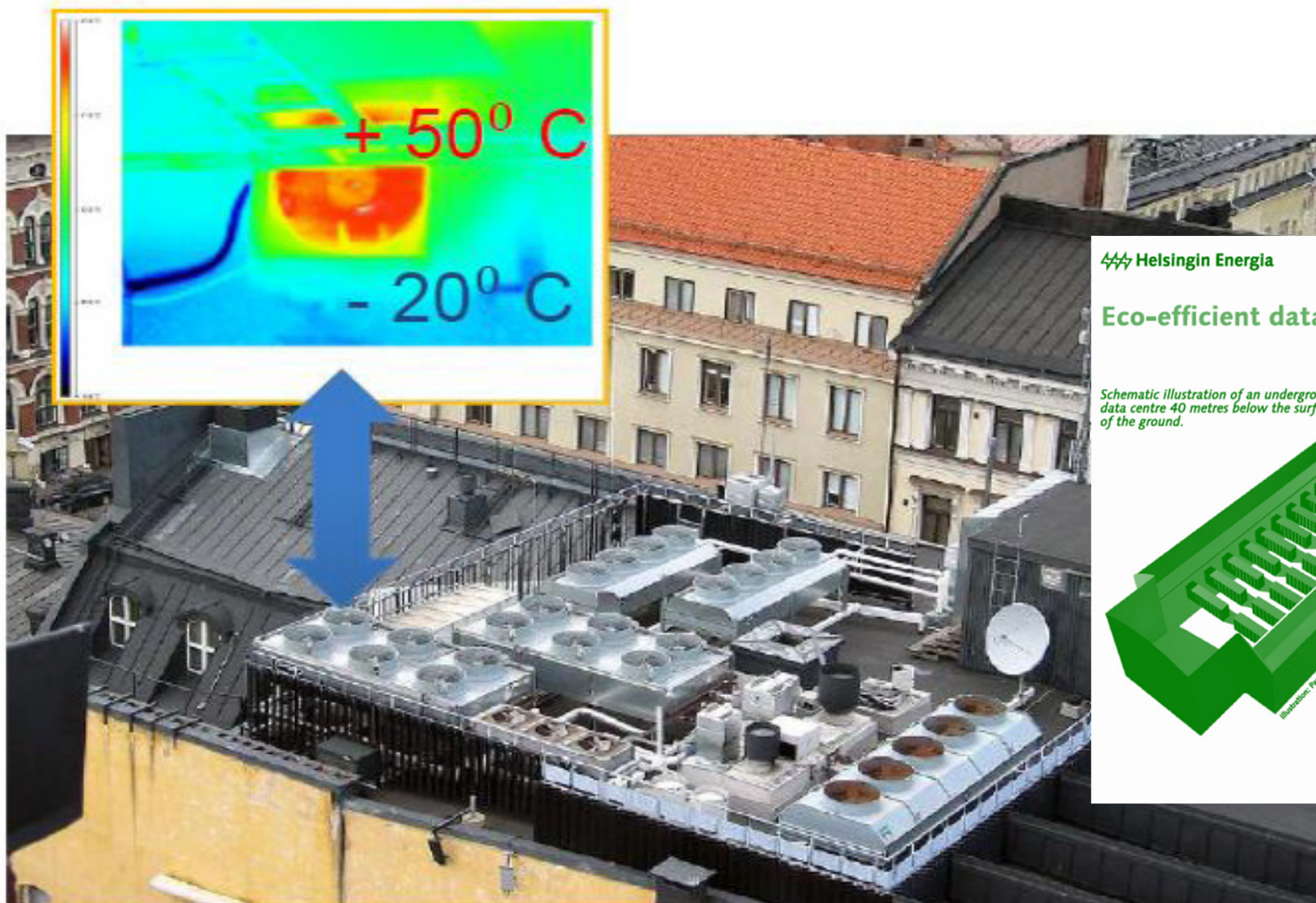


DISTRICT HEATING AND COOLING

MODERN DISTRICT ENERGY SYSTEM



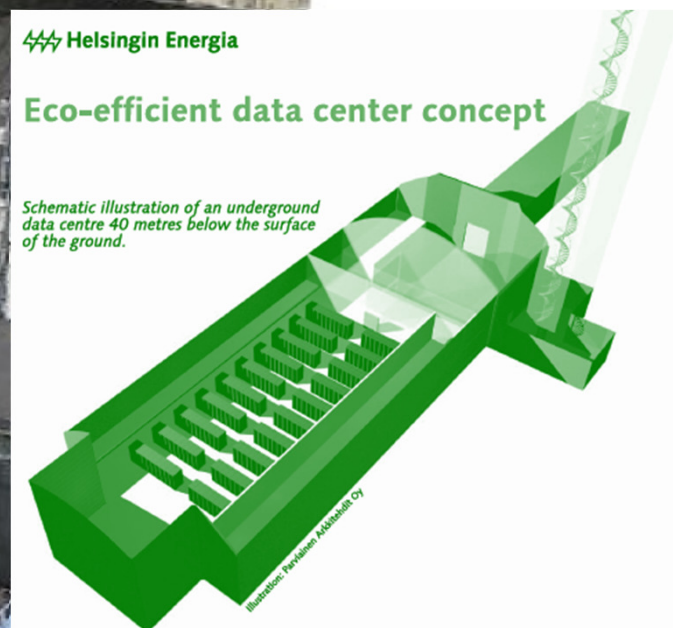
WASTE HEAT TO THE SMART SYSTEM



 Helsingin Energia

Eco-efficient data center concept

Schematic illustration of an underground data centre 40 metres below the surface of the ground.

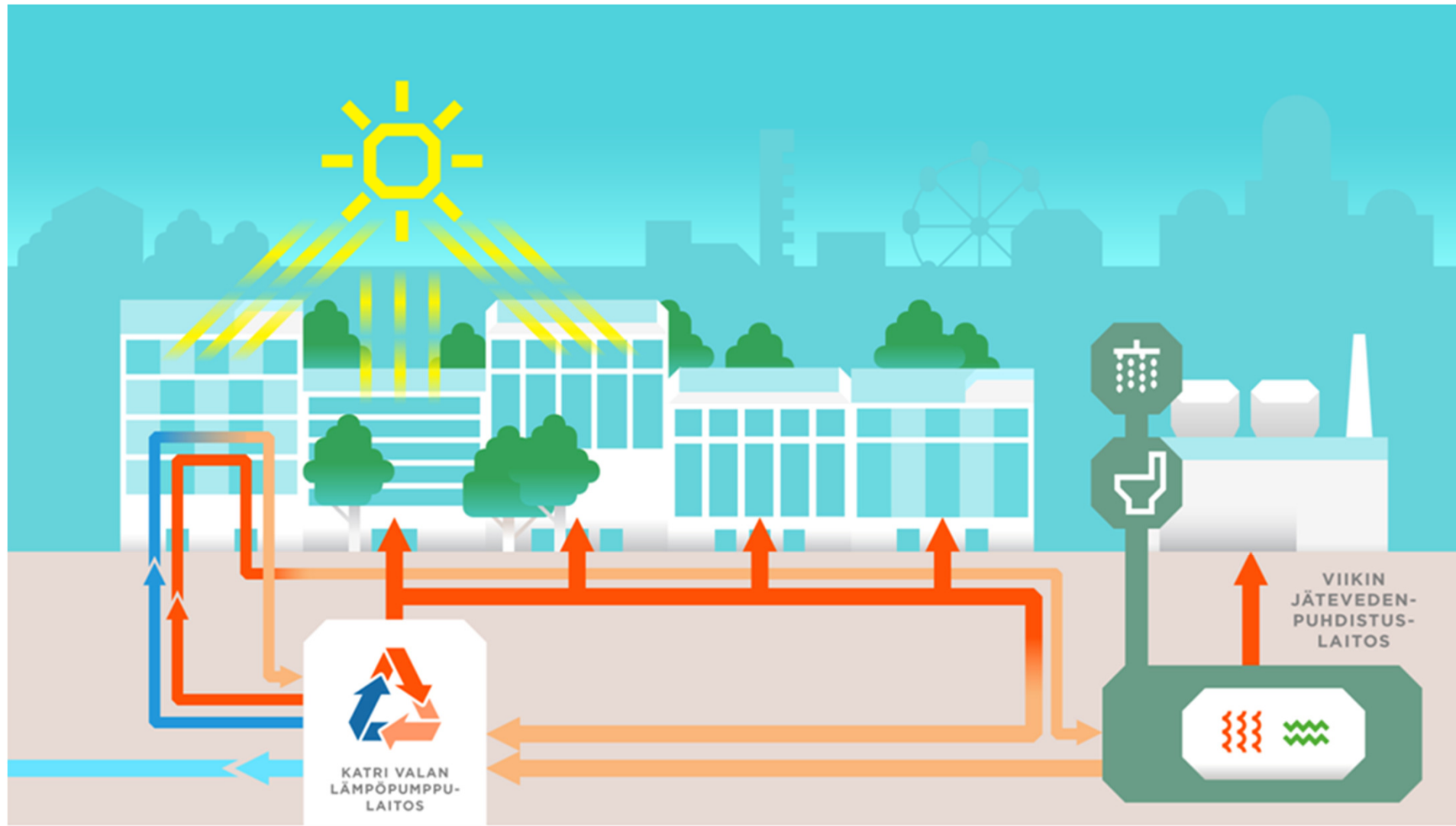


Uspenski data center upright shaft connecting to Helsingin Energia's underground world and tunneling network.

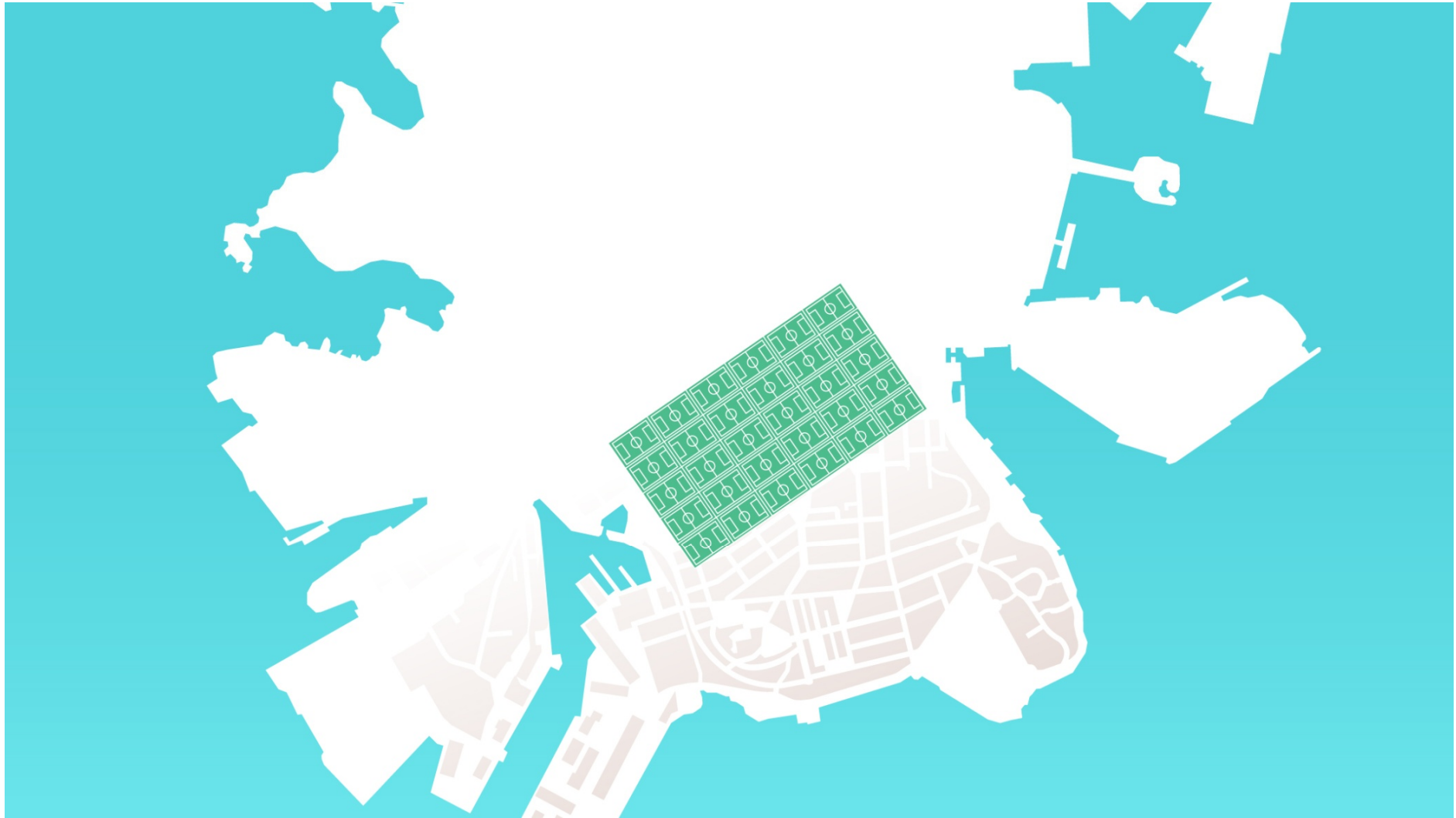


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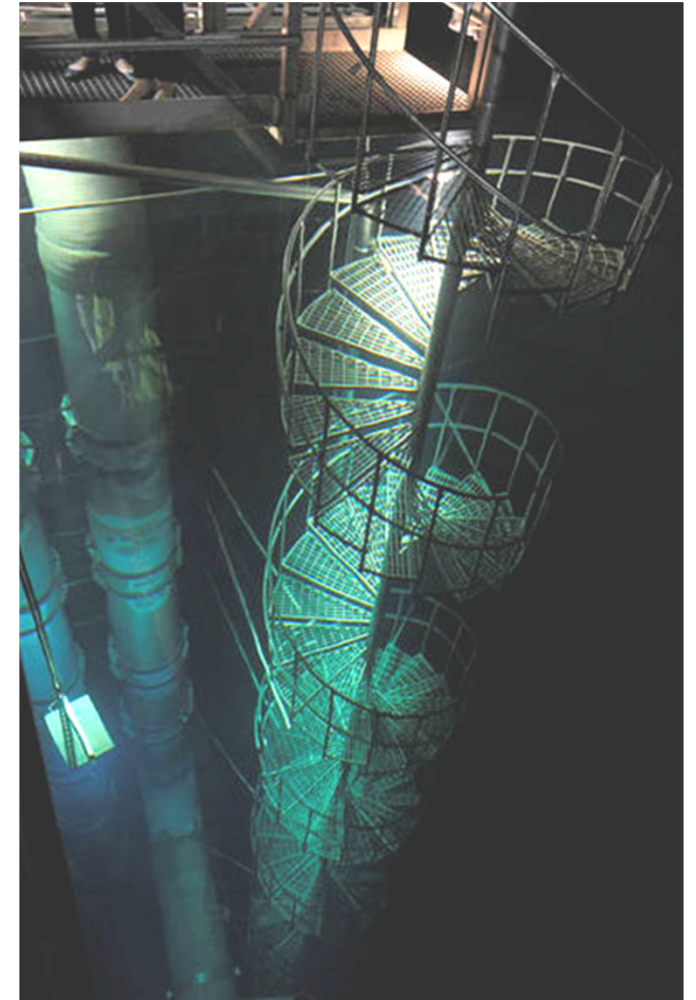
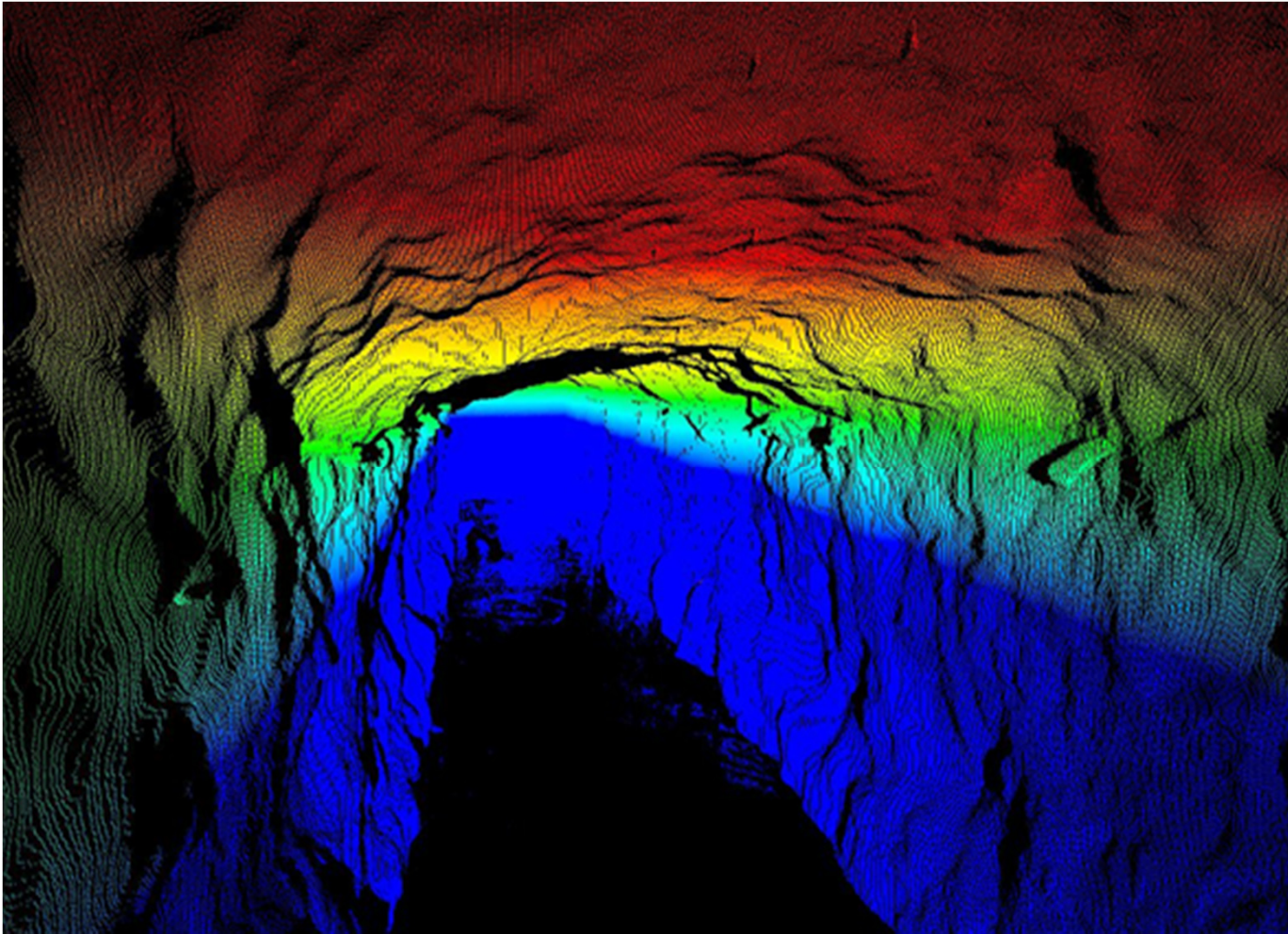
SUNZEB - SUN ZERO ENERGY BUILDING



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PRODUCTION – THERMAL STORAGES

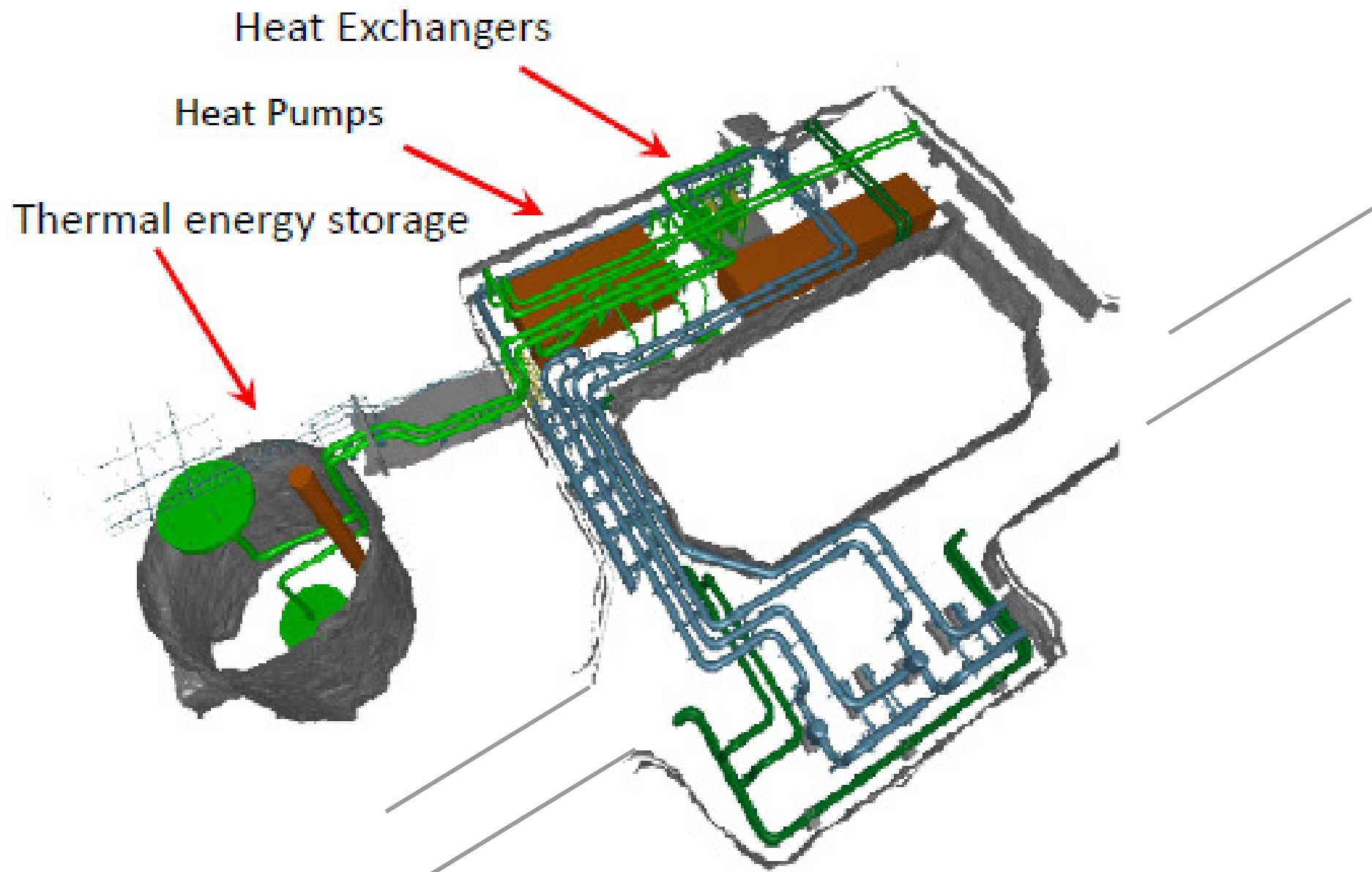


Katri Vala's Heat pump plant

- Heat sources
 - Purified sewage water
 - District cooling network
 - Sea water
- Total output is 90 MW of District Heat and 60 MW of District Cooling
- Katri Vala's heat pump plant is the largest in the world to produce District Heating and Cooling at the same process and using Purified sewage water as a heat source.



HEAT PUMPS + THERMAL STORAGE





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THANK YOU

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