Country report: **Sweden**

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Freiberg, 2019-05-22

Agenda: country report

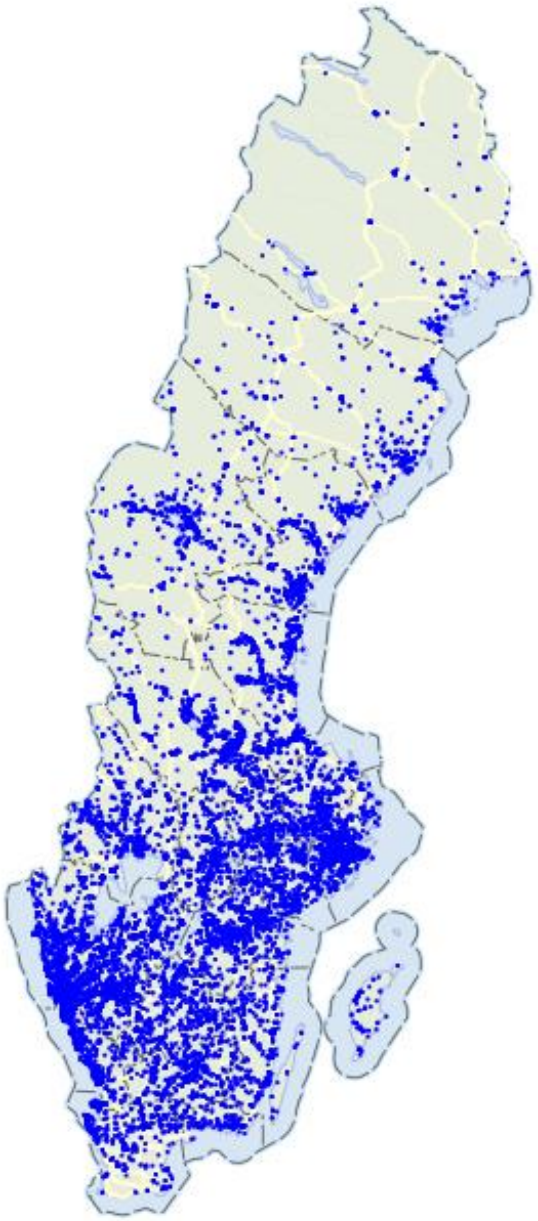
- Shallow geothermal in numbers
- Typical system
- New tendencies and ongoing research

Energy consumption in the building sector

	TWh
Electricity	77
District heating	46
Underground (heat and cold)	**19**
Biofuels	14
Oil and gas	13
District cooling	1

≈ 40% of the total consumption in Sweden (including industry and transport)

≈ 600 000
Borehole
heat
exchangers



≈ 16
TWh/yr
heat

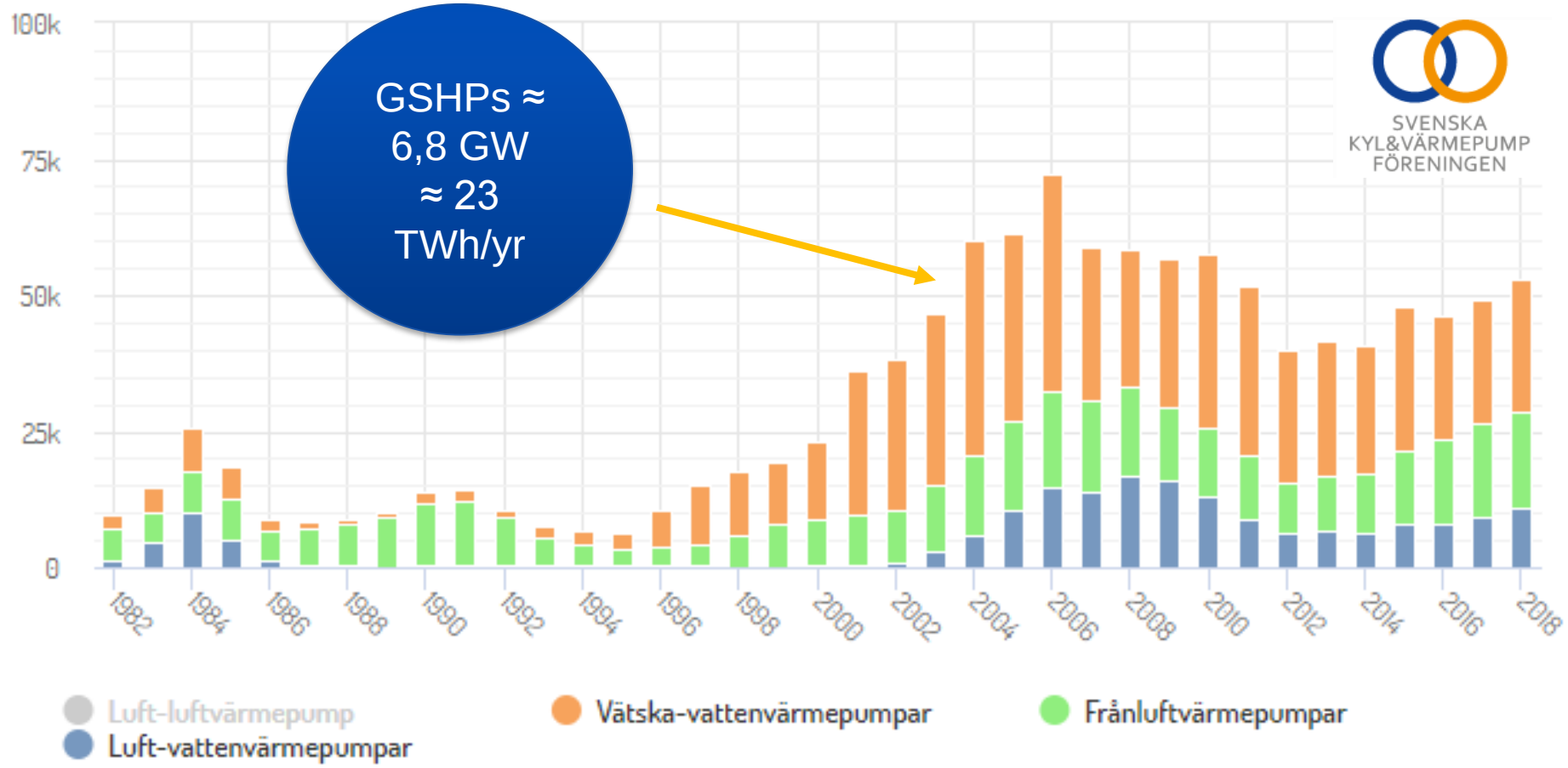
≈ 700
BTES
0,7 TWh heat
0,3 TWh cold

≈ 3
TWh/yr
cold

≈ 25 000 new systems per yr

Growing market for medium and large size (residential and commercial)

Heat pump sales



Few but big ATES systems

≈ 160 ATES
1 TWh heat
0,6 TWh cold

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ATES SYSTEM MONITORING PROJECT, FIRST MEASUREMENT AND PERFORMANCE EVALUATION: CASE STUDY IN SWEDEN

MOHAMMAD ABUASBEH JOSÉ ACUÑA

Increasing market in densely populated areas

- More restricted permission
- Confict with underground projects and DH companies being owned by municipalities (DH companies lose more and more clients)
- Lack of available drilling area

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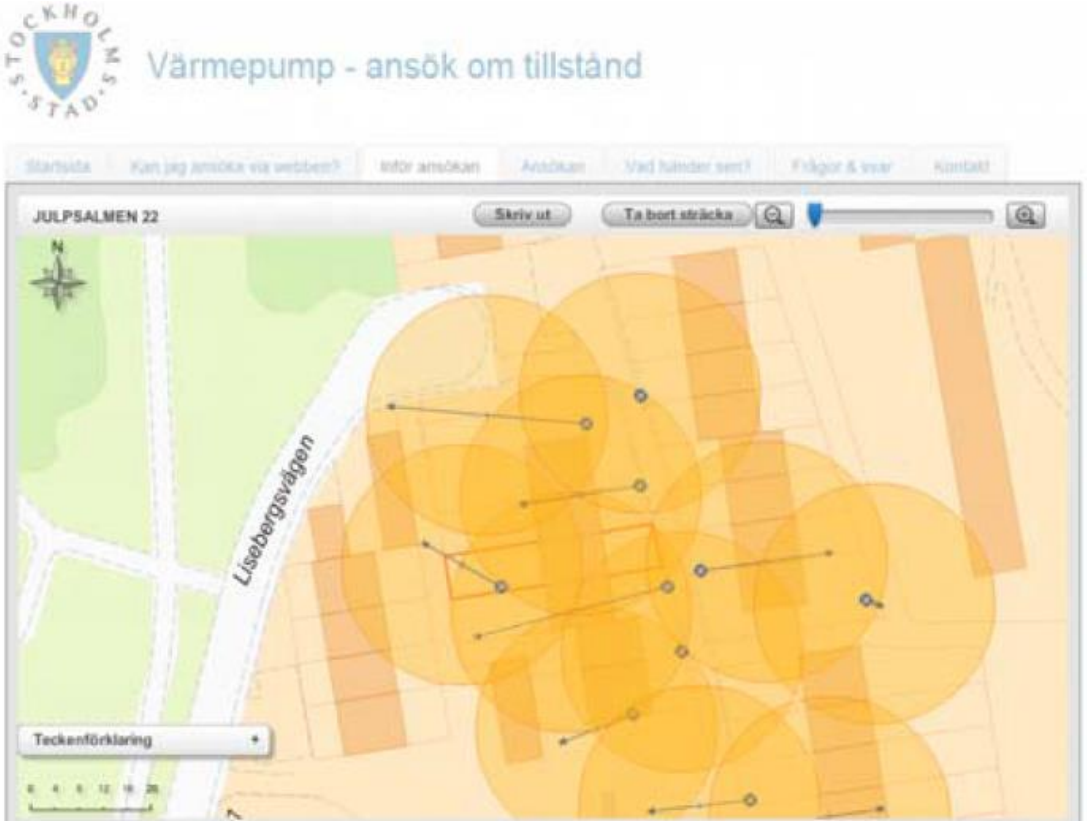
Thermal influence of neighbouring GSHP installations: relevance of heat load temporal resolution

Maria Letizia Fasci Alberto Lazzarotto José Acuña Joachim Claesson



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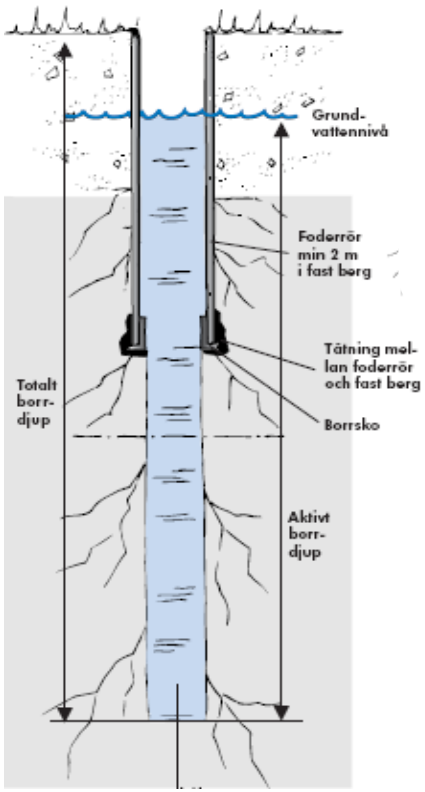
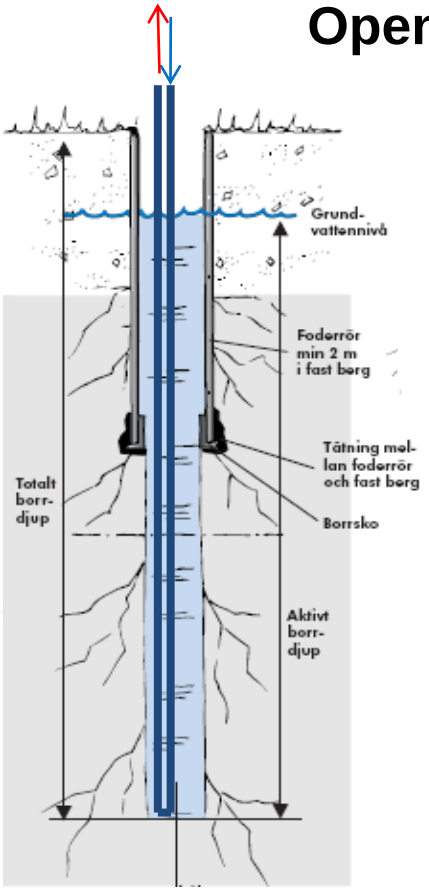


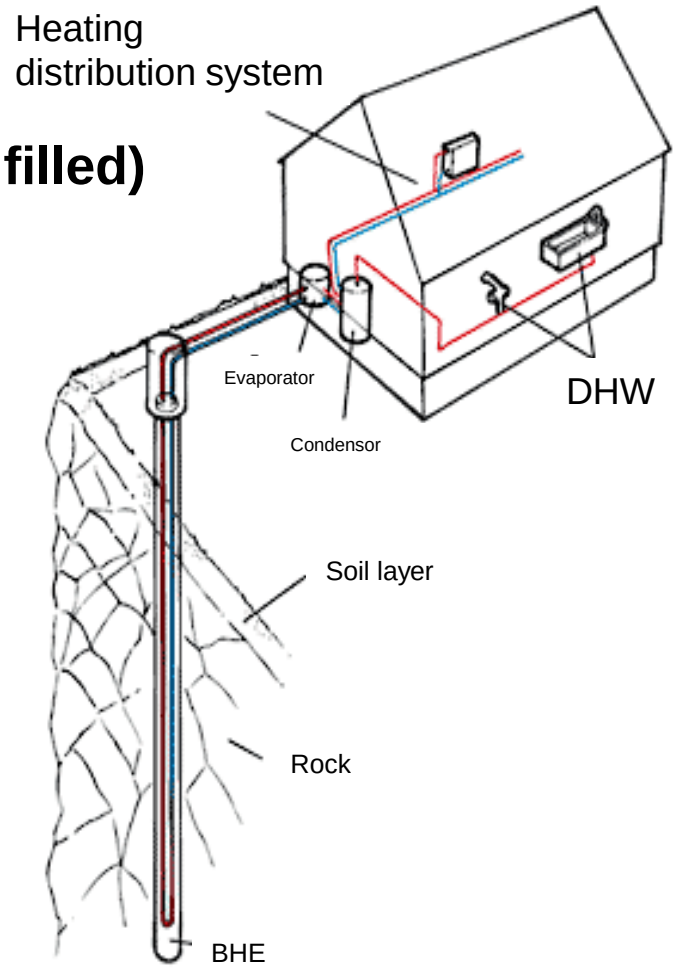
Standard for drilling contractors by the Swedish Geological Survey

The typical installation

Open boreholes (groundwater filled)

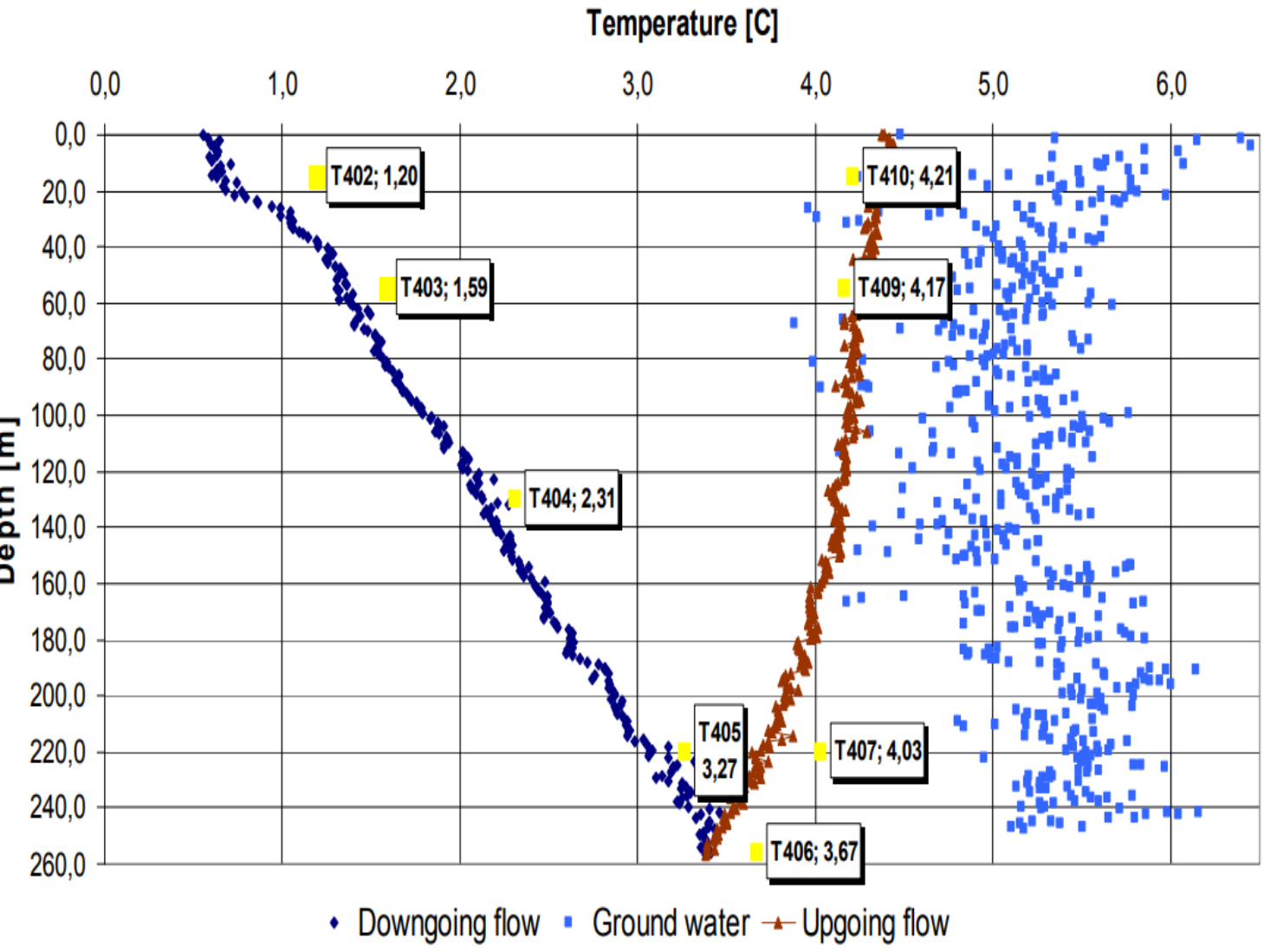


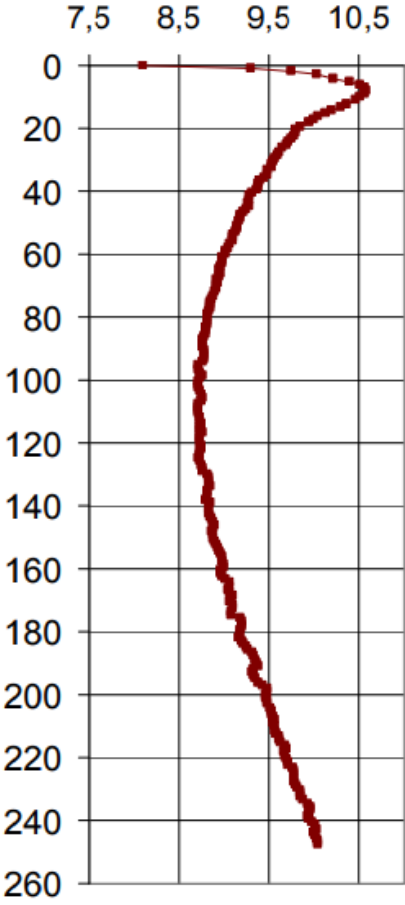
www.svepinfo.se



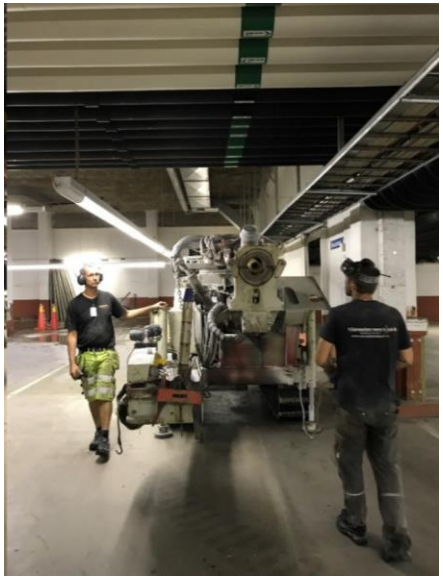
www.svepinfo.se

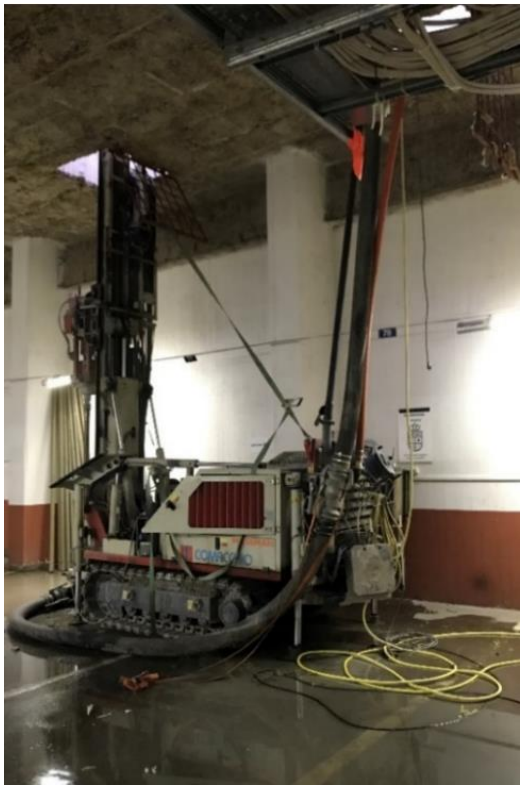
A typical Swedish borehole during heat extraction

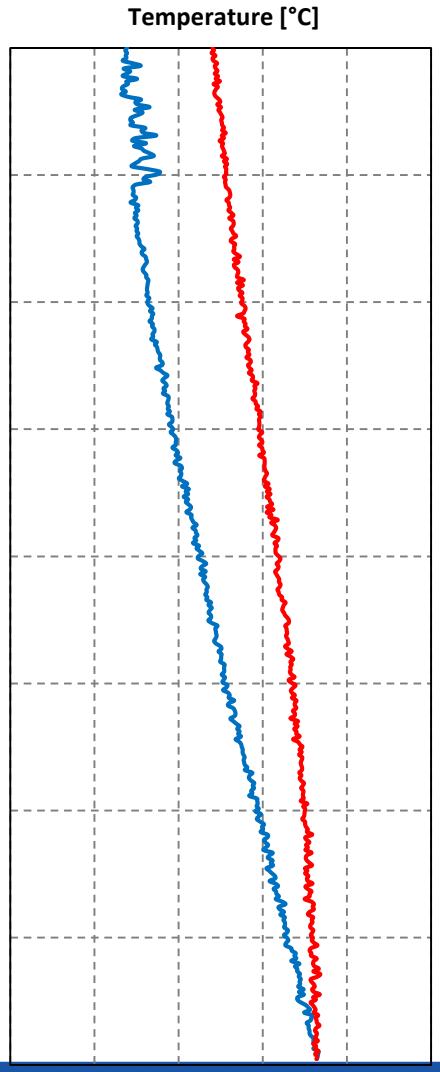


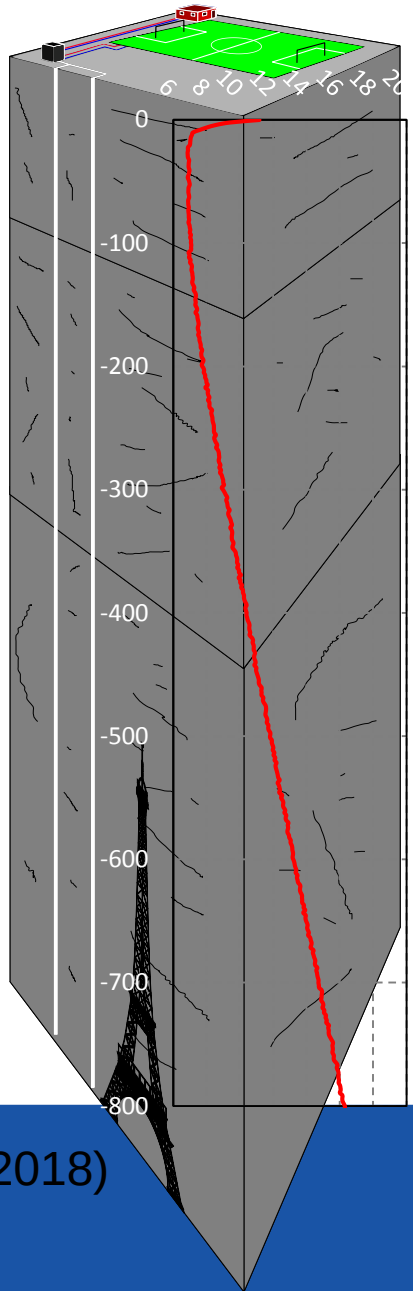


Deeper boreholes and/or drilling inside buildings due to lack av available drilling area





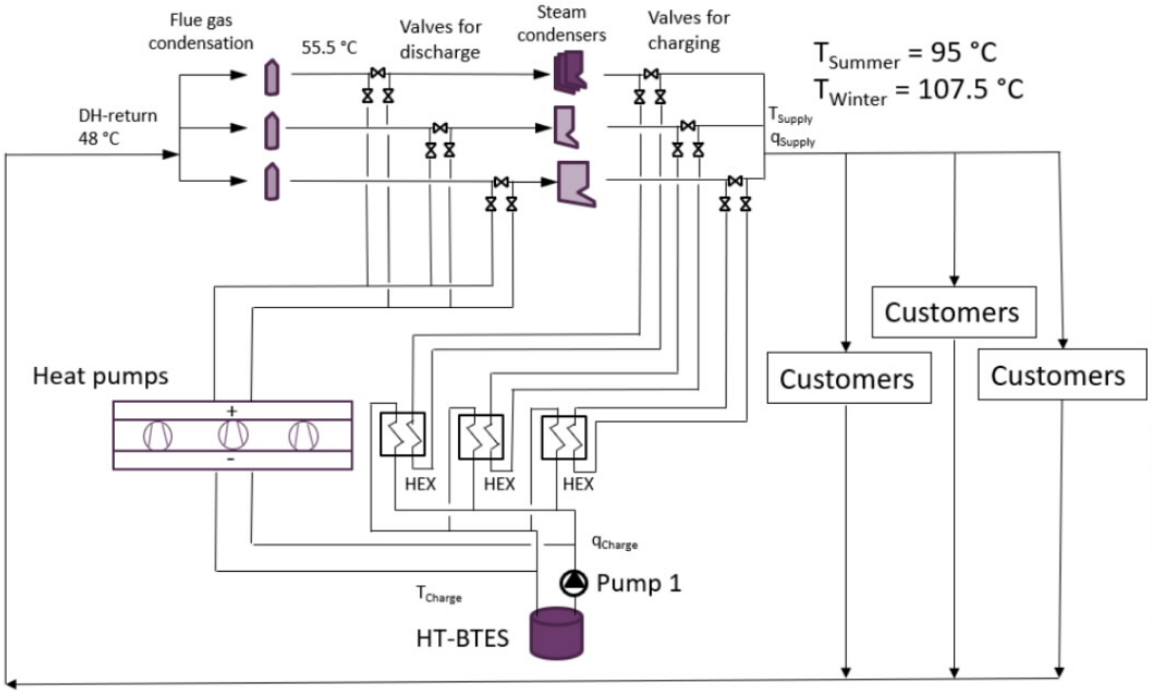


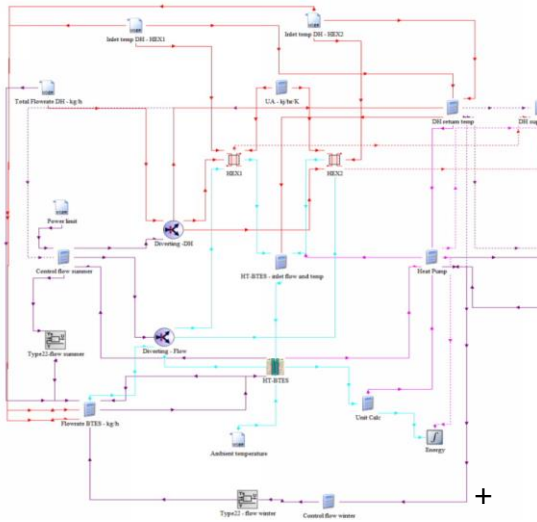


(Mazzotti et al, 2018)

New tendency

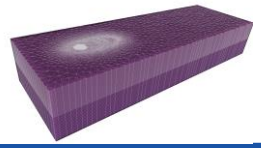
- HT-BTES (centralized)
- 5th generation DHC (closed to the clients)





TRNSYS model

+



Feflow

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High temperature borehole thermal energy storage – A case study

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Willem Mazzotti
José Acuña
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Ongoing research

- Annex 52: long term monitoring of GSHP systems

- Termiska Energilager:
  - Grouting screen for permeable boreholes in high temperature storage
  - Modelling the interaction between BTES and CHP plants
  - Influence of groundwater flow in HT-BTES (hard rock)
- Field characterization for HT-BTES in sedimentary soild
- Demonstration of Coaxial BHEs at large scale
- Thermal influence between neighbor BHEs

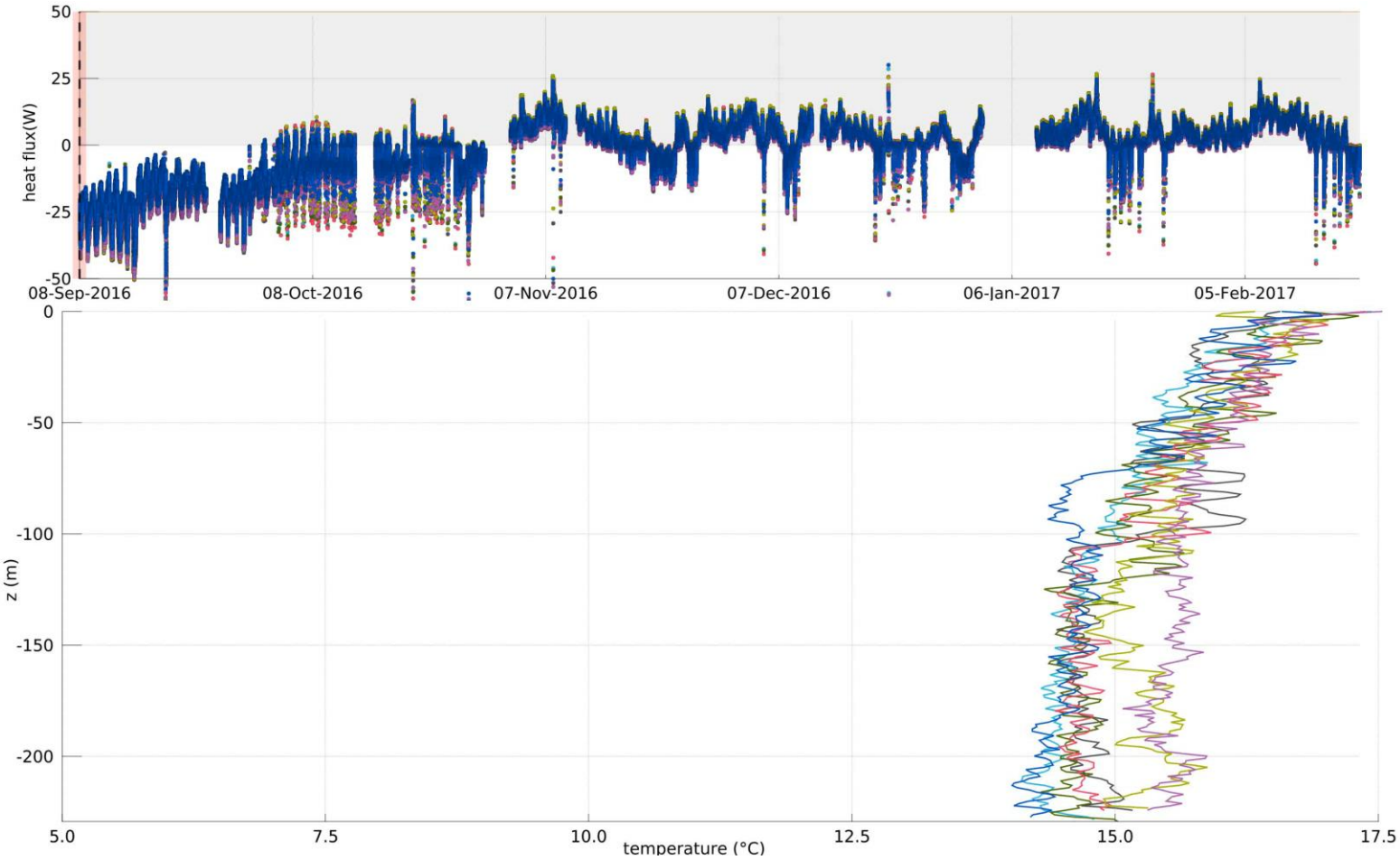
Monitoring large scale BTES

TIME
day: 2016-09-08
hour: 12:08:00

BH12 open
BH16 open
BH18 open
BH21 open
BH47 open
BH62 open
BH106 open

play

timesignal



Organisations

Concluding remarks

- Shallow geothermal provides about 19 TWh/yr
- Building owners install GSHPs in order to reduce operation costs and increase property value
- Utility companies are starting to invest in local GSHP solutions
  - Low temperatur network connected to BHEs
  - 3D real state properties sharing the same energy systems
- High interest for storing waste heat from DH system in BHEs
- Big market players are buying the small ones
- Joint projects between DHC and GSHP players
- Branch organisations are merging

Thank you!

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www.energy.kth.se/energibrunnar