

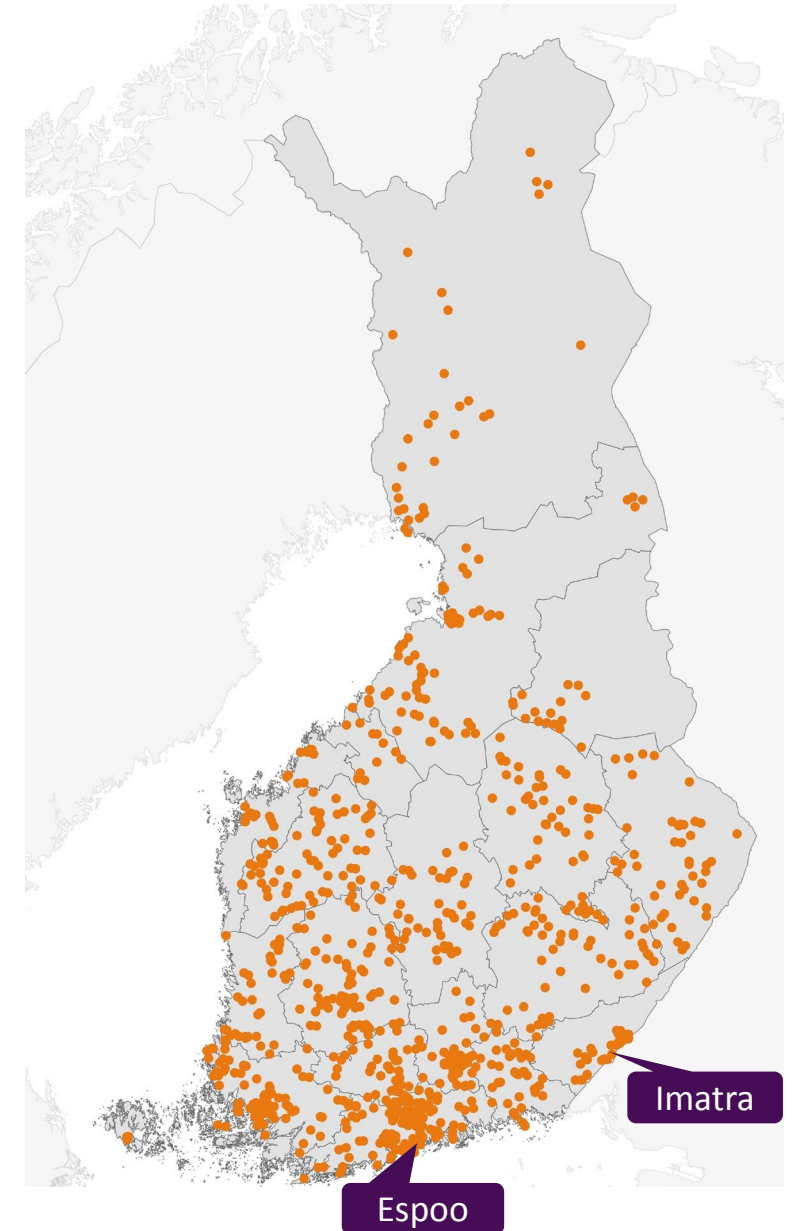
100% Renewable Heating & Cooling for a Sustainable Future Countries Roundtable - Finland

Mirja Tiitinen, Finnish Energy

28.10.2019, Helsinki

Towards decarbonized district heating and cooling

- Overview: Finland
- Cases
 - Espoo, district heating since year 1967
 - 281.000 inhabitants, district heat delivery 2.200 GWh
 - Imatra, district heating since 1965
 - 27.000 inhabitants, district heat delivery 157 GWh



District heating in Finland

Sustainable and smart District Energy recognizes region's true needs, development stage and resources.

15 000

Kilometers of DH network

900

DH production plants

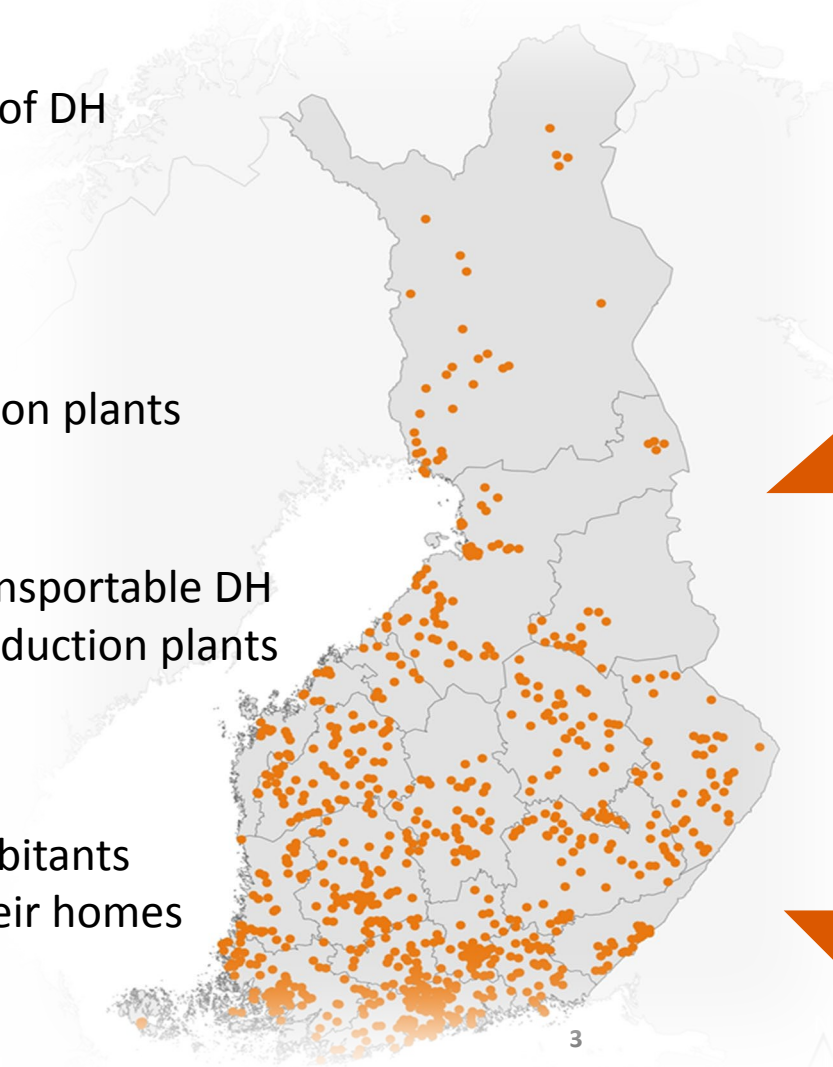
+

330

Transportable DH production plants

53%

of Finnish inhabitants enjoy DH in their homes



46%

DH's market share of space heating

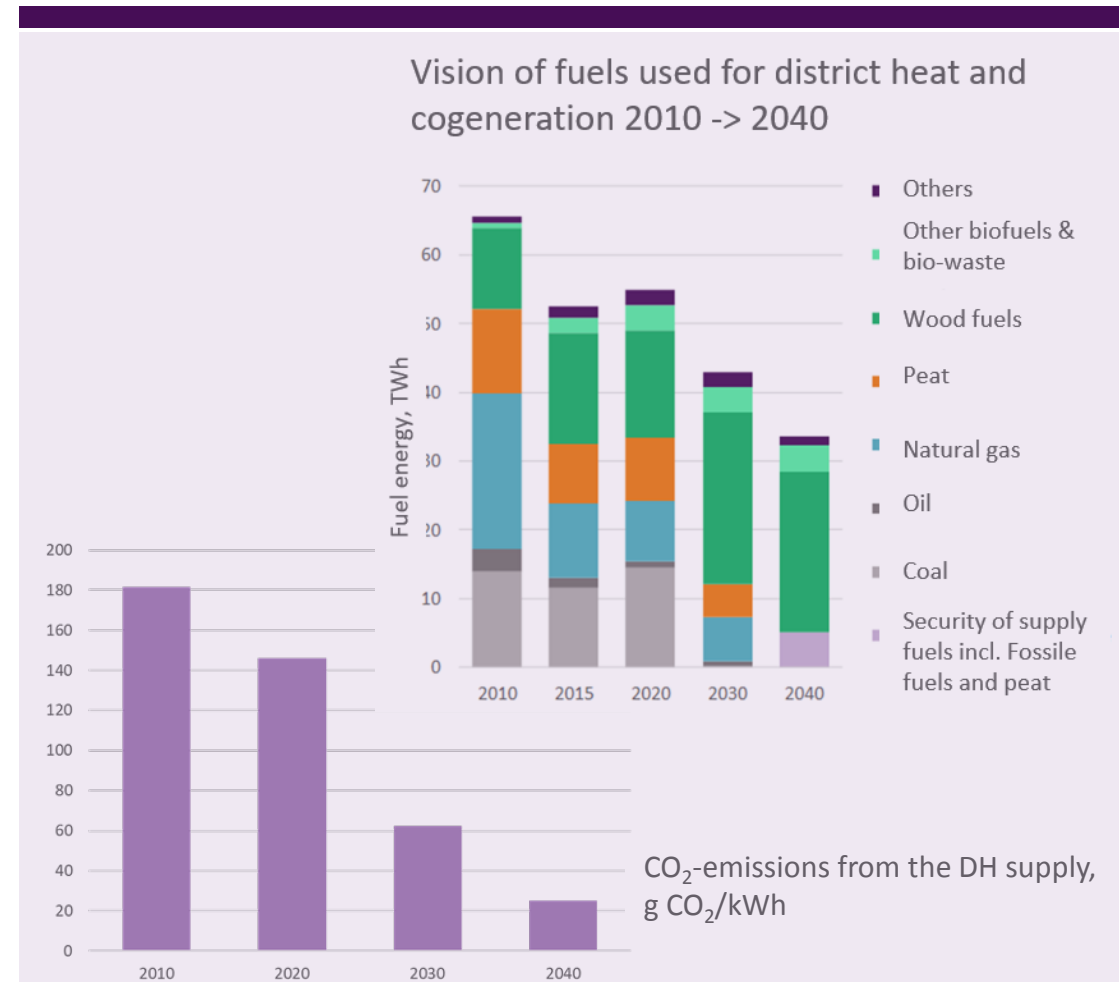
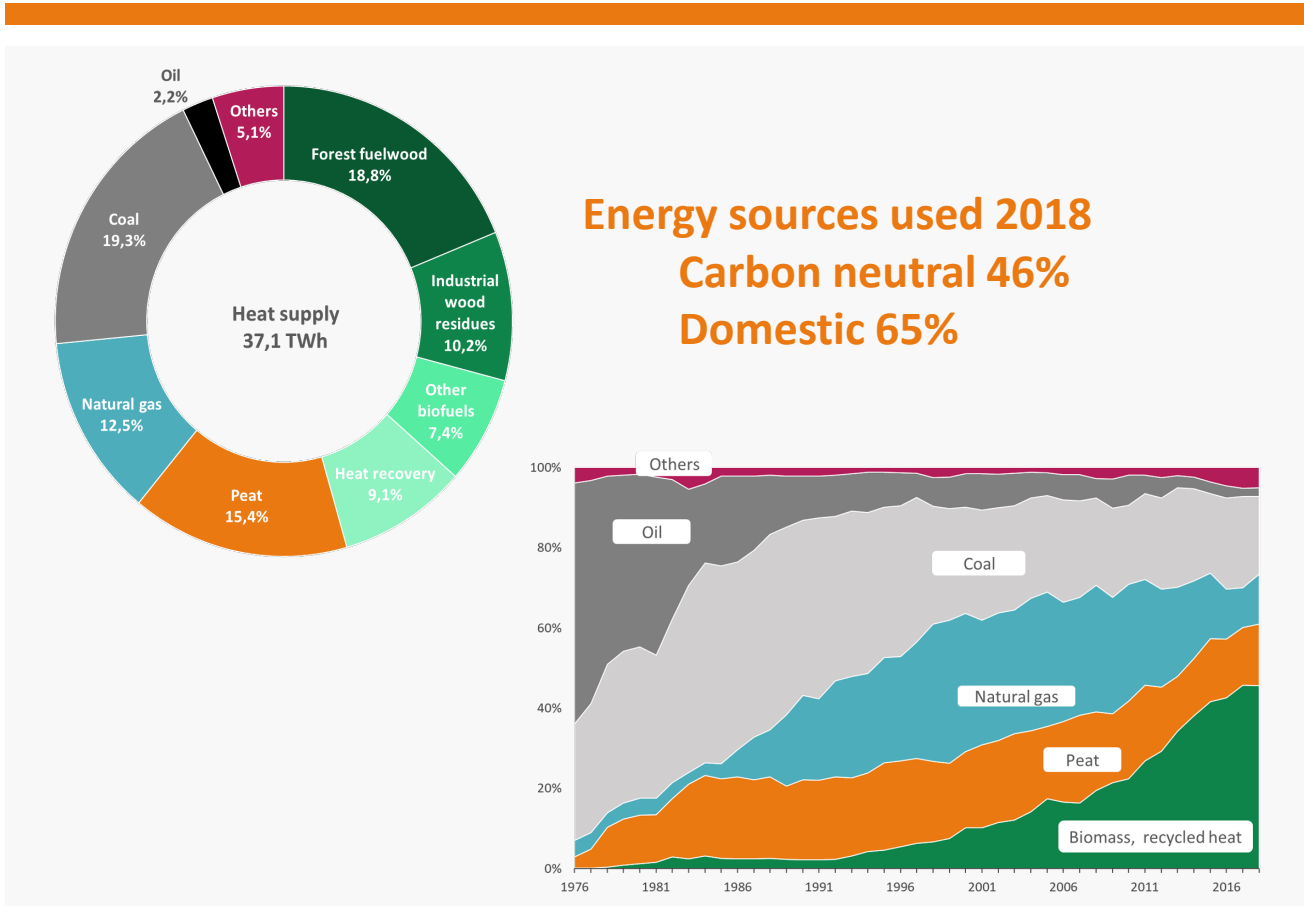
70%

of municipalities with DH use mainly renewable fuels and heat recovery

26%

Carbon emissions from DH production have fallen by 26% during this decade

Towards carbon-neutral district heat



Journey to the future

District heating is a service for the client and a platform for new solutions

Drivers

- Climate targets
- Seeking for new business
- Central role of the client

Enablers

- Technological development
- Digitalization
- Decreasing prices for renewables
- New business models
- Partnerships

Solutions

- Carbon-free production
- Bioenergy
- Heat recovery, heat pumps
- Geothermal heat
- Two-way production
- Hybrid solutions
- Energy storages
- Sector coupling
- Smart energy control systems and service platforms

Global megatrends are shaking the energy sector

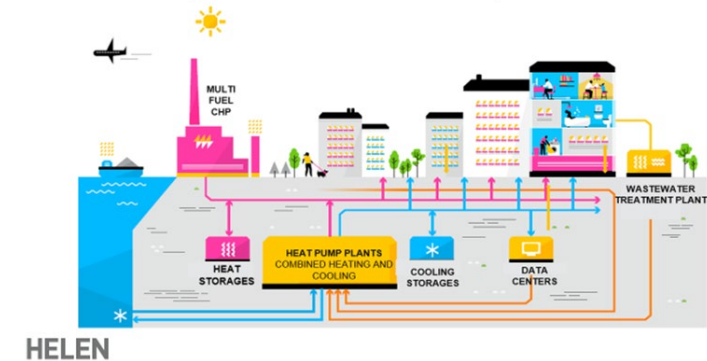
Case Helsinki – Helen Oy

A climate-neutral future will be achieved through innovative, customer-focused solutions and services.

- Efficient trigeneration – Recycling of energy – Role of customers.

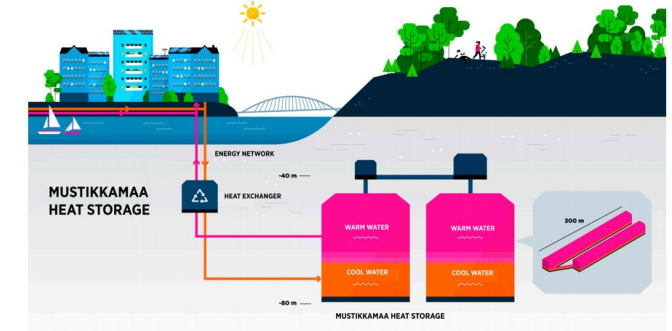
HELEN'S CITY ENERGY SYSTEM

District cooling is used for recovering heat from buildings where heat would otherwise be wasted. On a warm summer day, half of the district heat in Helsinki is produced with recovered waste heat.



THERMAL ENERGY STORAGE

EXAMPLE: HEAT STORAGE FACILITY IN THE OLD OIL CAVERNS



Towards decarbonized district heating and cooling - case Espoo

Source: Fortum Power and Heat Oy

Towards decarbonized district heating and cooling

Case Espoo

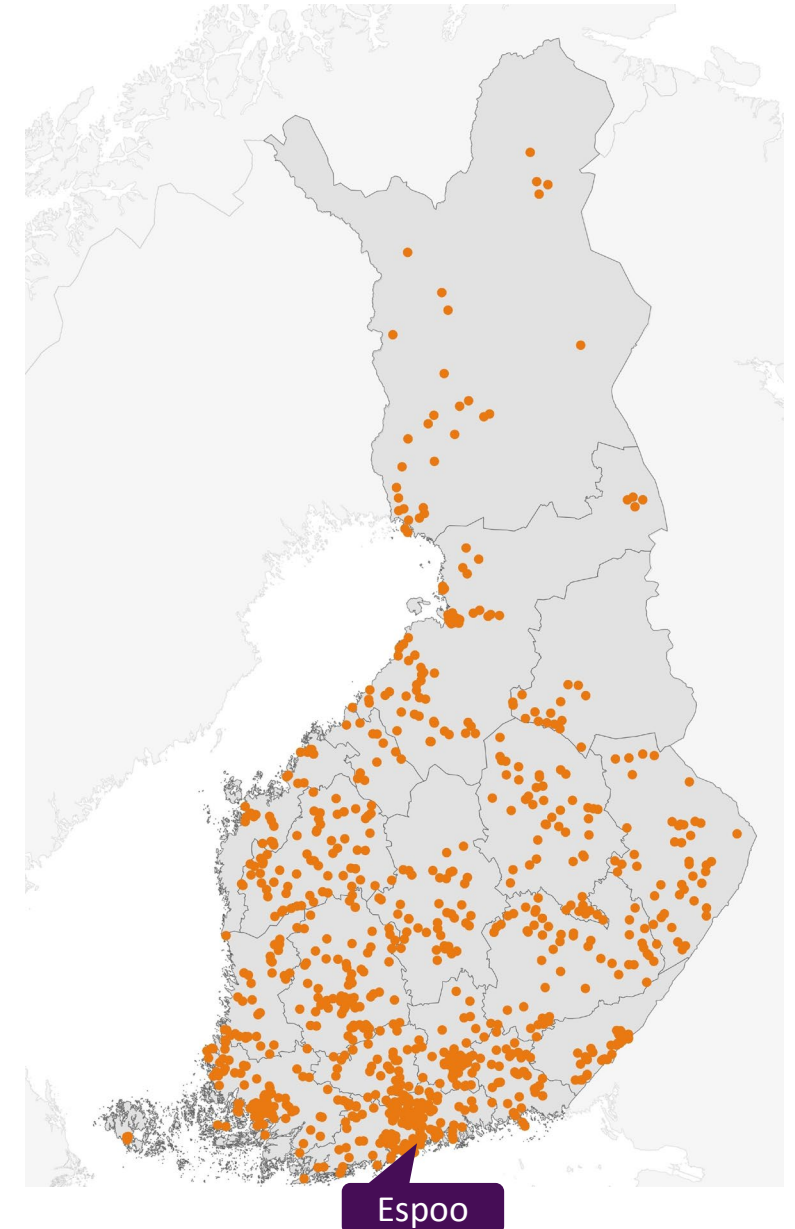
- Second largest city in Finland
- 281.000 inhabitants
- Population growth is high.
- Espoo does not have a traditional city center, having instead several local regional centers.
- Espoo has hardly any energy intensive industry.

Fortum Power and Heat Oy, Espoo

- District heating since year 1967
- District heat delivery 2.200 GWh
- DH market share ~85%

Fortum's vision for heating and cooling:

- Flexible, smart and two-way district heating network – enabler of a carbon-neutral energy system.



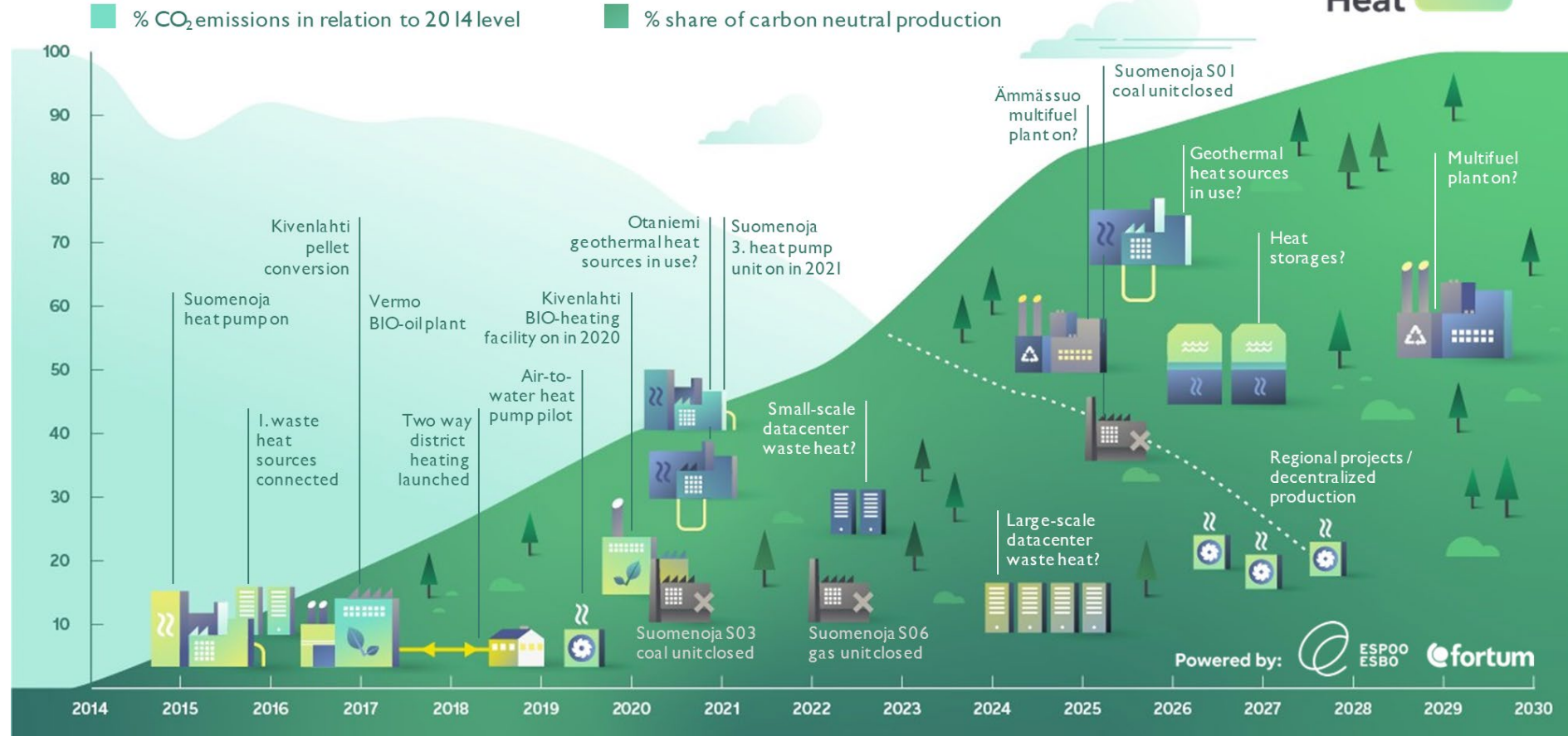


The new generation of district heating is based on replacing fossil fuels with smart and flexible solutions, e.g. by utilising waste heat, renewable electricity, geothermal energy, and bioenergy. Artificial intelligence optimises the district heating system's operations.

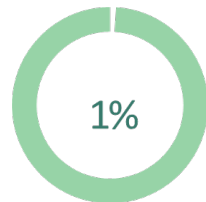
www.espoo-clean-heat.com

Espoo district heating transformation journey 2014–2029

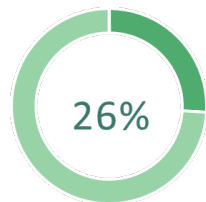
Illustrative



Amount of carbon neutral district heating in Espoo (forecast)

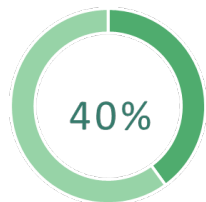


2014

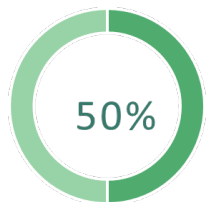


2018

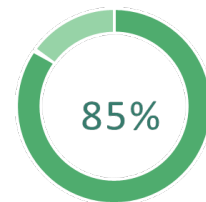
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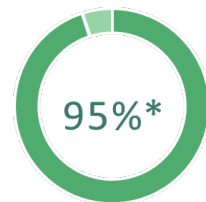
2020



2022



2026



2029

Environmentally friendly heat - with most modern technique Case Imatra

Source: Imatran Lämpö Oy

Decarbonizing district heating

Case Imatra

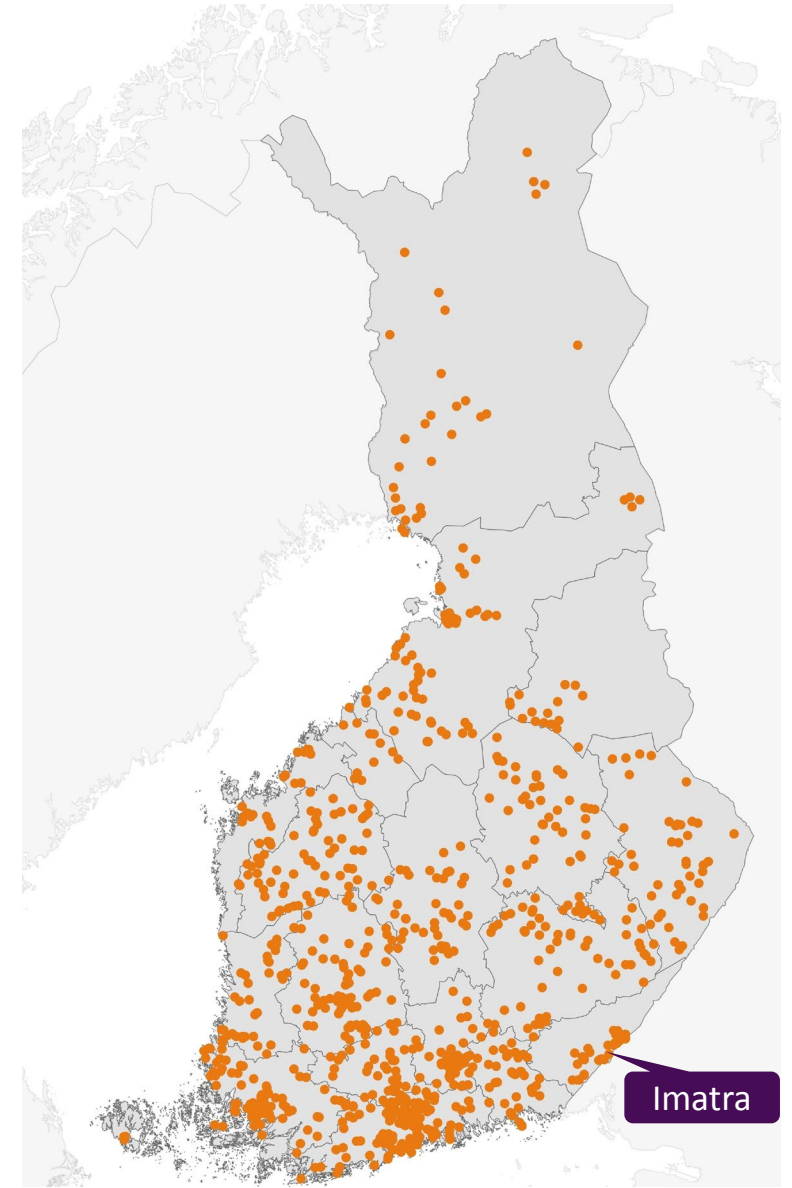
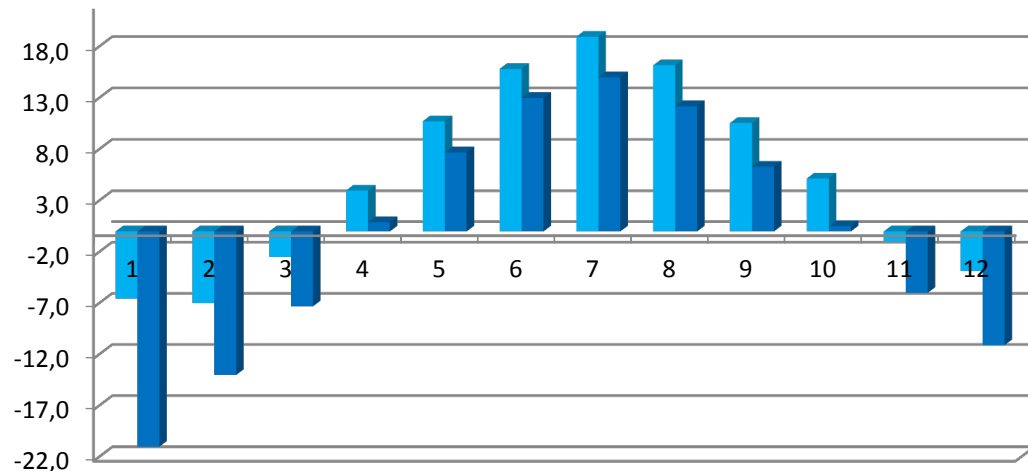
- 27.500 inhabitants
- Small town close to Russian border.
- Industrial town with large wood processing plants.

Imatran Lämpö Oy

- Limited Company owned by Imatra city
- district heating since 1965
- district heat delivery 157 GWh
- Market share of DH ~50%

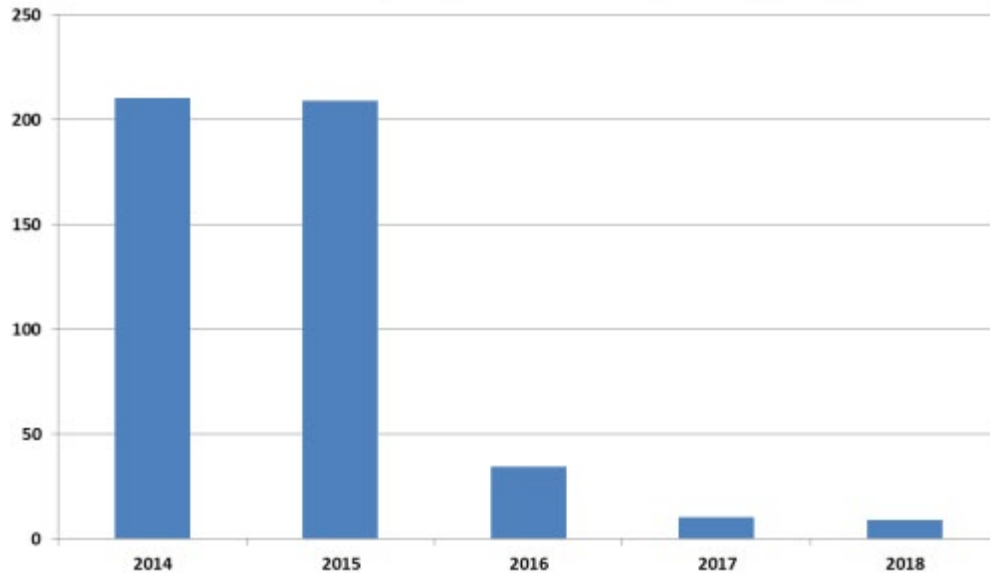
Average monthly temperatures 1987-2016

Light blue: 25 years average monthly temperature in Imatra
Dark blue: the coldest average monthly temperature in Imatra



From 100% natural gas to 96% RES in four years

CO₂-emissions from the DH supply, g CO₂/kWh



District heat price reduction year 2016:

- Energy charge - 23,6%.
- Total heat price (incl. capacity charges) reduction 20% - 22%.

Three new biofuel boilers and DH transmission line (6,3 km)
- project started year 2014

Fuel: Side products from forest industry (bark), wood chips and forest residues. Heat boilers are remote operated and unmanned.





Thank you!

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