



District Heating & Cooling in Helsinki

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Collaborative & Clean Energy
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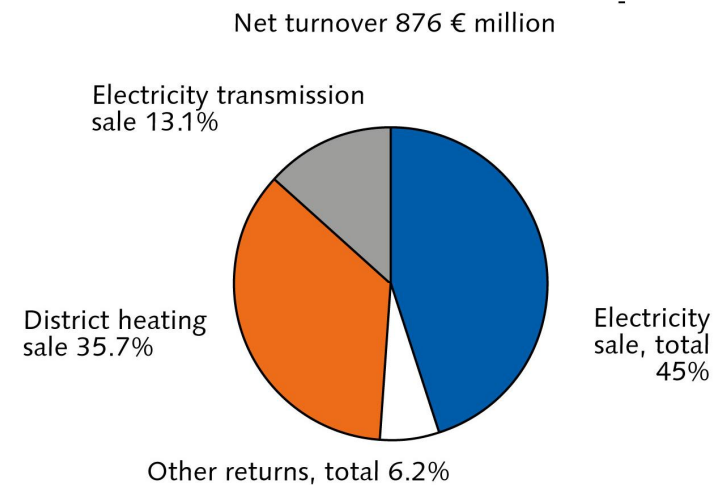
City of Helsinki

- Population 600 000 people
- Heat market *totally* ca. 8 000 GWh
- Thermal energy demand is greater than electricity demand
- Growing cooling demand despite of relatively cold climate



Helsinki Energy

- As one of the largest energy companies in Finland
 - Turnover (2011): 876 M€
 - Net profit (2011): 287 M€
- Supplies electric energy to approx. 400,000 customers
- Covers more than 90 percent of the heat demand of the capital city with District Heat



	Connected capacity	Connections	Building volume
District Heating	3300 MW	14500	132 000 000 m3
District Cooling	135 MW	250	12 500 000 m3

Outsourced energy solutions

- Customers are willing to outsource heating and cooling production to energy company
- Harms and risks of own production are avoided
- DHC are reliable and cost efficient solutions for whole life-cycle
- DHC customers can concentrate on their key businesses



DHC Customers

- Customers are buildings or building groups, never separate apartments
- Real estate ownership is concentrated in the hands of major real estate owners
- Voluntary connections to DHC
- No obligations for energy companies to connect every building
- No specific DHC legislation in Finland



90 / 90 / 90 philosophy in District Heat

- 1) Market share is more than 90 %
- 2) Share of CHP more than 90 %
- 3) Overall efficiency is more than 90 %



1950



With DH and the CHP



CHP and DHC in Helsinki

- The decisions of CHP and DH were made in 1953 by City Council
- Basic reasons for the DH were;
 - *Economical*
 - *Ecological*
 - *Supply reliability*
 - *Energy political*
- CHP has been the basic production solution from the very beginning
- District Cooling supply started in 1998
- From the beginning DHC has been economically success



CHP Plants - Salmisaari

Salmisaari A:

Commissioned:	1953 (1986)
Electric power output:	-
Heating output:	180 MW
Fuel efficiency:	92 %
Fuel:	Coal

Salmisaari B:

Commissioned:	1984
Electric power output:	160 MW
Heating output:	300 MW
Fuel efficiency:	88 %
Fuel:	Coal



CHP Plants - Hanasaari

Hanasaari B:

Commissioned:	1974, 1977
Electric power output:	228 MW
Heating output:	420 MW
Annual efficiency:	85 %
Fuel:	Coal



CHP Plants - Vuosaari

Vuosaari A:

Commissioned:	1991
Electric power output:	160 MW
Heating output:	160 MW
Fuel efficiency:	91 %
Fuel:	Natural gas

Vuosaari B:

Commissioned:	1998
Electric power output:	470 MW
Heating output:	420 MW
Fuel efficiency:	92 %
Fuel:	Natural gas



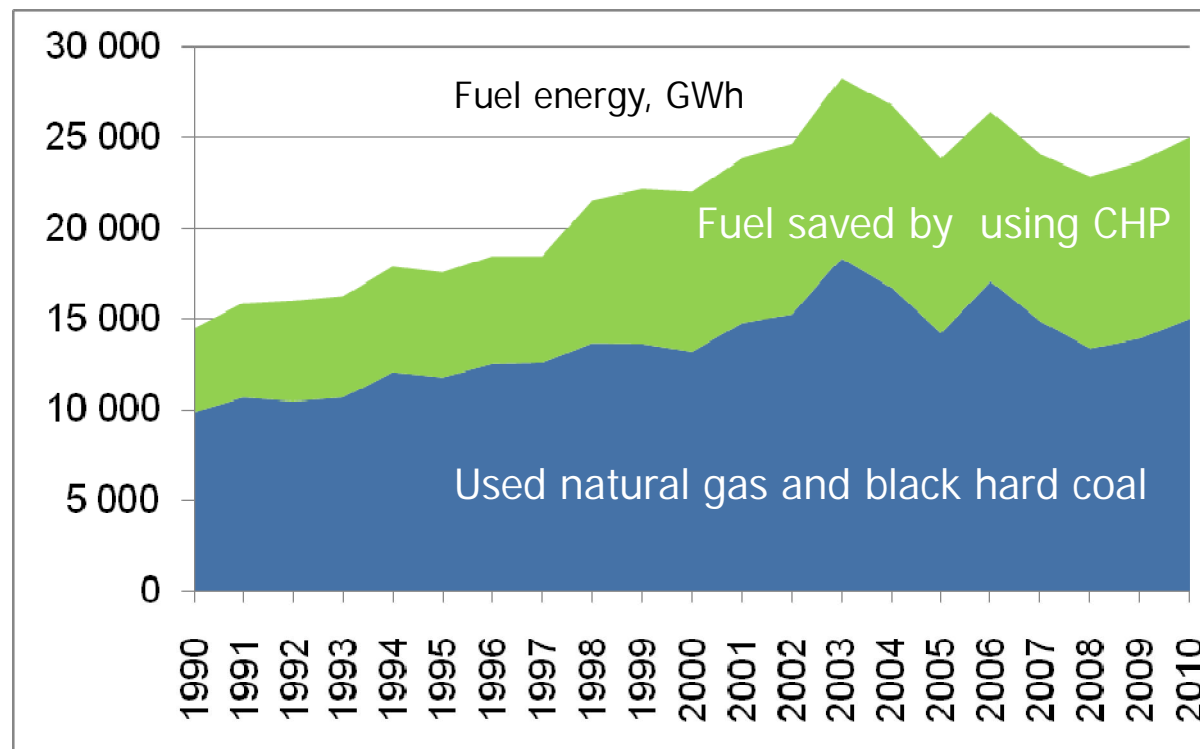
Combined Heat and Power (CHP) production

- The combined generation achieves high efficiency, in other words more energy is gained from the same amount of fuel
- Combined generation reduces carbon dioxide emissions
- District heating has improved the air quality in Helsinki
- Energy efficiency has improved further when District Cooling is produced in the same processes

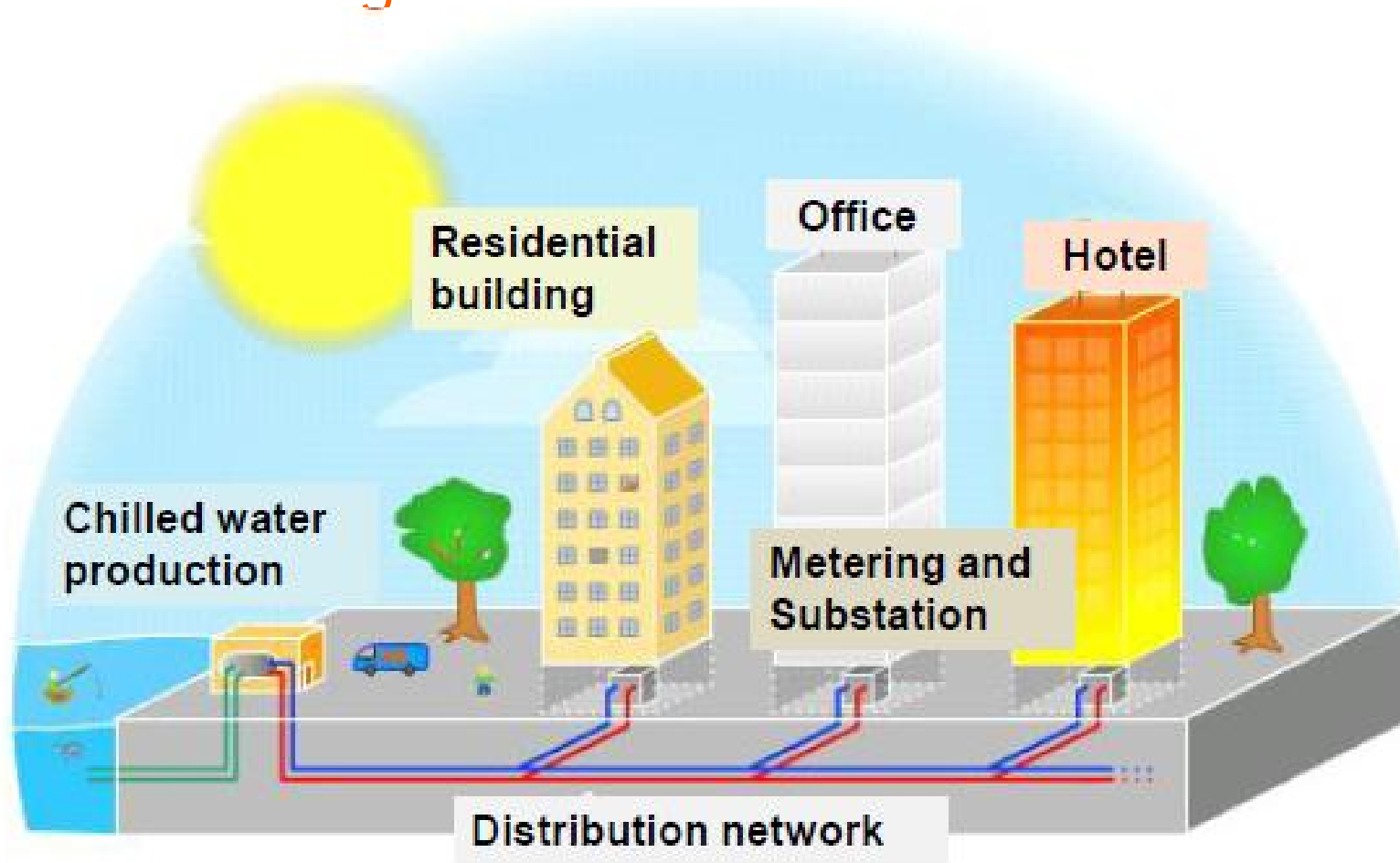


The amount of fuel saved by using CHP

With CHP, Helsinki saves so much energy compared with separate property-specific heating produced by condensing electricity that it would heat up to 500,000 detached homes each year.

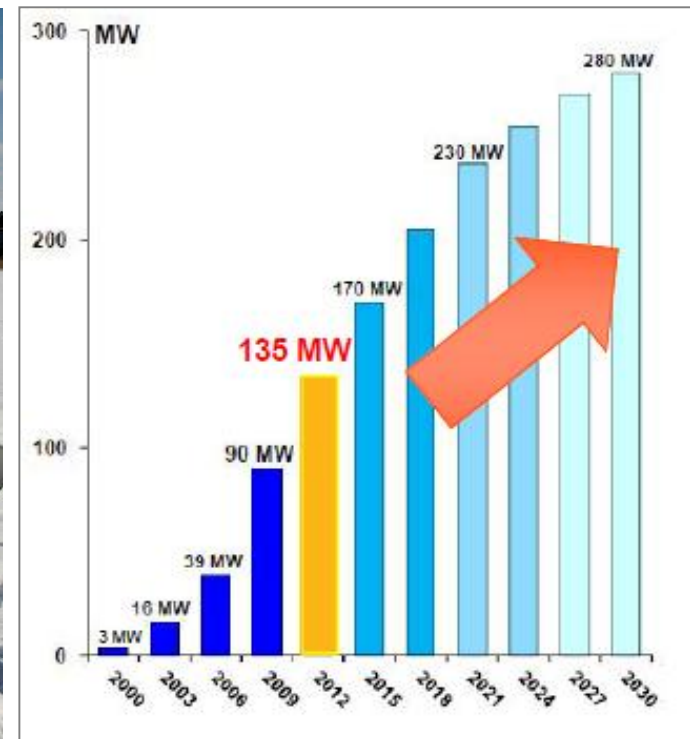


District Cooling



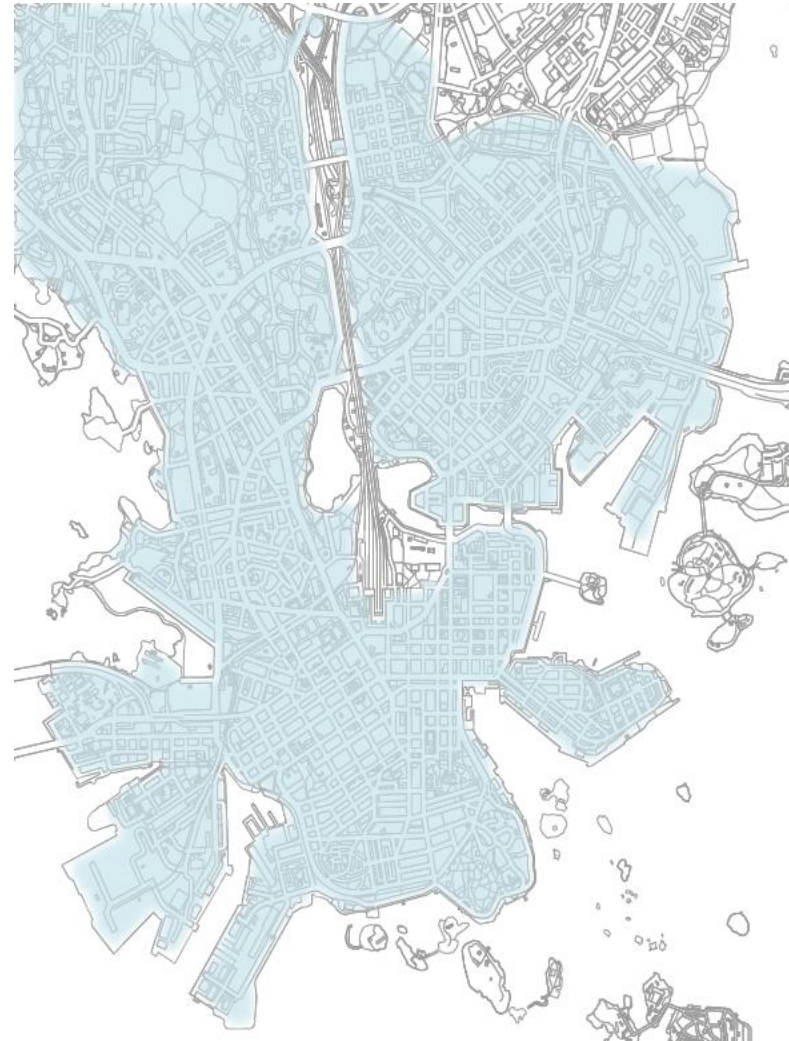
Success story from the Finland

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



District Cooling in Helsinki

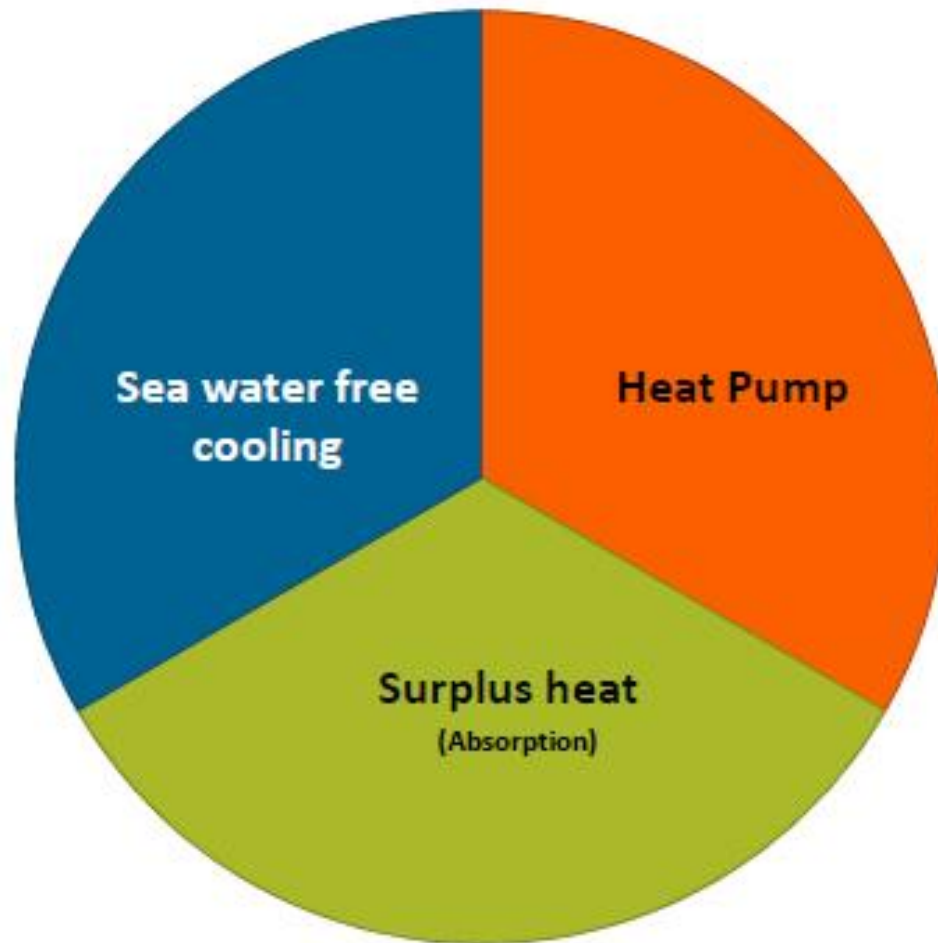
- District cooling is expanding rapidly
- It substitutes locally produced cooling
- It saves energy and conserves the environment
- It is produced in an environmentally benign way
- Europe's 3rd largest supplier of District Cooling



Cooling demand in Helsinki



District Cooling production



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



Absorption chillers

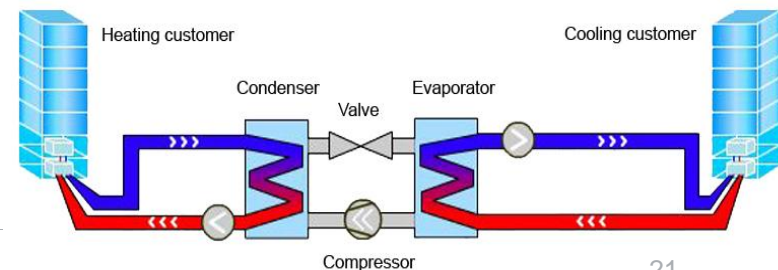


The Katri Vala heating and cooling plant

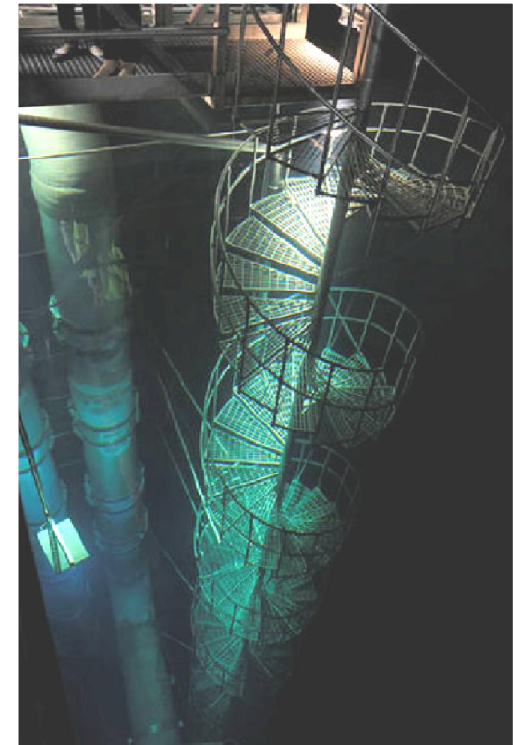
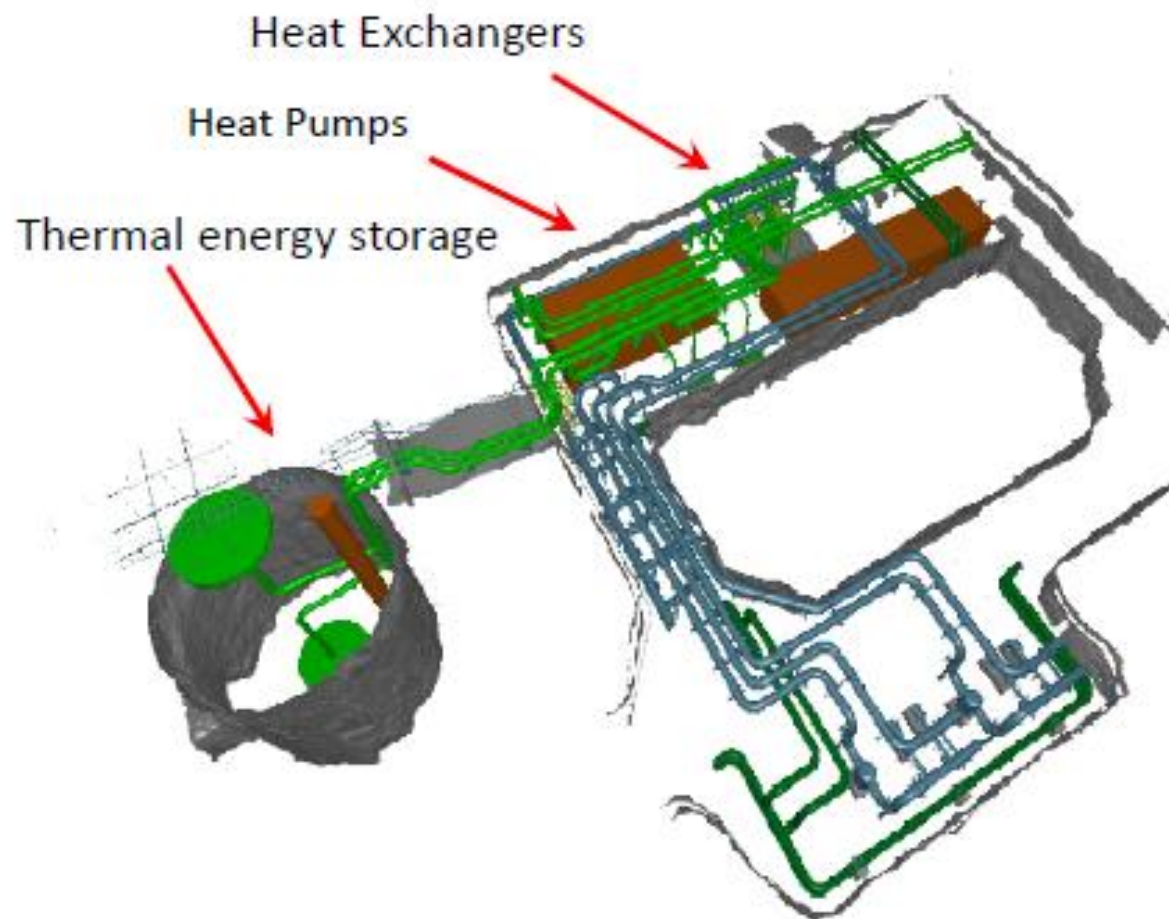
- The plant is the largest in the world to use heat pumps to produce District Heat and District Cooling form both purified sewage water and sea water.
- Its output is 90 MW of District Heat and 60 MW of District Cooling. This is enough to heat a small town.
- The plant is located in a space excavated underneath the Katri Vala park in the district of Sörnäinen



Heat pump

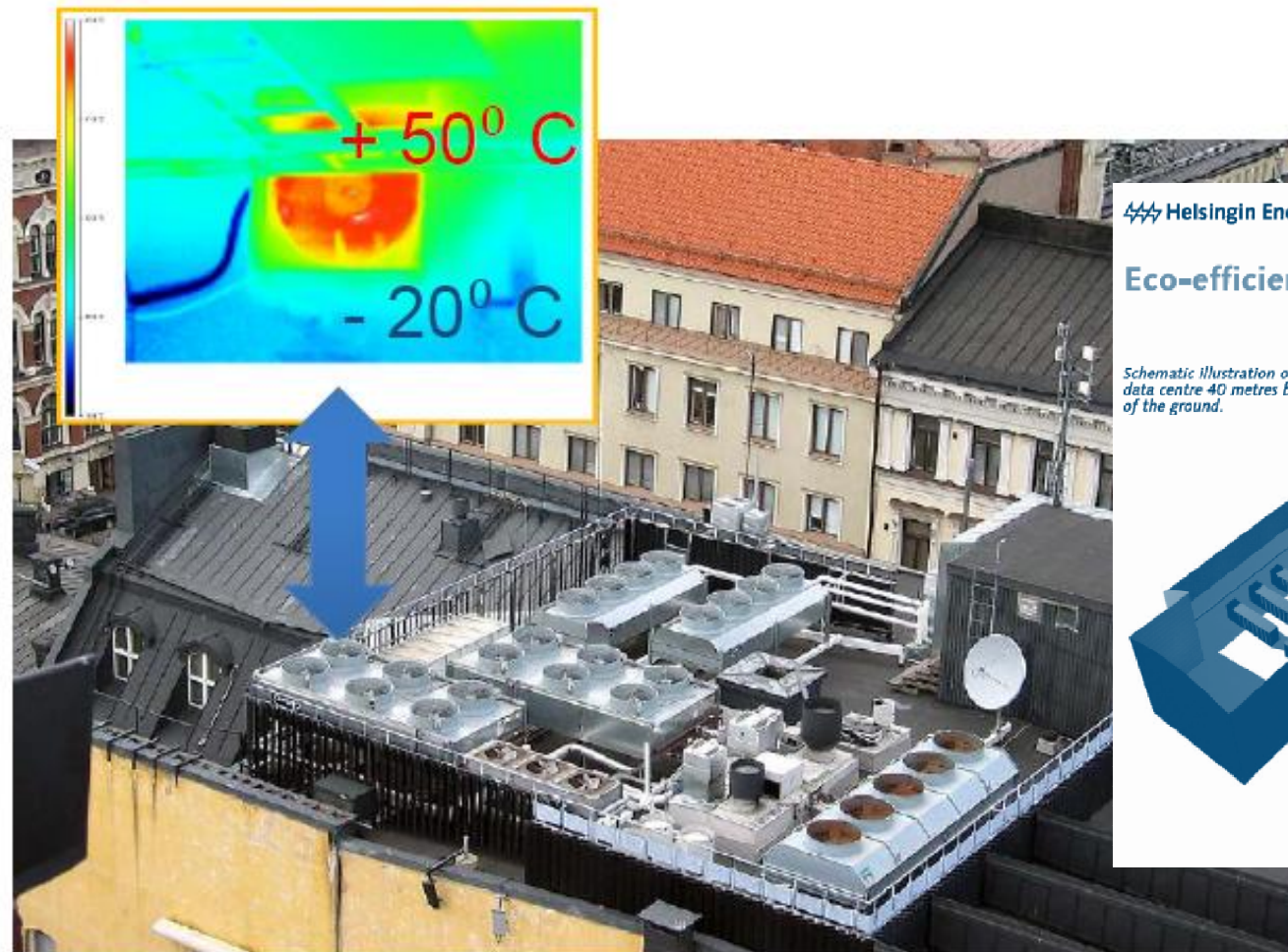


Production sites and thermal energy storages under the city center



Location:
35 meters below the
ground level

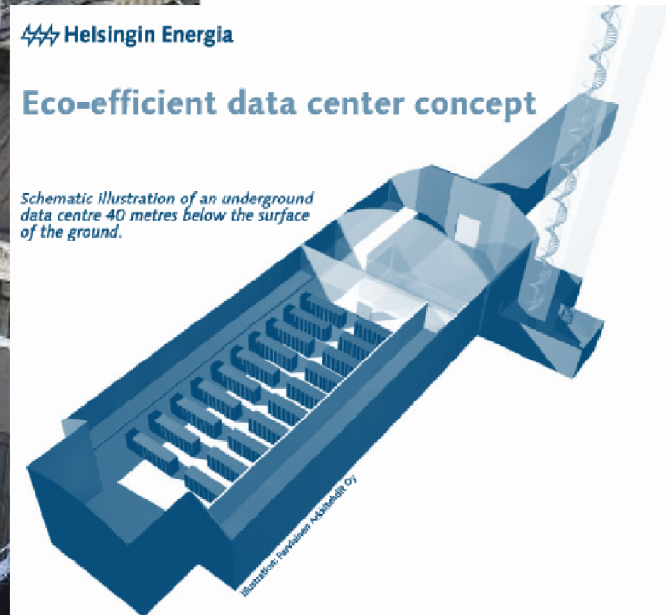
Wasted energy is a huge opportunity



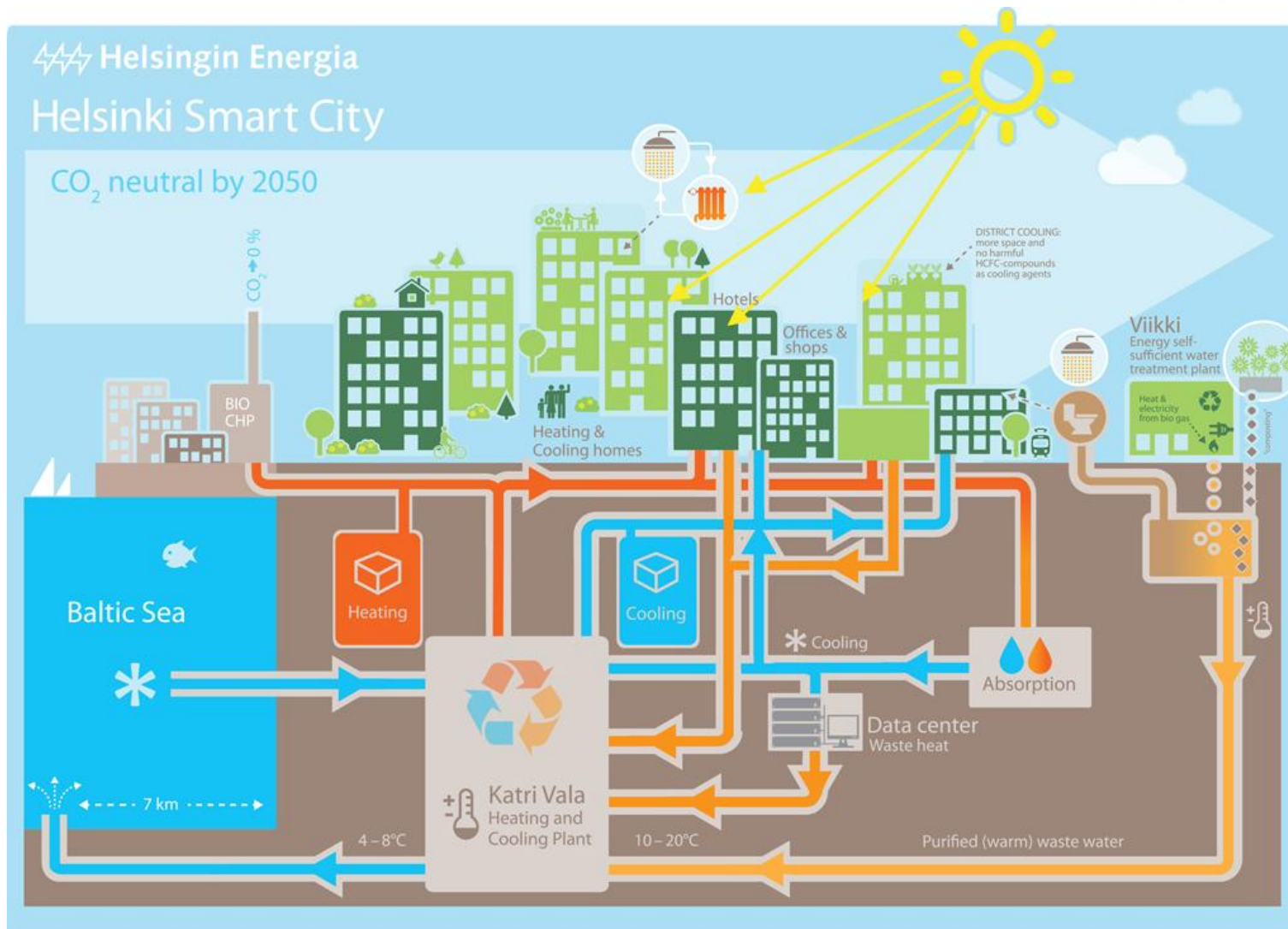
 Helsingin Energia

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.



Quality and awards



Towards to CO₂ -neutral production



Three dimensions in balance

- The sufficiency and reliable transmission of energy
- The environmentally benign operations to reduce climate change
- The moderate and competitive price of energy



Thank you