4th generation heating system using geothermal energy as the main source

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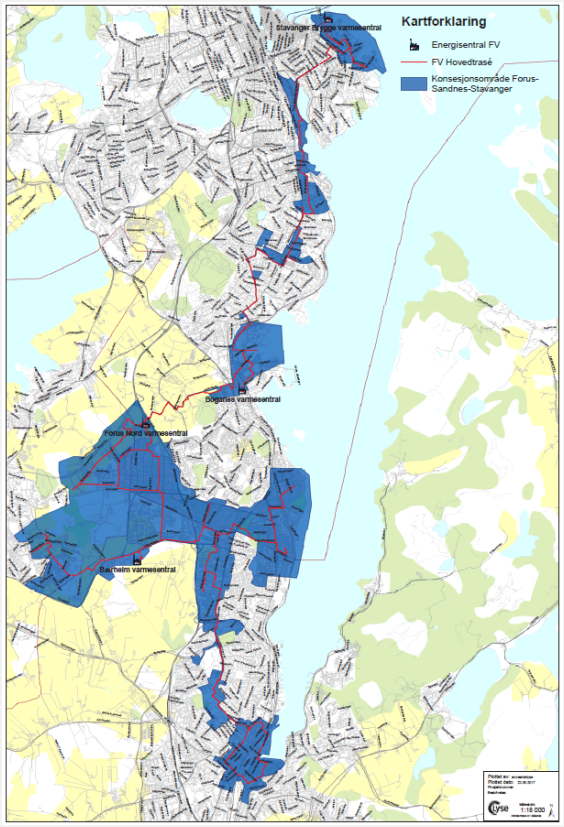
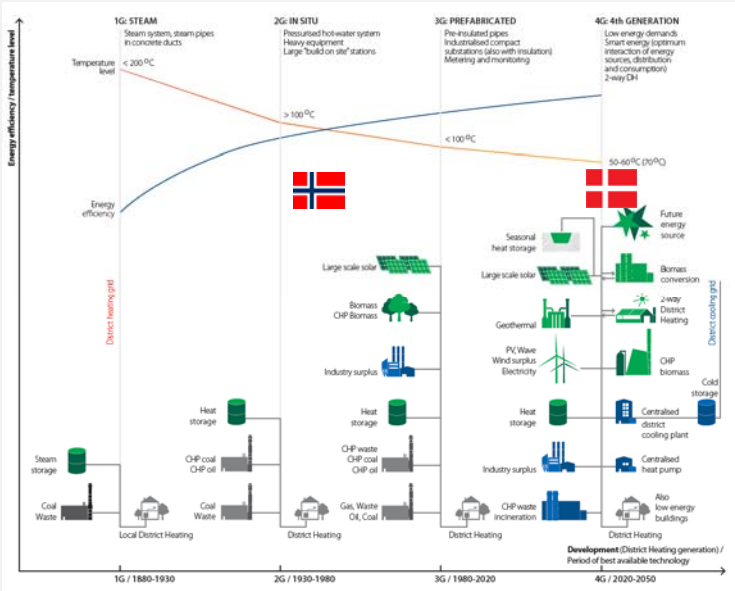
District heating in Norway

Stavanger, Norway

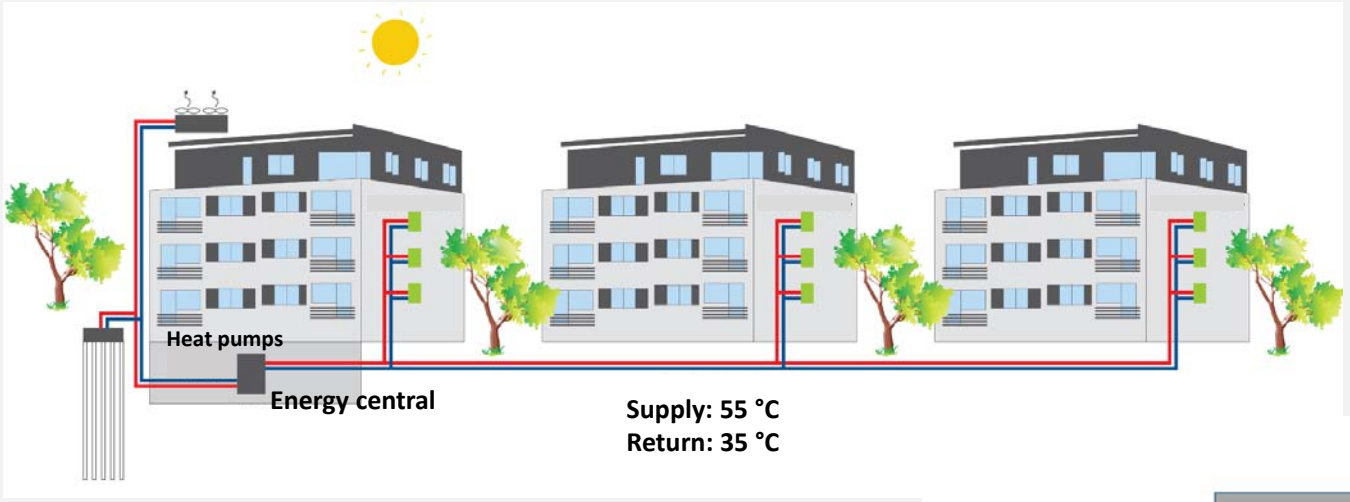




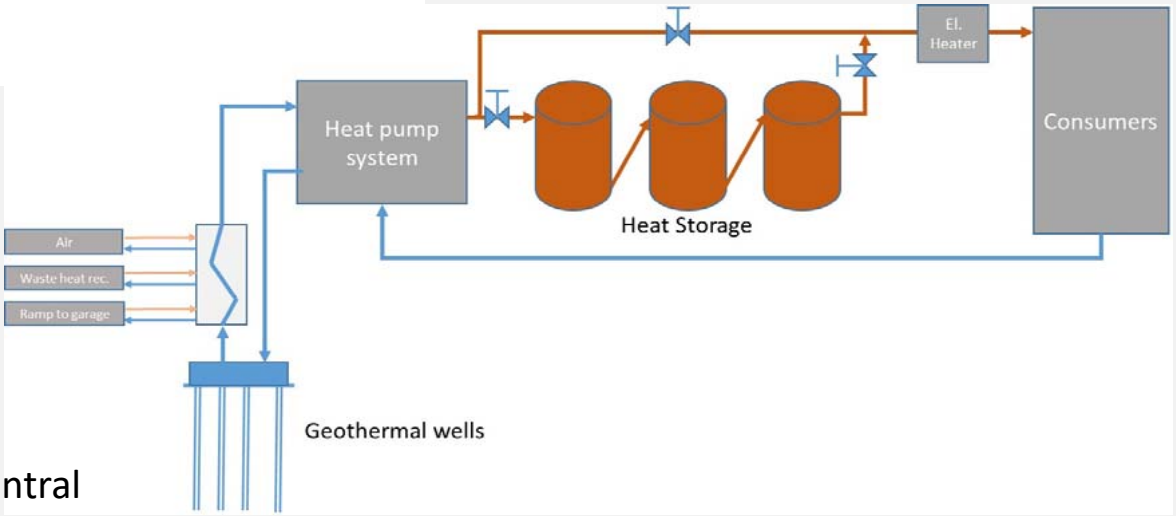
«Look to Denmark»

Østre Hageby

- 66 residential units
- 6 800 m²
- Low-temperature heating system
- Lower installation costs due to smaller pipe systems
- Learnt from the Lystrup project in Aarhus, Denmark



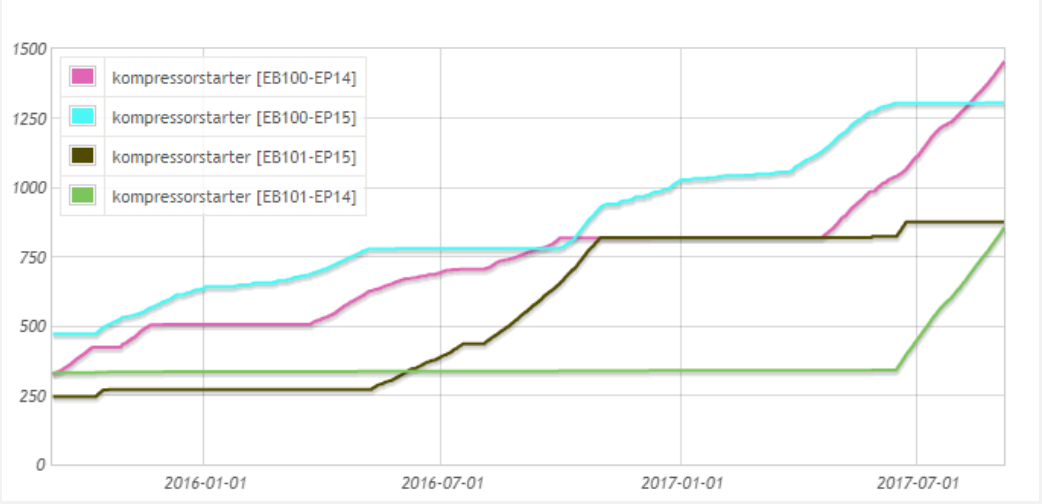
Sketch of Østre Hageby

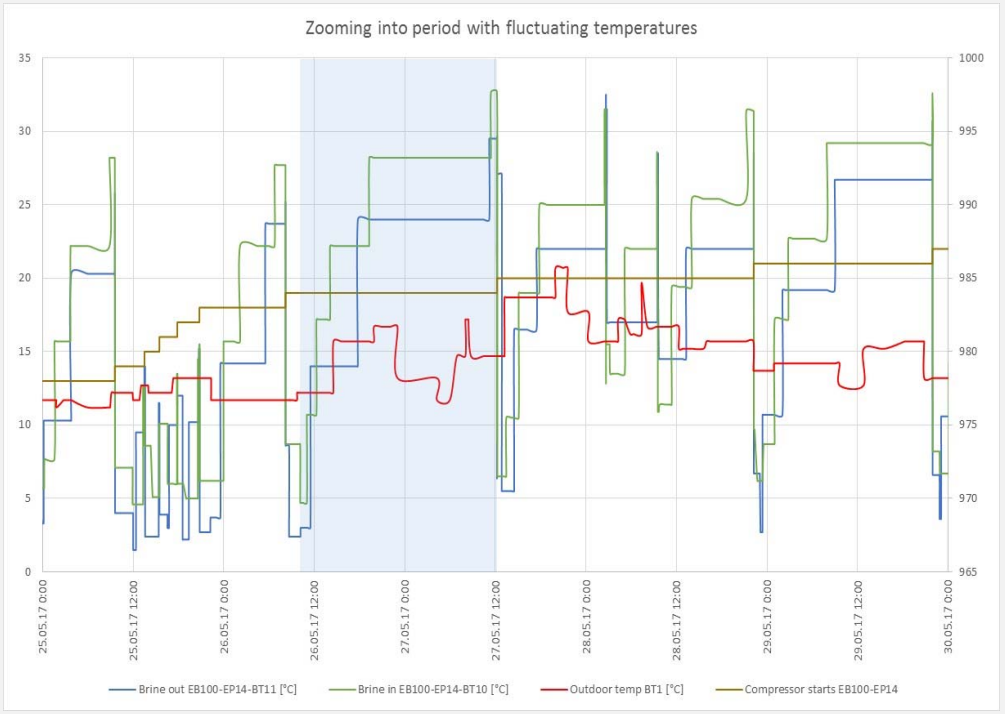


Simple sketch of the energy central

Measurements

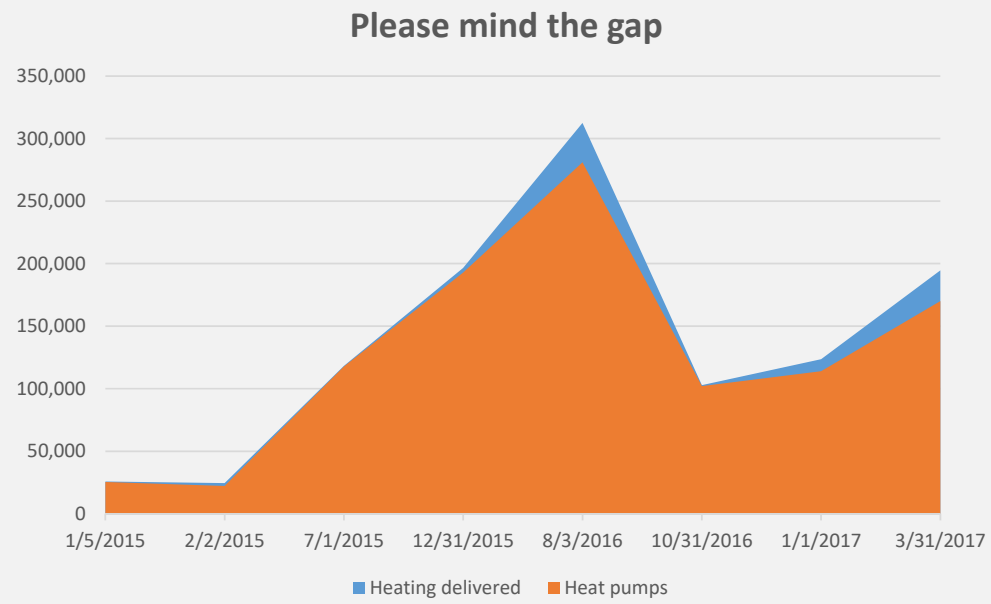
- Monitored at Nibe Uplink via an internet connection
- Measured available data are based on standard instrumentation only
- Able to keep track of the compressor work rate
- Electricity consumption and delivered heat are measured





Results

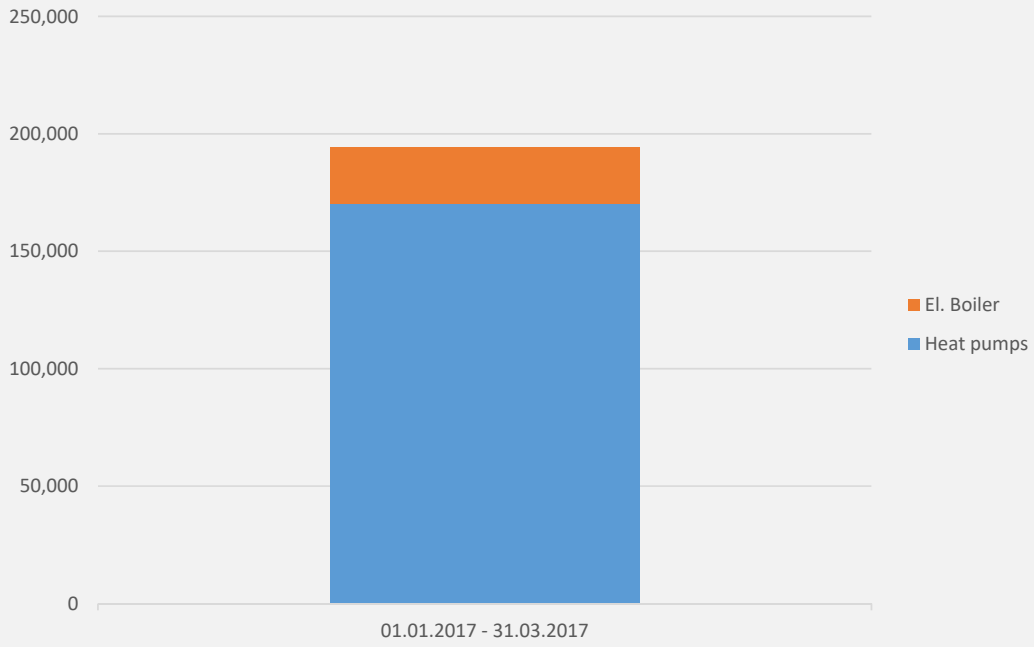
- Heat pumps do most of the work
- Electrical boilers sometimes necessary to compensate for the peak demand
- Gaps are explained by adjustment issues



Results of 2017

Energy consumption

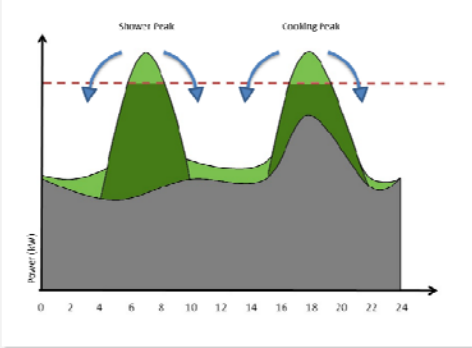
Total	= 194 620 kWh
Heat pump	= 170 588 kWh
Electric boiler	= 24 033 kWh



61 % reduction in energy,
when compared to an all-electricity based solution

Conclusion

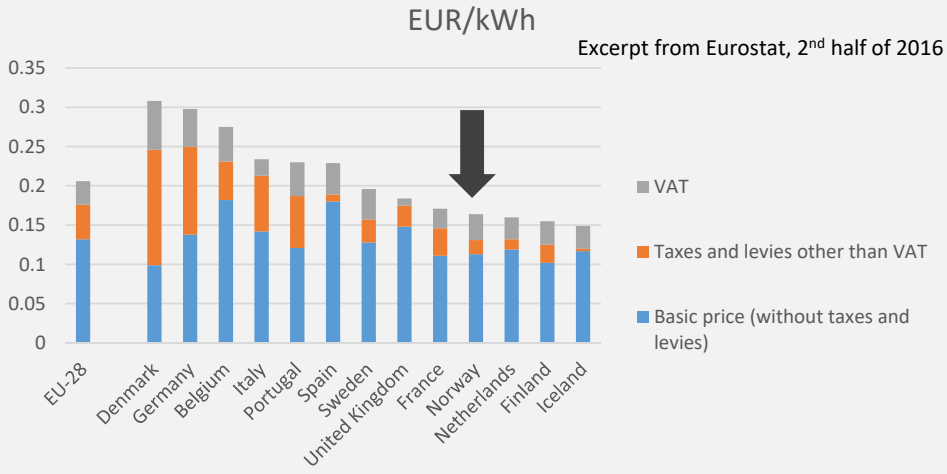
- First 4th gen. in Norway
- Operating reliably for 2.5 years
- 40 % lower energy consumption pr. m²
- Greener choice than all-electric solutions
- Downside is lack of more exact measurements



The future

- Norwegian electricity prices amongst the lowest in Europe, but are expected to increase (hopefully!)

- Planning energy solutions for the future's retirement homes
- Combining:
  4th and 5th gen. district heating
  Geothermal energy
  Improved heat recovery systems
  Hybrid solar panels (PV-T)
  New hybrid legionella preventing technology



Excerpt from Eurostat, 2nd half of 2016

www.Racell.dk

Thank you for your attention

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4th Generation District Heating Technologies and Systems