High Temperature Borehole Thermal Energy Storage (HT-BTES)

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Agenda

- MuoviTech
- Heat storage technologies
- Borehole characteristics
- Case study, HT-BTES challenges, future
- Conclusion

Overview

MuoviTech is the only European manufacturer of shallow geothermal products with production sites in several countries.

Borås, Sweden

Turku, Finland

Noordwijkerhout & Tilburg, Holland

Krakow, Poland

Frogner, Norway

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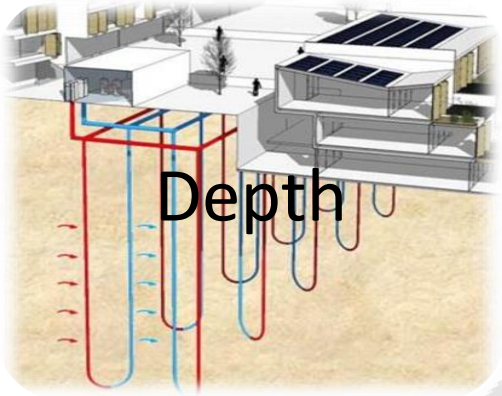
BHE Developments

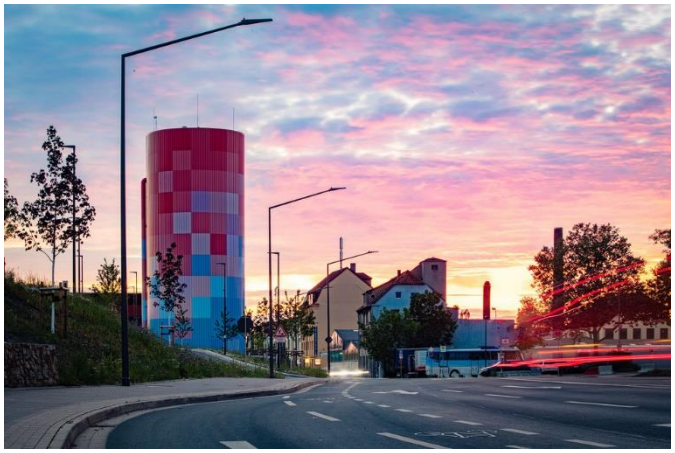


Depth

- Up to 450m
- 450-650 m
- 600-1000 m
- 1000-2000 m

Temperature

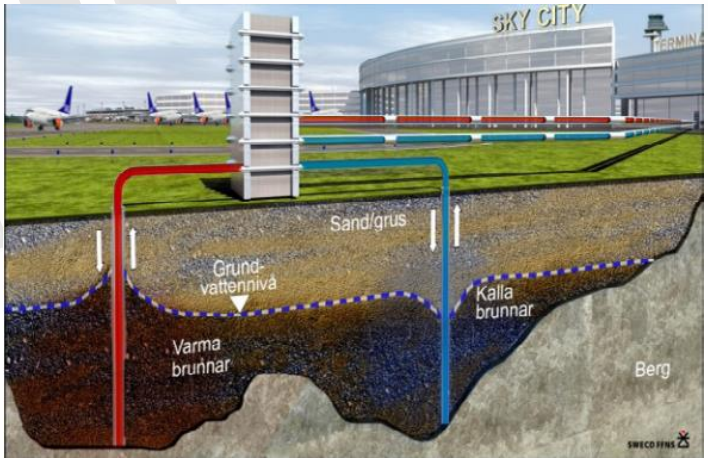
- Up to 40 °C
- From 40°≈ 70 °C
- Above 70 °C



TTES from Stadtwerke Detmold, 1’850 m^3 of water

PTES from Gram district heating, 122’000 m^3 of water

BTES system from Emmaboda Sweden



ATES system from Arlanda airport Sweden

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BTES-Key Factors

Borehole radius & depth

Flow rate

Thermal interaction

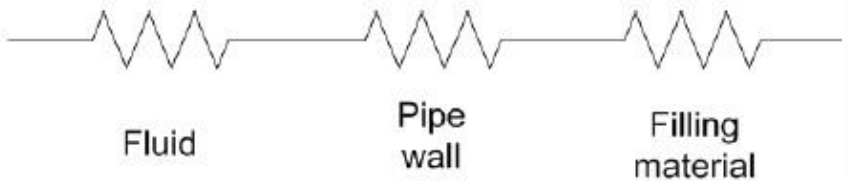
Shank space

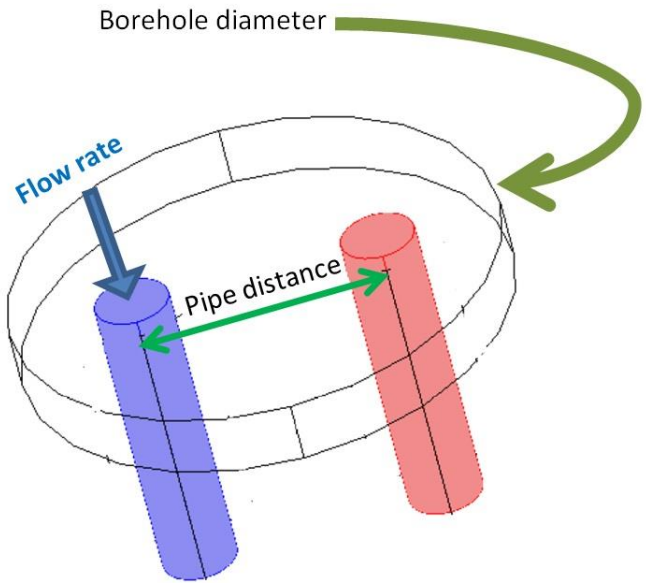
Thermal conductivity of backfilling material

Thermal resistance of fluid and pipe

Pipe thermal resistance & pressure drop

Minimizing borehole resistance





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Storage Factors

Storage size, shape & configuration

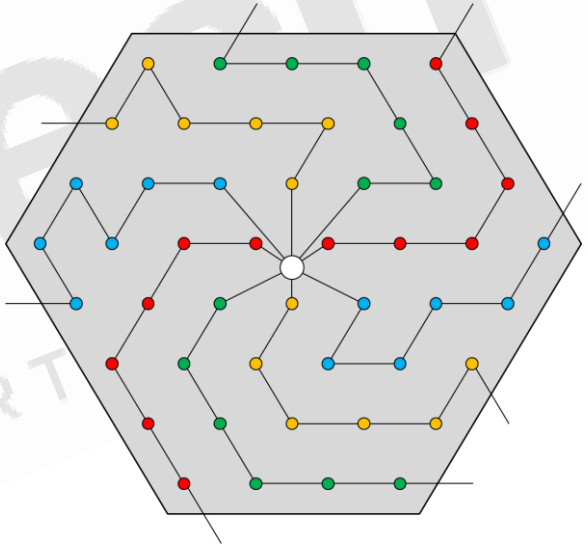
Number of boreholes, & depth

Highest / lowest temperature

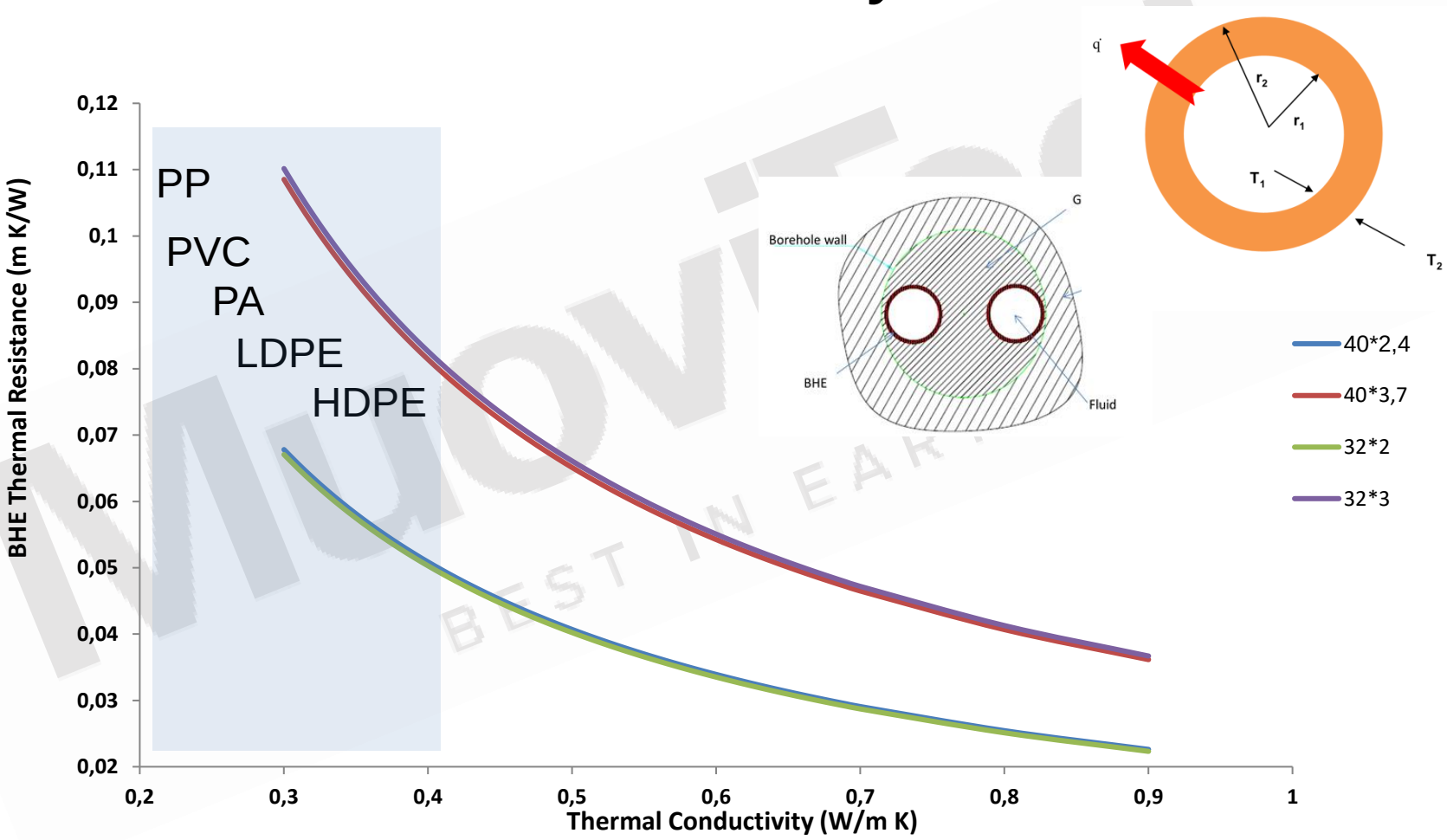
Grouting, non-grouting boreholes

Stress, hydronic, thermal, lifetime, techno-economic analysis

Geology and ground properties



BHE Thermal Resistance Vs Thermal Conductivity



The legend shows outside dimeter * pipe wall thickness

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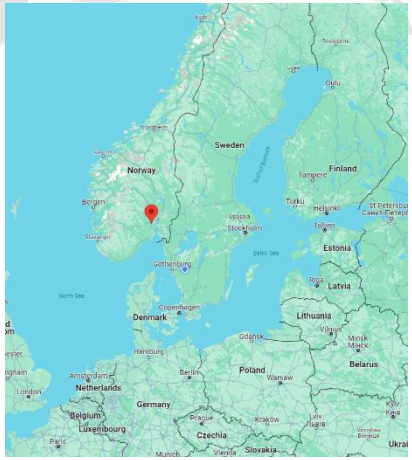
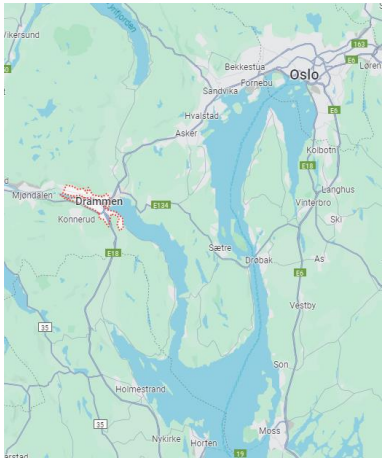
Case Study Fjell School in Drammen

- GeoTermos project
- Built:2018-2019
- Area:10 000 m²
- 100 boreholes 50 m
- 4m distance
- On site heat 50-60°C





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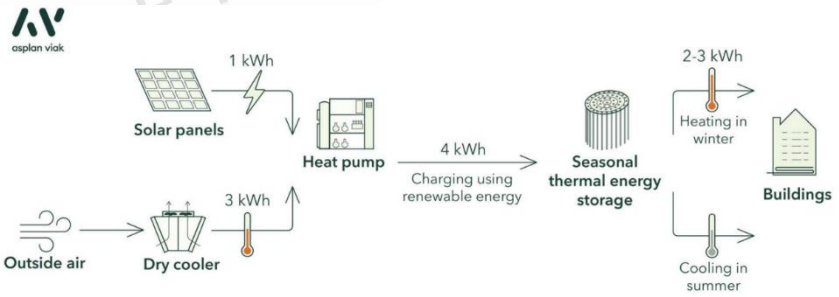

Source: Asplan Viak

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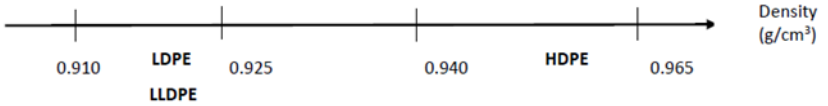
Polyethylene (PE)

- Corrosion and chemical resistance
- Long lifetime
- Low-cost material
- Light in weight , flexible, can be coiled
- Mechanical fittings, fusion joints and leakage free
- Maintenance free
- Low thermal conductivity (high thermal resistance)



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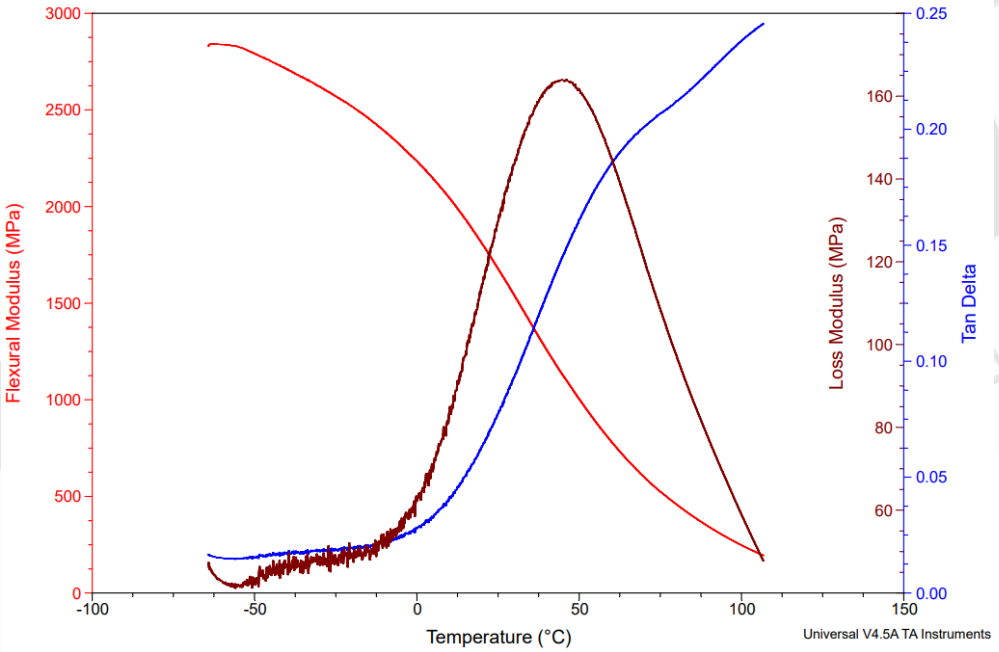
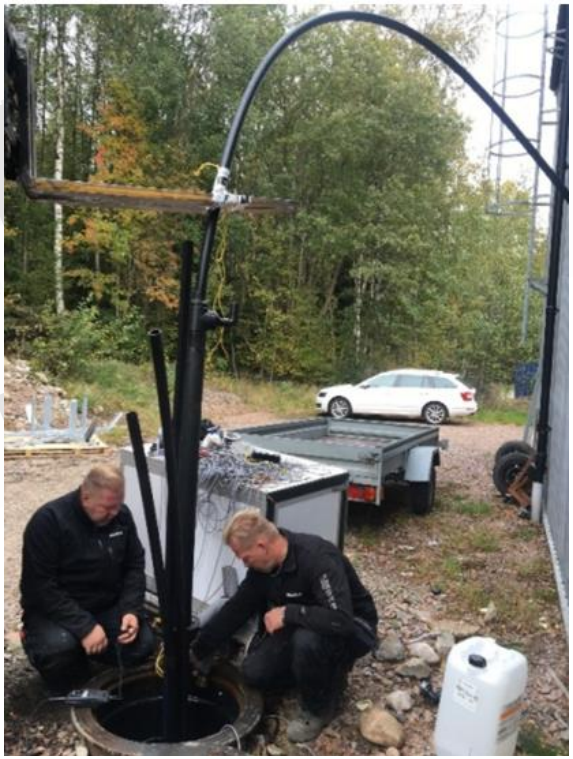
Dynamic Mechanic Analysis





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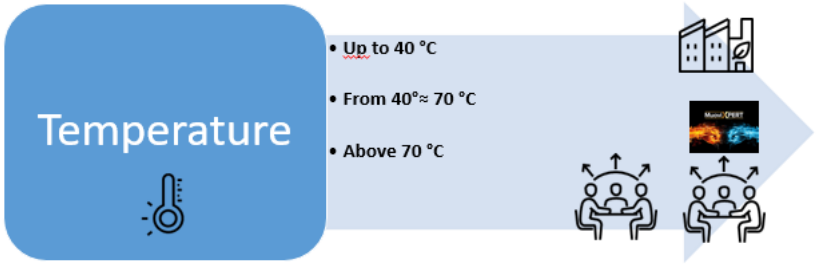
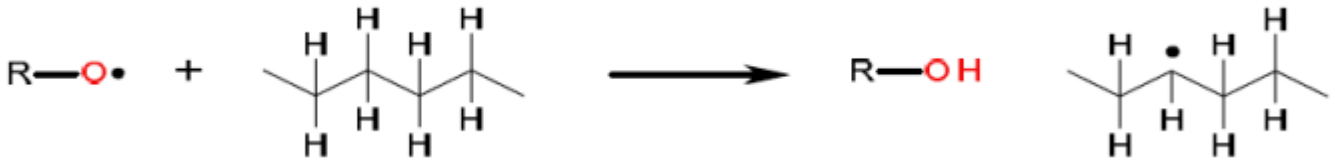
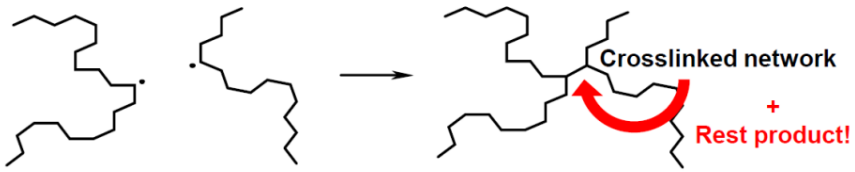
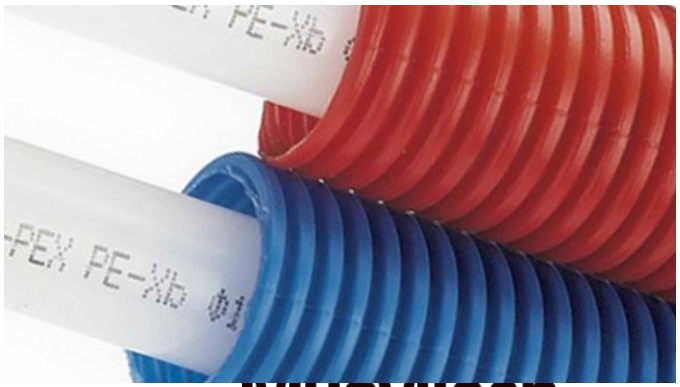
Crosslink Polyethylene









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MuoviXtreme

- New Challenges
- New material, chemicals, process technologies
- Nyhavna Trondheim
- 95 °C DH
- Field tests
- 3 years accelerating ageing test
- Lab tests, lifetime expectancy

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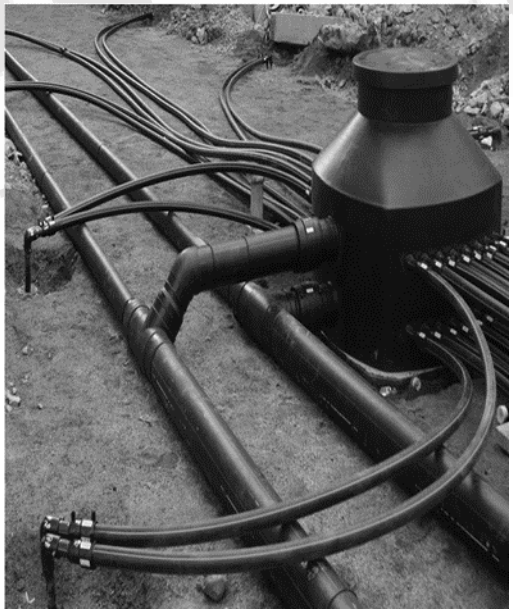
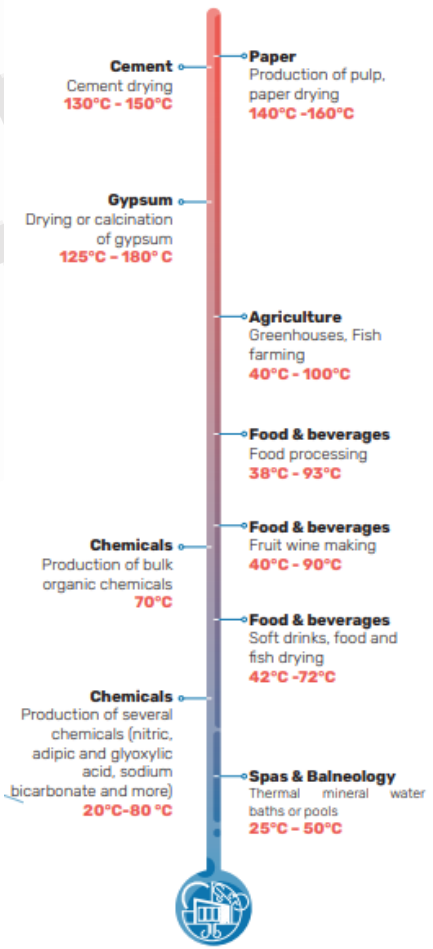
HT-BTES Lessons Learned

- Waste heat considered as a renewable energy
- On site heat, at scale, wherever, sustainable,
- Just one solution among a lot of options
- Works prefect with low temperature, small scale, on site
- Increased self-consumption
- Shave the grid peak
- Compactness, long lifetime
- Storage as a part of property





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IEA-ES Task 39

PlanEnergi

newheat
renewable heat supplier

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IF Technology Creating energy

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Thank you!

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