Bestaande warmtenetten in de vijfde versnelling

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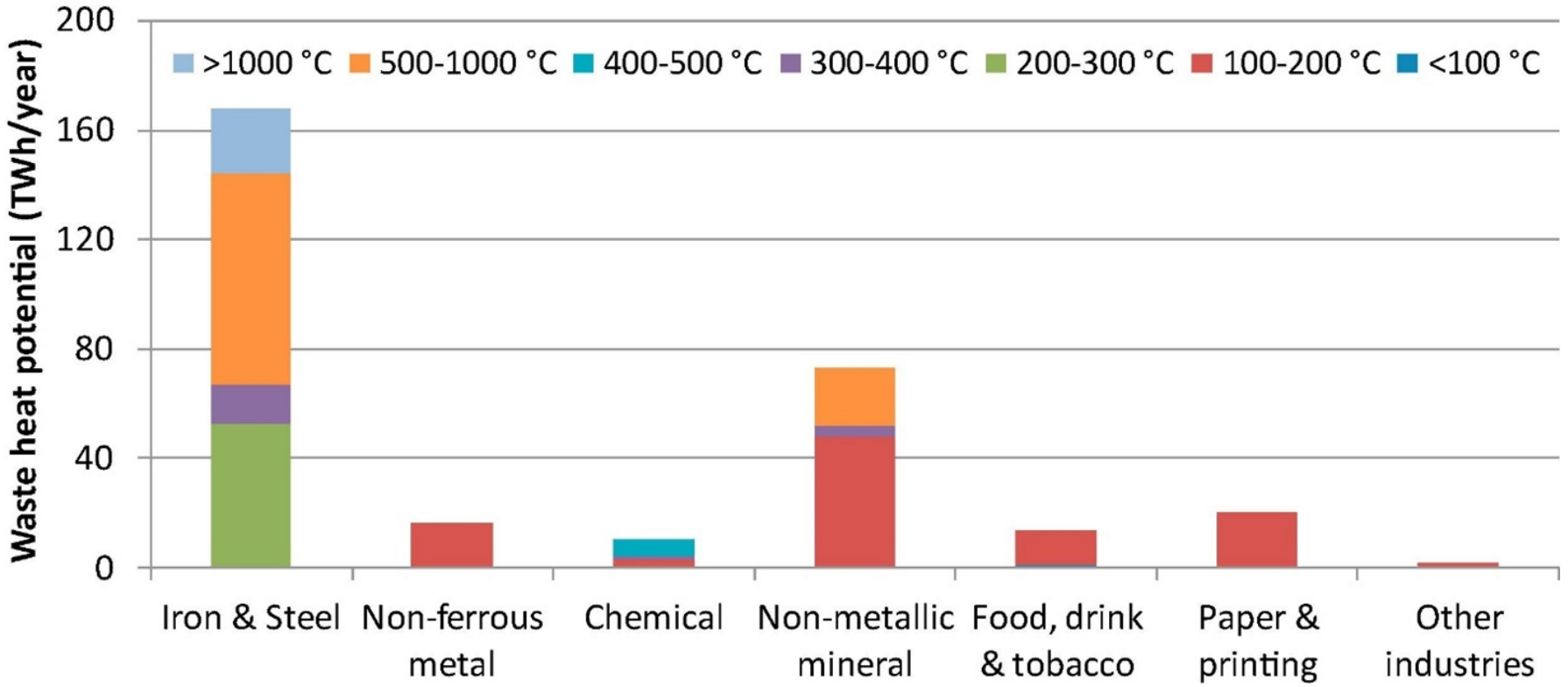
Content

- Residual heat in EU/BE/NL
  - Industry
  - Urban area
- Deep and shallow geothermal energy
- Overview in Flanders – heat maps
- Balancing Example – Storm District Energy Controller

Residual heat in EU/BE/NL

- Large amount of untapped residual heat in EU

Papapetrou 2018: Papapetrou, M., Kosmadakis, G., Cipollina, A., La Commare, U., MIcale, G., 2018, Industrial waste heat: Estimation of the technically available resources in the EU per industrial sector, temperature level and country, Applied Thermal Engineering 138 (2018) 207-216



Residual heat in EU/BE/NL

- Europe - Industry
  - 304.13 TWh/year (on average 34700 MWt) of waste heat which is 16.7% of the industrial energy use for process heating
    - Potential at 100-200° : 100 TWh/year
    - Potential at 200-500° : 78 TWh/year
- BE – industry:
  - 13 TWh/y
  - On average: 1 484 MWt
- NL – industry
  - 14 TWh/y
  - On average: 1 600 MWt

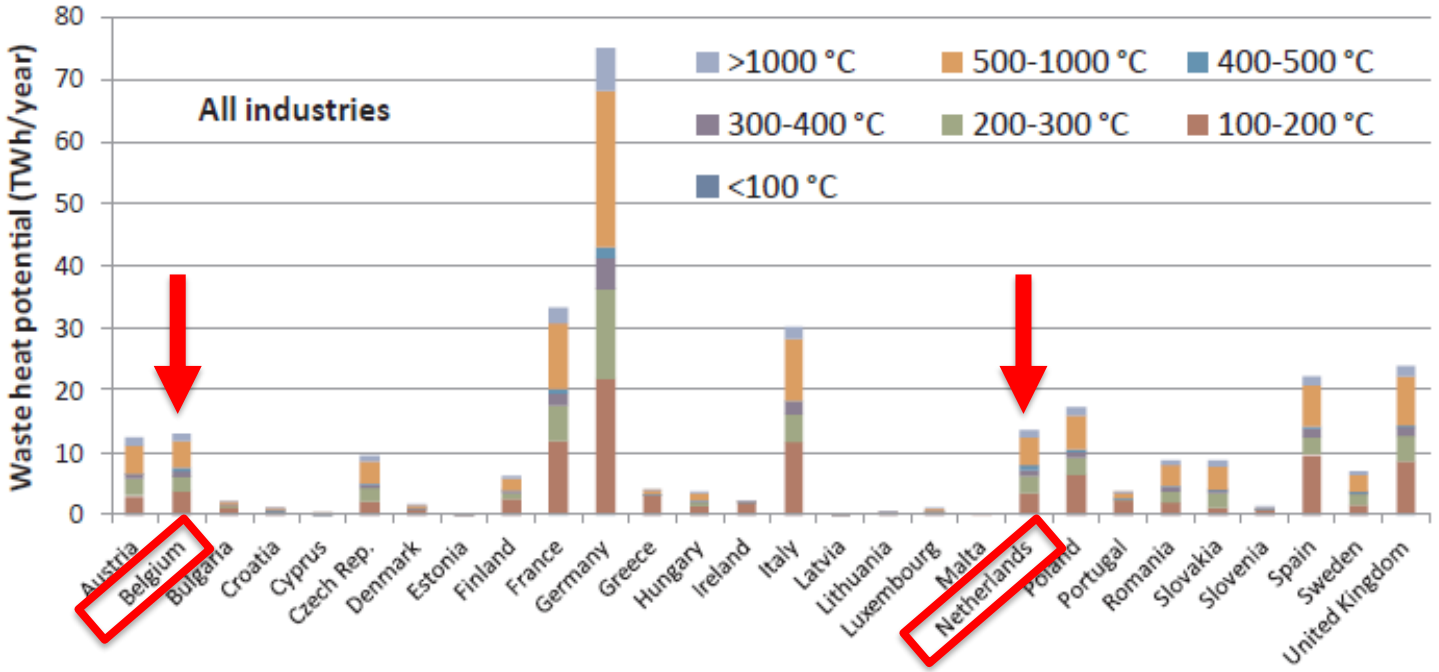


Fig. 12. Waste heat potential in each EU country per temperature level in all industries.

Papapetrou 2018: Papapetrou, M., Kosmadakis, G., Cipollina, A., La Commare, U., MIcale, G., 2018, Industrial waste heat: Estimation of the technically available resources in the EU per industrial sector, temperature level and country, Applied Thermal Engineering 138 (2018) 207-216

Residual heat in EU/BE/NL

- Overview of available and accessible excess heat within 2 km of urban areas
- EU
  - 391 TWh/year (on average 44 600 MWt) to recover from data centres, metro stations, service sector building and waste water treatment plants.
  - More than 10% of the EU's total energy demand for heating
- BE:
  - 10.4 TWh/year (on average 1 185 MWt)
- NL
  - 7.6 TWh/year (on average 862 MWt)

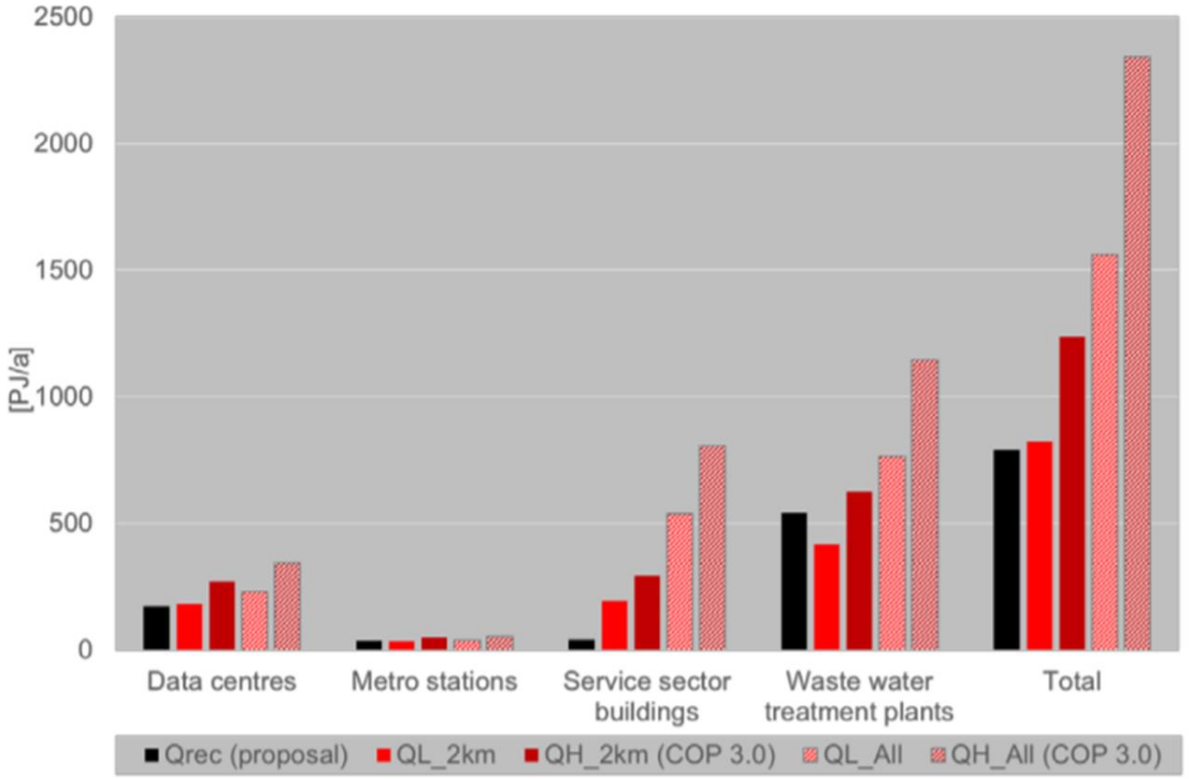


Figure 26. Summary overview of modelled available and accessible excess heat total volumes inside or within 2 kilometres of urban district heating areas (2km) vs. volumes unrestricted by local conditions (all), by source category and with comparison to recoverable excess heat volumes (Q_{rec}), as anticipated in the project proposal.

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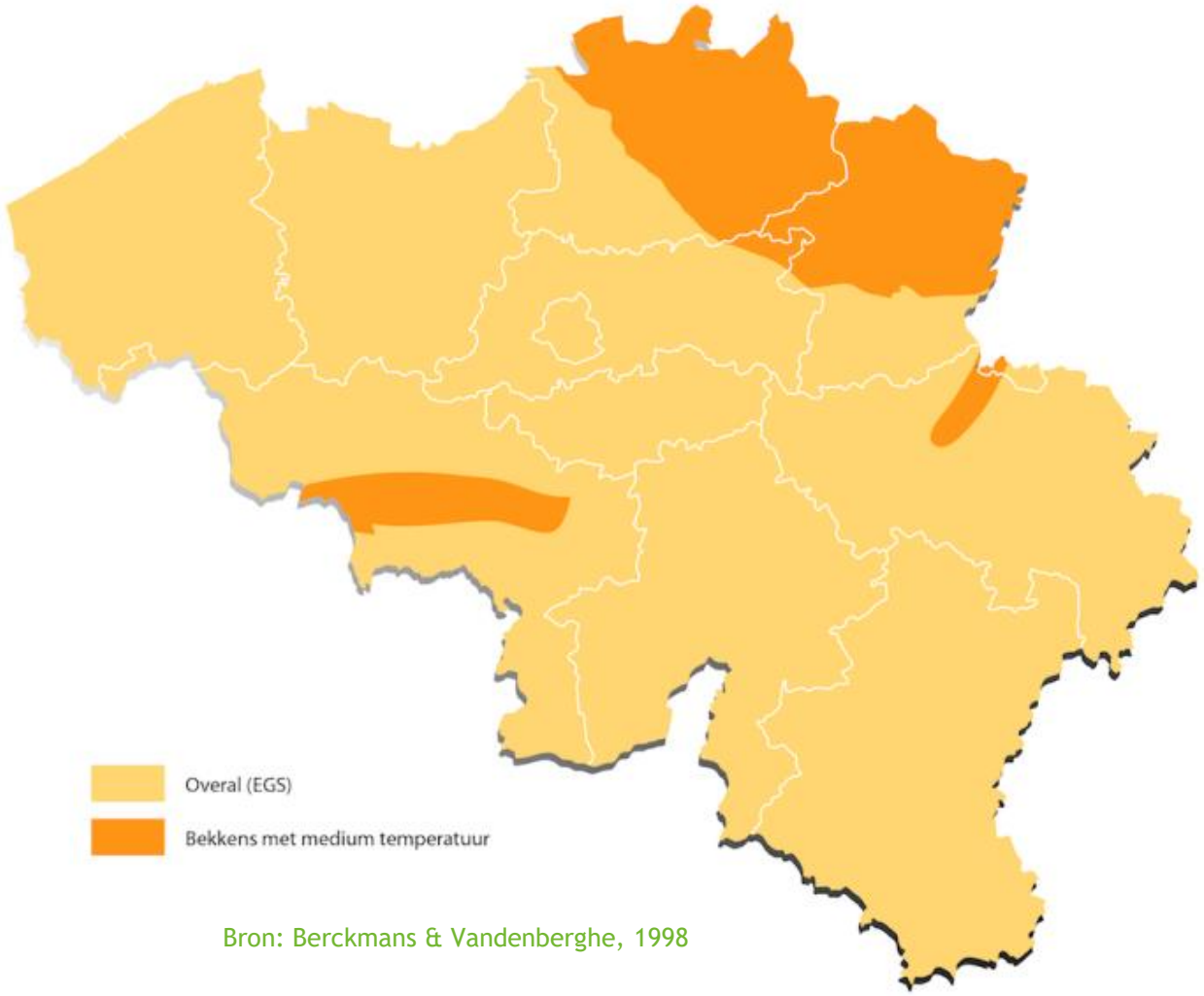
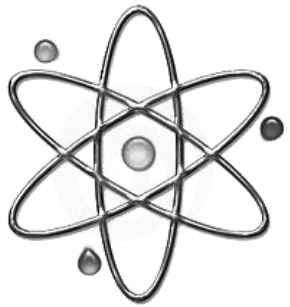
Deep and shallow geothermal energy



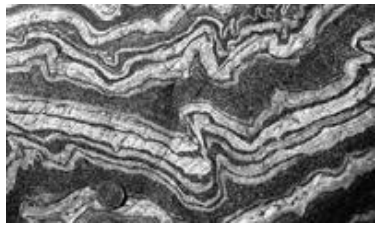
Bron: Berckmans & Vandenberghe, 1998

Heat flux: ~50mW/m²

Collision heat
~55%

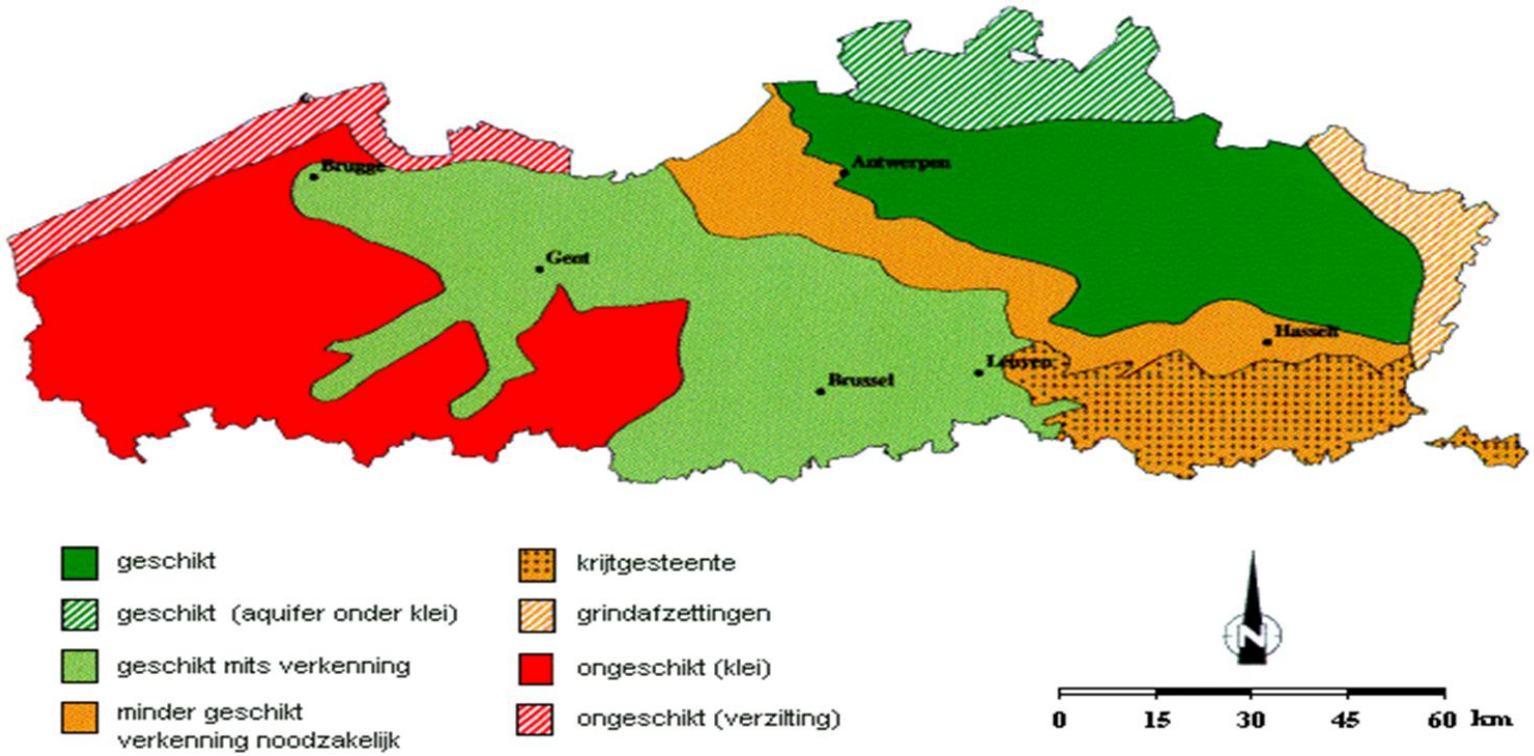


Nuclear decay
~ 40%



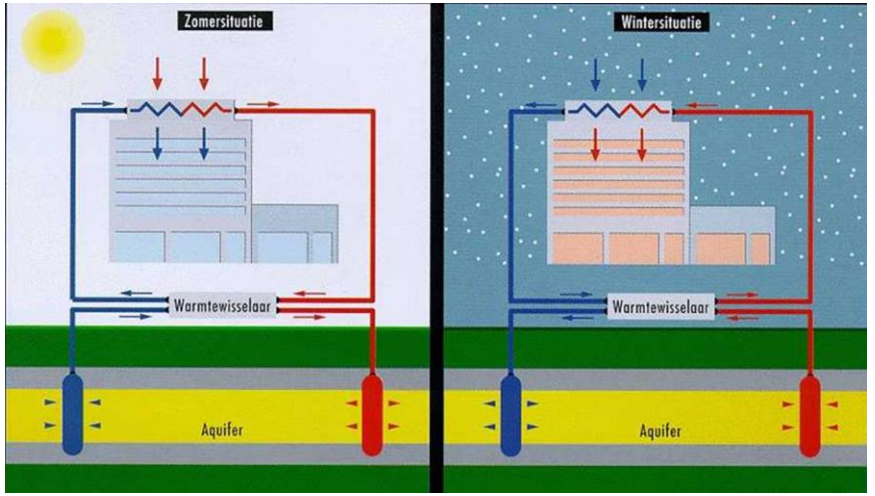
Deformation heat
~ 5%

Deep and shallow geothermal energy

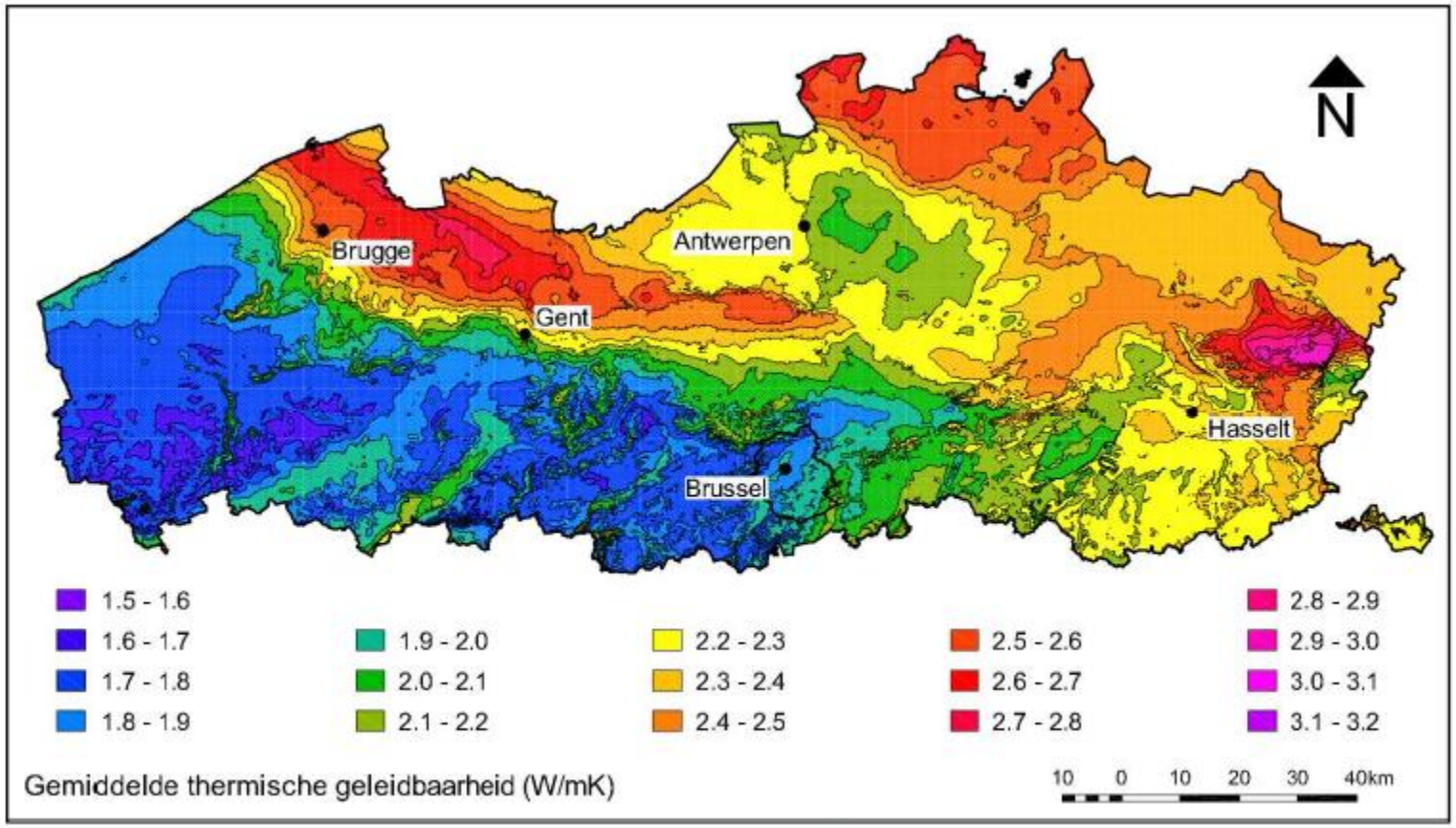


ATES

Aquifer Thermal Energy Storage



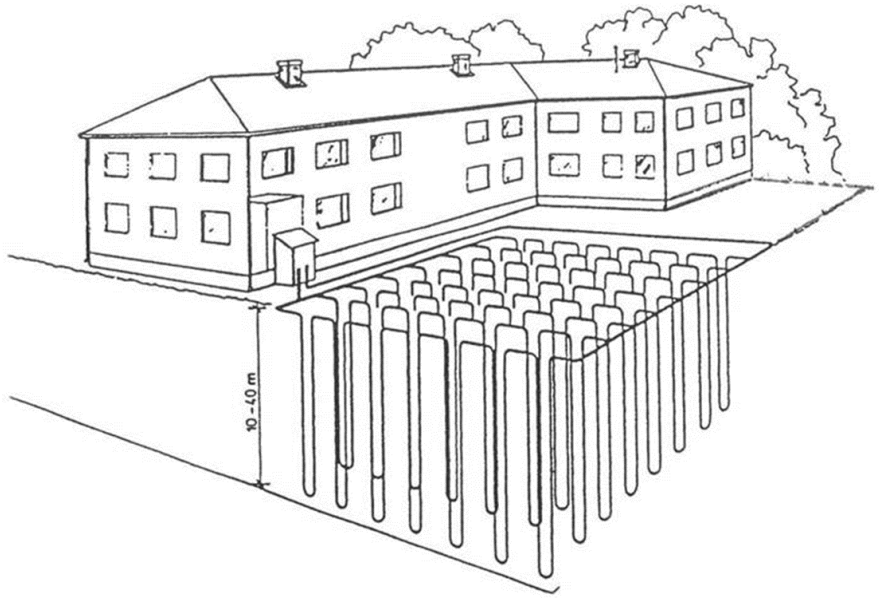
Deep and shallow geothermal energy



Figuur 9: Gemiddelde thermische geleidbaarheid tot op een diepte van 100 m of tot op de vaste rots

BTES

Borehole Thermal Energy Storage



Heat in Flanders

Deel III: Rapportage van het economische potentieel van efficiënte en hernieuwbare verwarmings- en koelingstechnologieën die in het kader van de kosten-batenanalyse zijn opgespoord

JAAR 2050

	TOTAAL GWh/jaar
Industriële afvalwarmte	25.277
Industriële afvalkoude	739
Afvalverbranding	767
Hoogrenderende WKK	5.292
Hernieuwbare energiebronnen	
Geothermisch(ondiep + diep)	49.807
Biomassa	9.622
Thermische zonne-energie	4.946
Andere hernieuwbare energiebronnen	-
Warmtepompen	28.869[19]
Vermindering van warmteverlies bij bestaande netwerken voor stadsverwarming en -koeling	0

Warmte in Vlaanderen, rapport 2020 - https://publicaties.vlaanderen.be/view-file/40481

Heat maps Flanders

- Heat maps of Flanders at GEOpunt : Website www.geopunt.be
- Heat demand in color codes
- Eg city of Ghent

Grootverbruikers

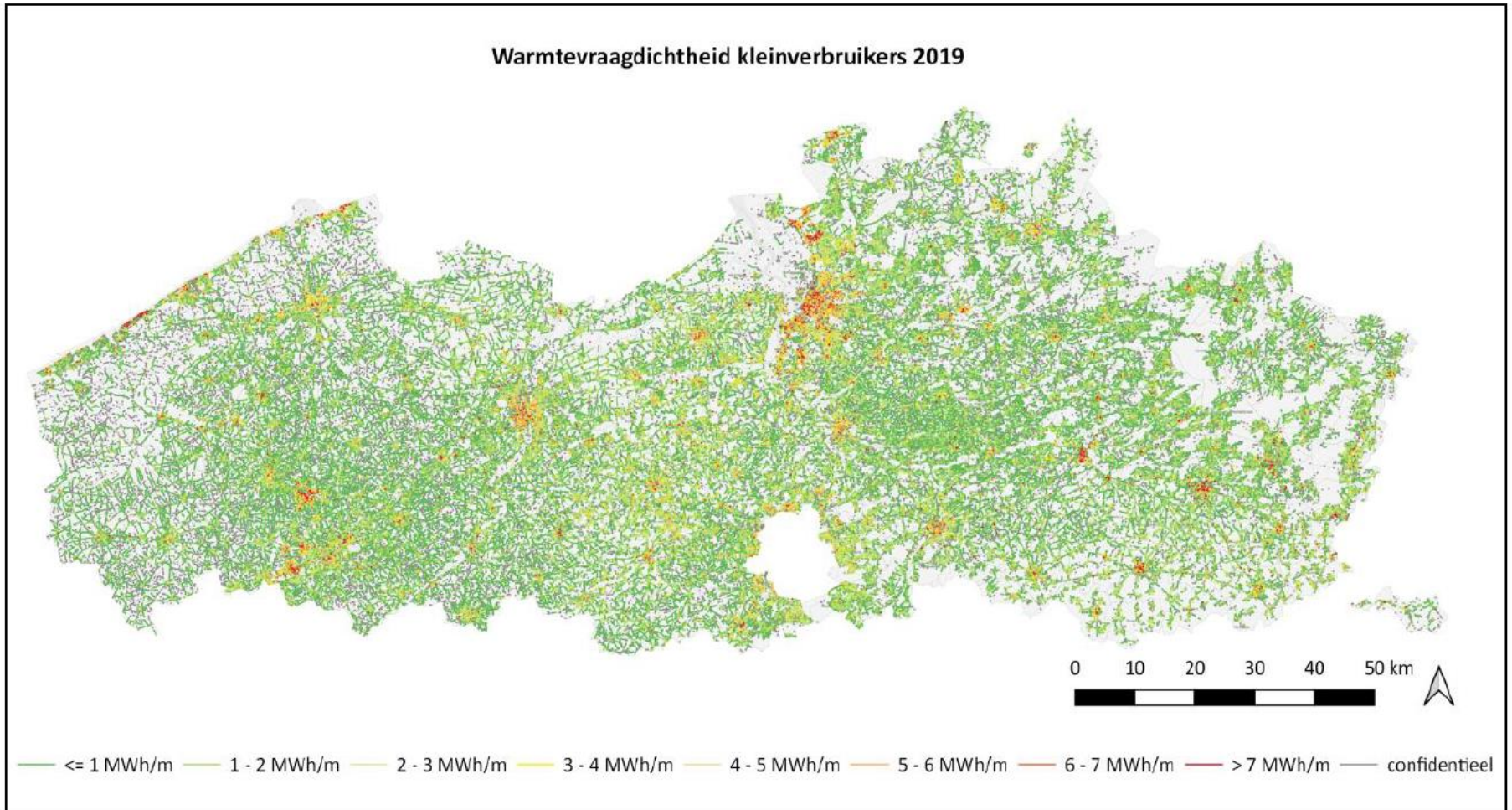
- 0,2 - 1 GWh/jaar
- 1 - 20 GWh/jaar
- 20 - 200 GWh/jaar
- > 200 GWh/jaar

Kleinverbruikers

- <= 1 MWh/m
- 1 - 2 MWh/m
- 2 - 3 MWh/m
- 3 - 4 MWh/m
- 4 - 5 MWh/m
- 5 - 6 MWh/m
- 6 - 7 MWh/m
- > 7 MWh/m
- confidentieel

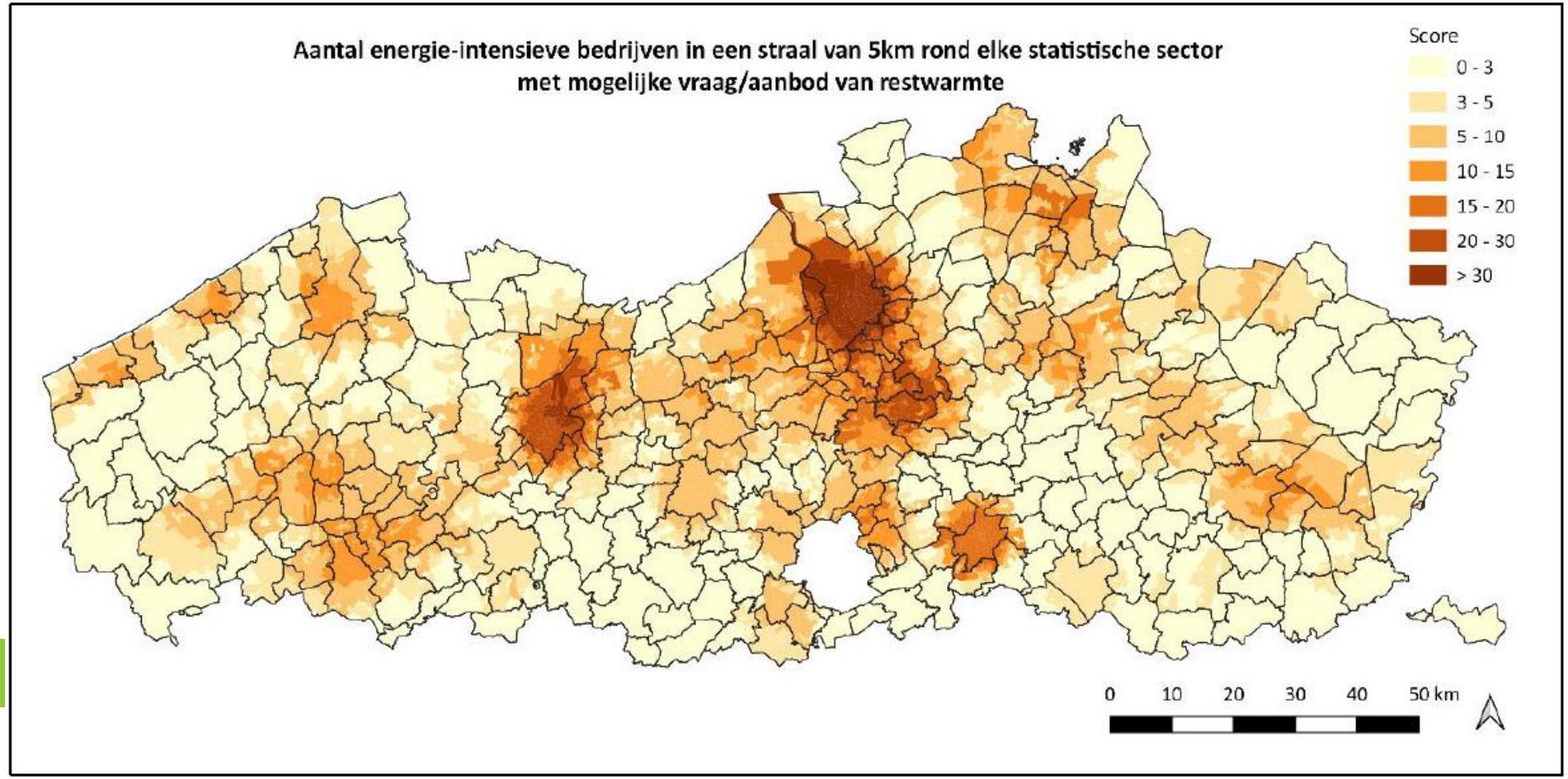
Heat maps Flanders

- Heat maps of Flanders at GEOpunt : Website www.geopunt.be
- Heat demand small consumers



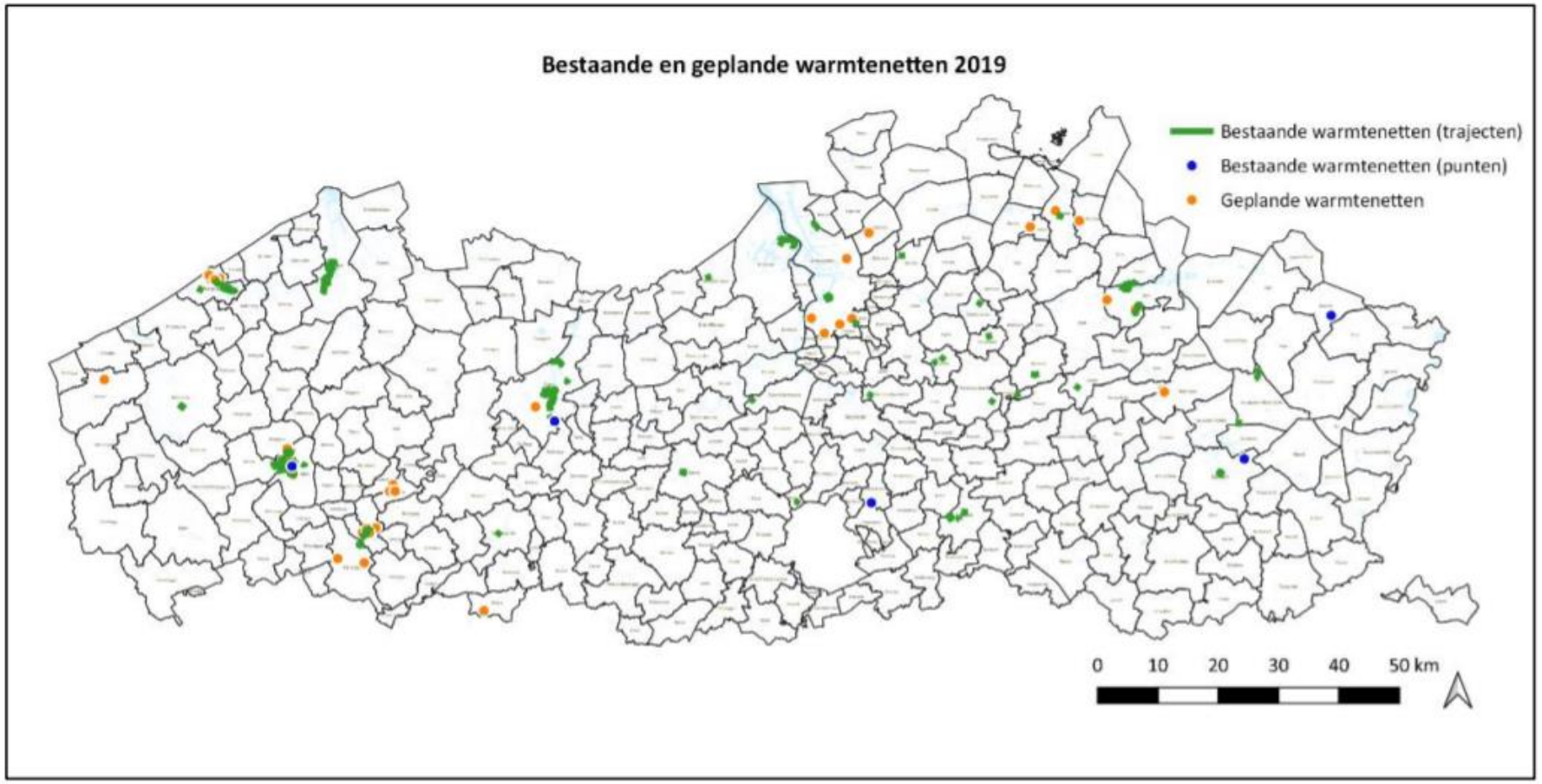
Heat maps Flanders

- Heat maps of Flanders at GEOpunt : Website www.geopunt.be
- Energy intensive companies with possible demand/availability of waste heat



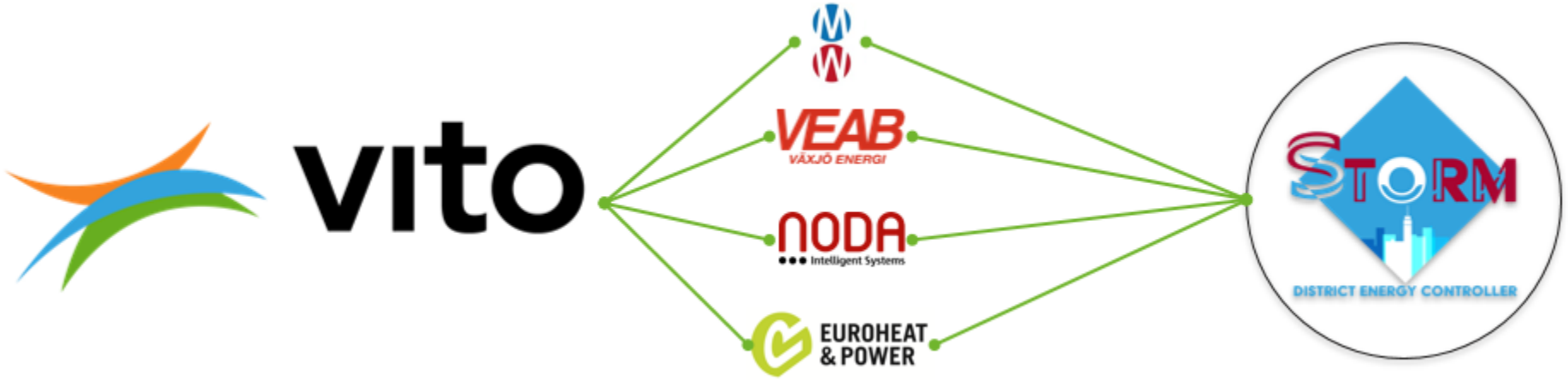
Heat maps Flanders

- Heat maps of Flanders at GEOpunt : Website www.geopunt.be
- District heating networks in Flanders



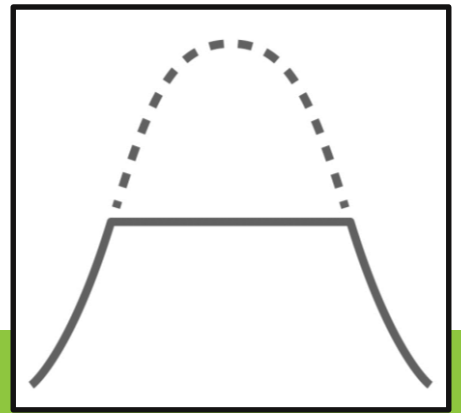
Storm District Energy Controller

- An artificial intelligence based smart controller for district heating network operators to optimize operations through active demand side management.

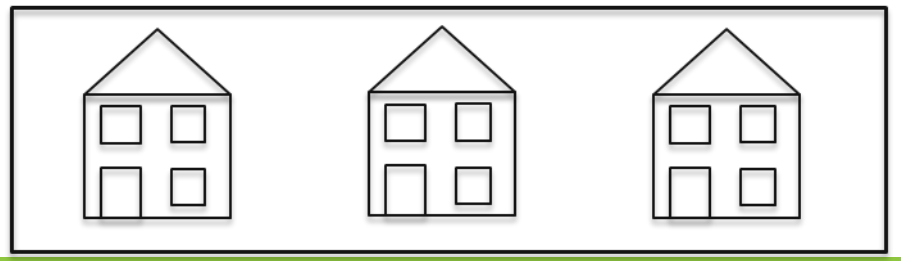


Operational Optimization Potential

- What? Peak shaving
  - Base load (Cheap): Residual heat, Biomass, Renewables, CHP
  - Peak load (Expensive): Oil, Gas



- How?
  - Active demand side management
  - Using thermal mass of buildings
  - Without loss of comfort



Demonstrated technology

3GDH in Rottne, SE

5GDH in Heerlen, NL

3GDH in Eindhoven, NL

3GDH in Mol, BE

5GDH in Paris, Fr

Past projects

Current projects

Benefits in numbers

Reduction in peak heat demand
17.3%

Reduction in CO_2 emissions
11.2 kilo Tonnes/year

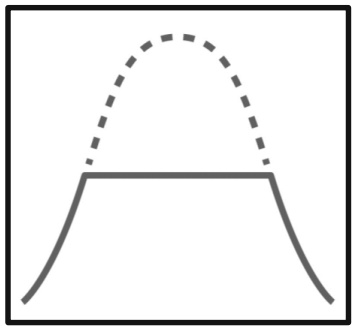
Potential increase in capacity of
42.1% enabling **48.000** additional homes

Reduction in peak heat demand
12.7%

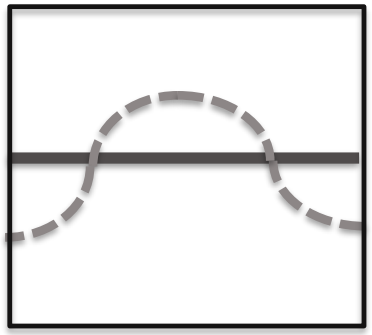
Reduction in CO_2 emissions
10.8 kilo Tonnes/year

Reduction in power procurement costs of **6%**

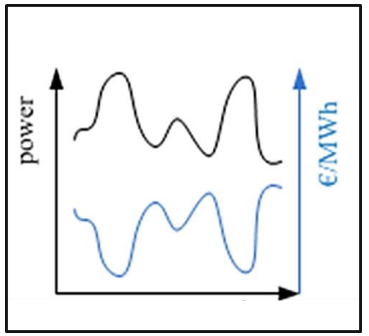
Storm Technology Roadmap



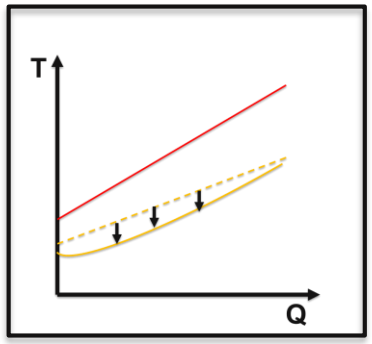
Peak shaving



Load curve flattening



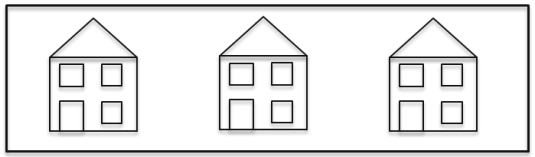
Electricity Market Interaction



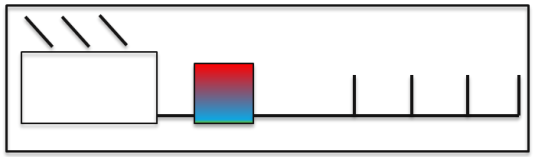
Return temperature reduction

Demonstrated

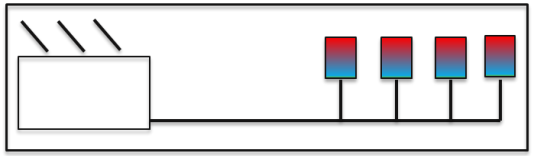
roadmap



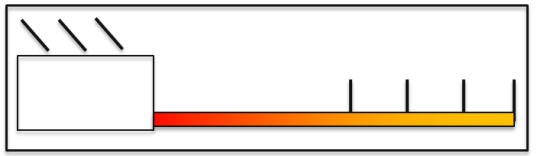
Building mass



Centralised storage



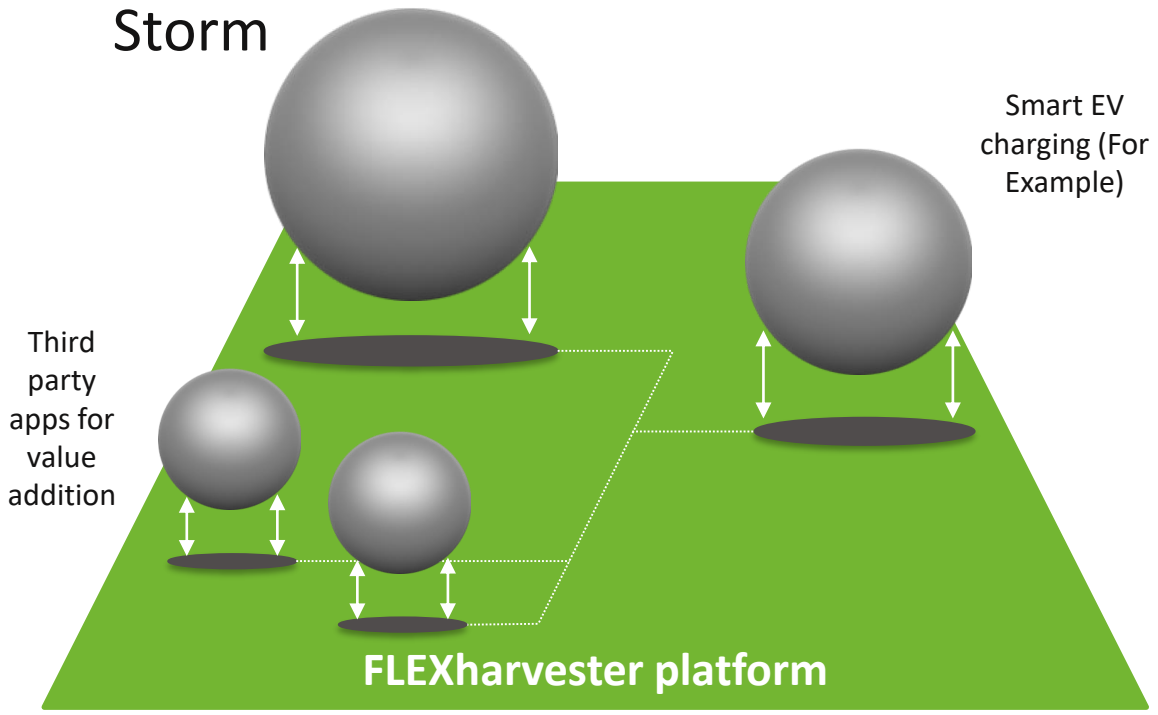
Decentralised storage



Storage in the network piping

Storm running on FLEXharvester

- Storm is the first among the applications supported by the FLEXharvester platform



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