From 3rd to 4th generation DHC networks
–group work
EnergyVille, Genk, Belgium
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DHC Challenge
"The first DHN in the city of Genk"

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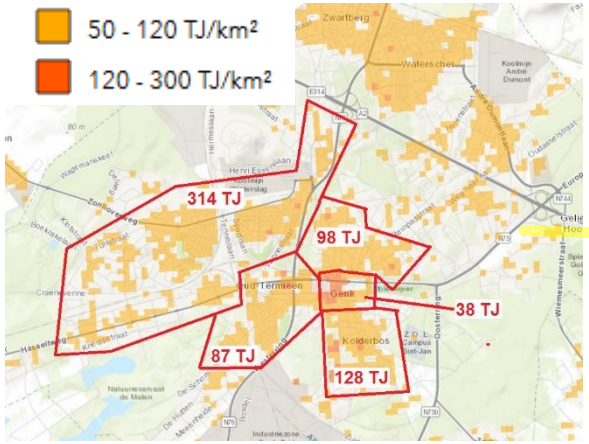
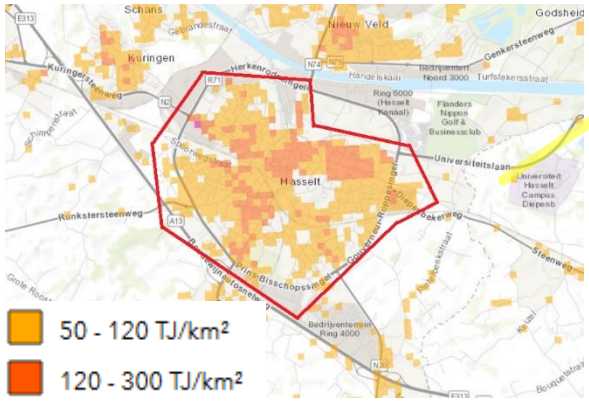
Summary

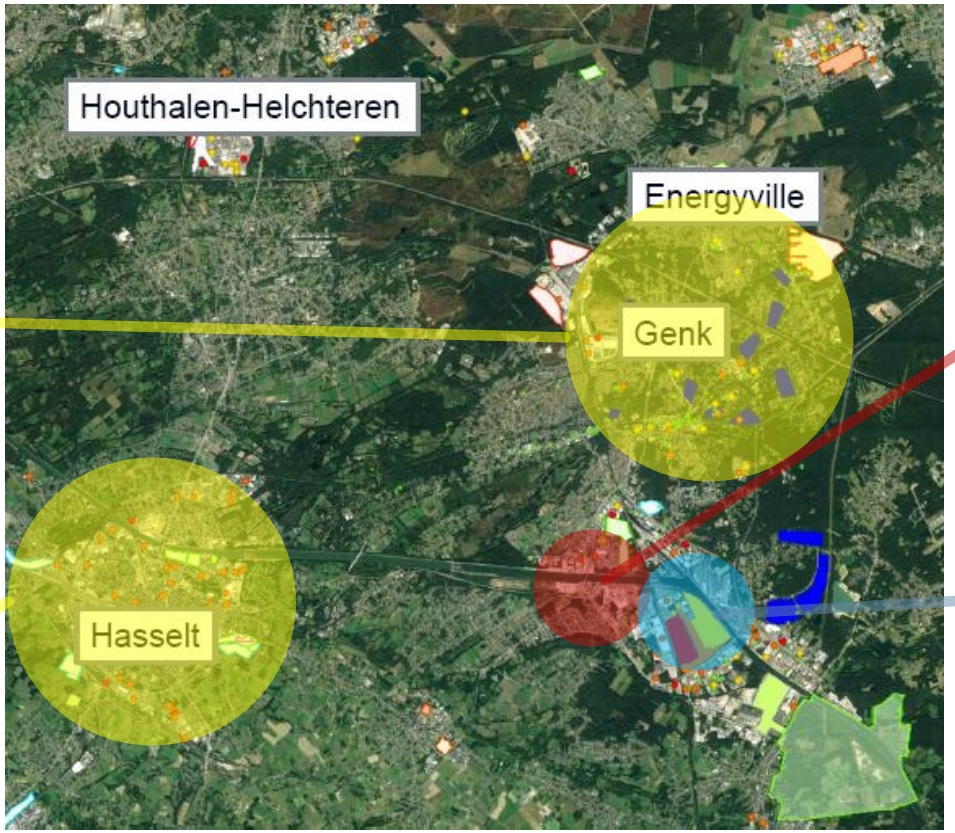
- Current situation
- Goals
- Concept
  - Planning of the DHN
  - Design of the DHN
  - Other mesures
- Conclusions

Overview of Genk and the city nearby

Heat demand density







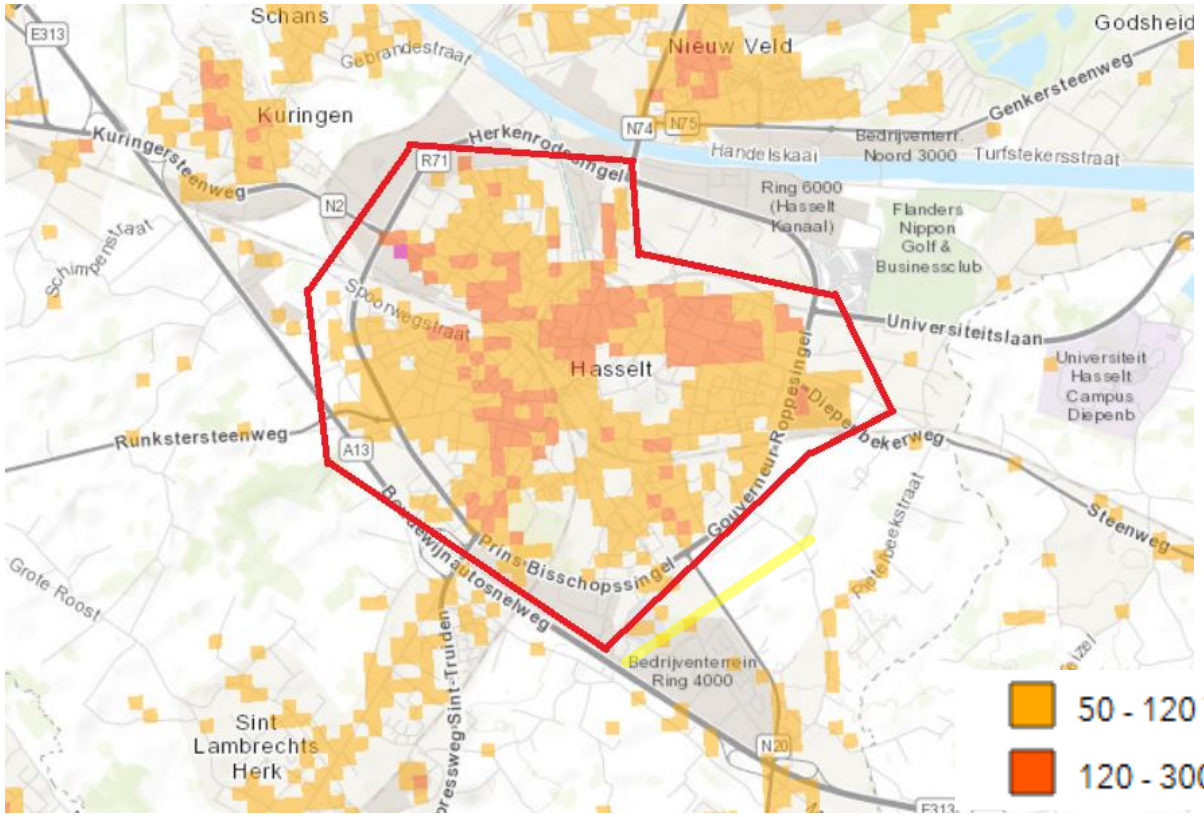
Industrial area

New LT district

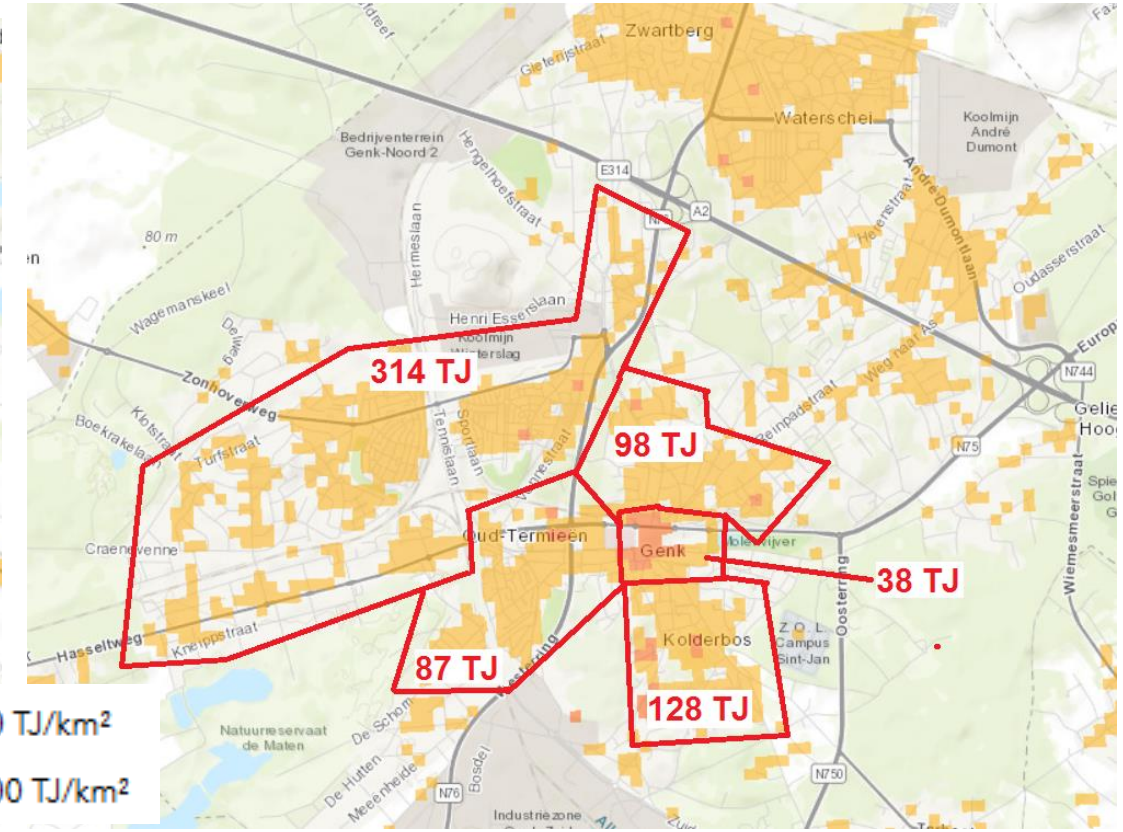
*http://www.heatroadmap.eu/maps.php
**googlemaps

Overview of Genk and the city nearby

Heat demand density of Hasselt



Heat demand density of Genk

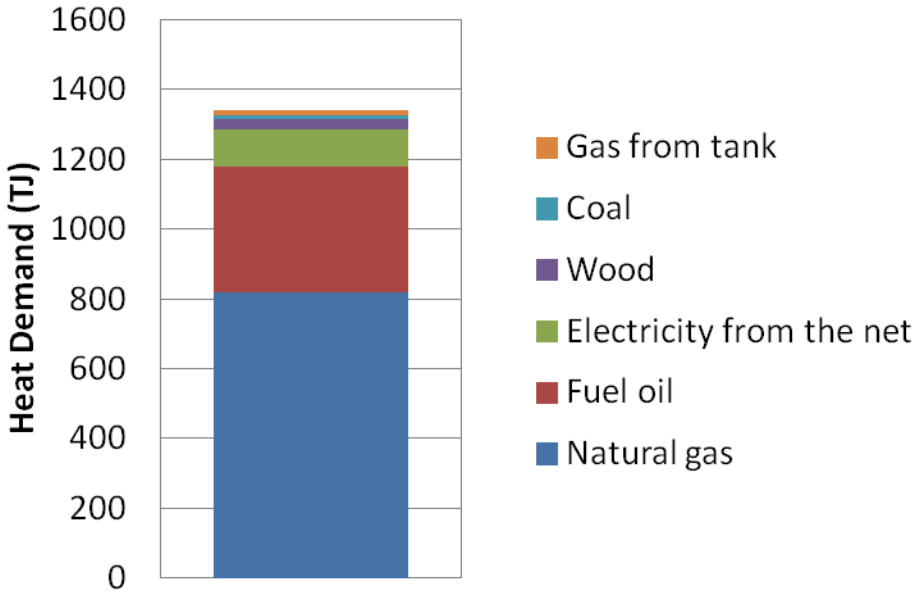


*http://www.heatroadmap.eu/maps.php

Current energy mix for the city of Genk

	%*	Heat demand Genk (TJ)	Heat demand Hesselt (TJ)	EUR ($x10^6$)
Natural gas	61	405	412	12,13
Fuel oil	27	179	183	9,05
Electricity from the net	8	53	54	8,19
Wood	2	13	14	0,21
Coal	1	7	7	
Gas from tank	1	7	7	
Total	**100**	**664**	**676**	**29,57**

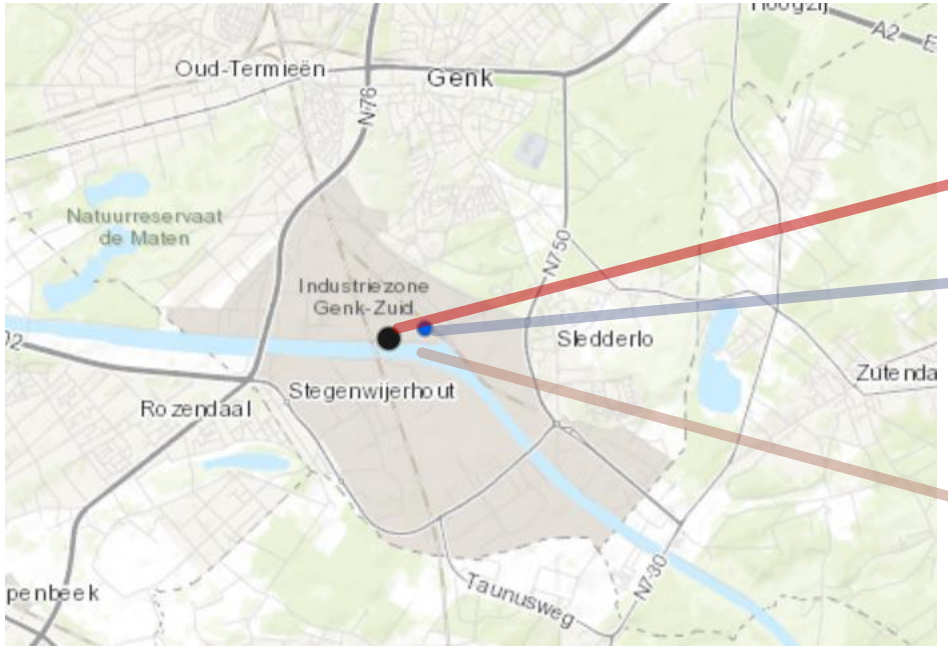
Energy source	(EUR/KWh)**
Natural gas	**0,0534**
Fuel oil	**0,09**
Electricity from the net	**0,275**
Wood	**0,028**



Current energy mix for the cities of Genk and Hesselt

*Main heating source - Flemish region , 2010
** Eurostat

Overview of the concept
Strategy for the heating source



Thermal Power Generation for electricity production (coal → wood palets?)

Iron and steel manufacture

Total theoretical excess heat annually : 0,48 PJ
- >100°C temperature
- Base load

New CHP plant

- Potential : Nuclear at about 50% of electricity production to be banned till 2050.
- Belgian framework : biomass too expensive, coal not possible → gas

- Mines (~35°C) possible usage as storage
- Possibility to use central solar, but in a small scale (land too expensive)

Main problems and challenges of the H&C systems

- Tradition/ mindset/acceptance
- Low gas price / concentrated gas grids
- High investment cost / time delay / long term investment
- Demand high support from local authorities (obligation to connect, low taxes if connected,..) / financial facilities (banks,..)

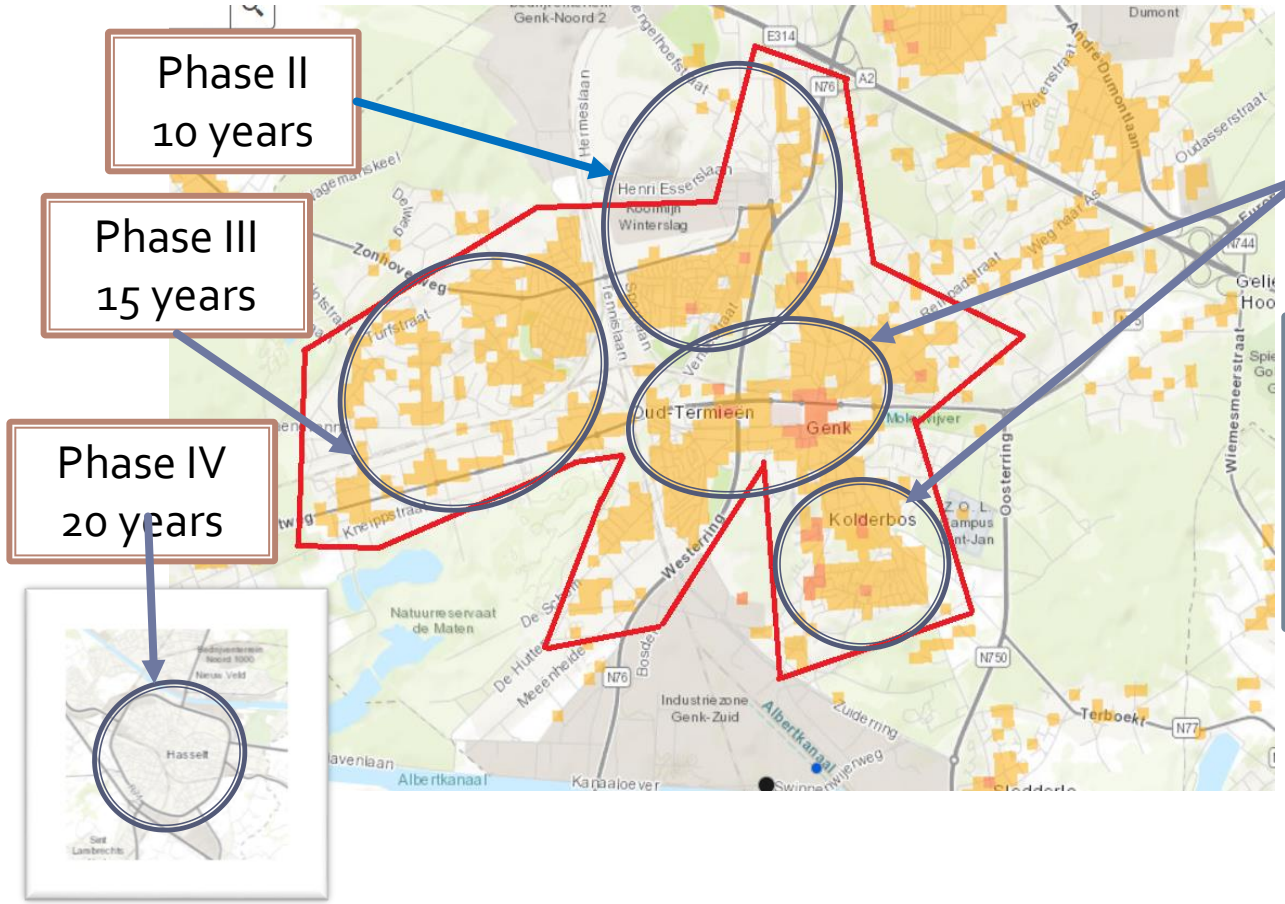
GOALS

✓Reduce CO_2 emissions

✓Gains for the local community

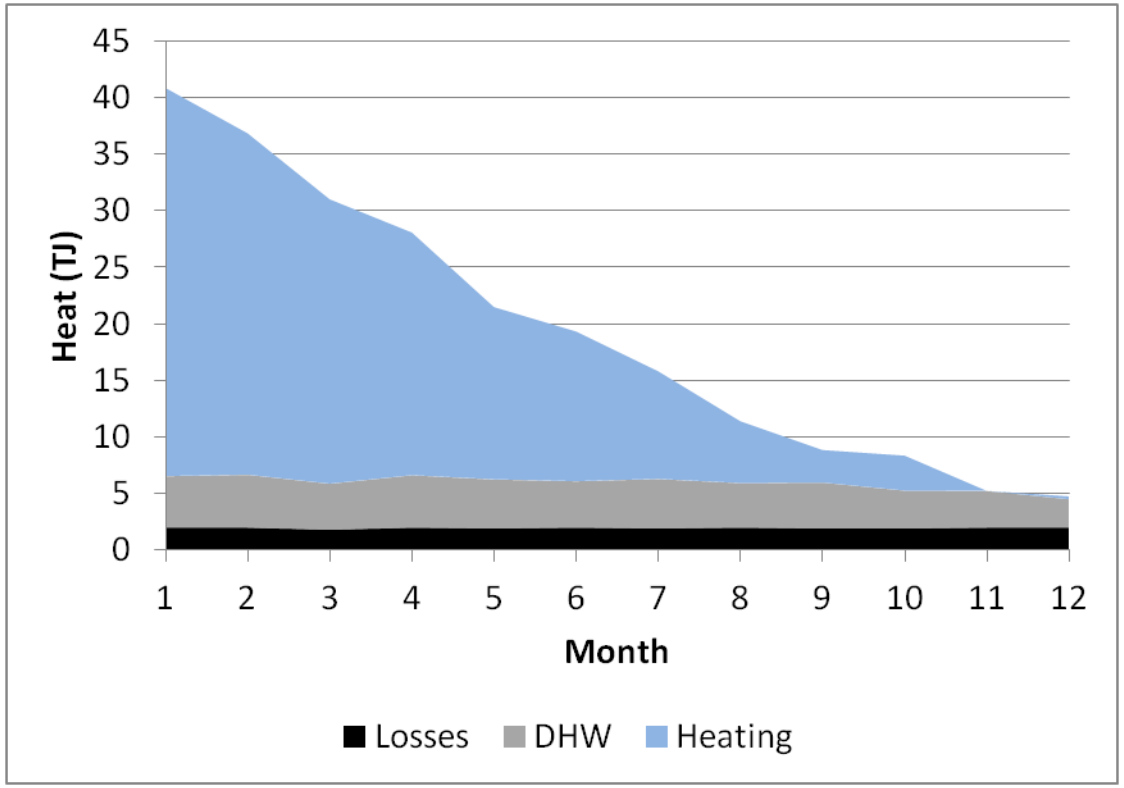
REDUCE CARBON footprint → DHC!

Overview of the concept



Cost:
Phase I – 13 m€
Phase II – 18 m€ + storage
Phase III – 30 m€
Phase IV – 50 m€

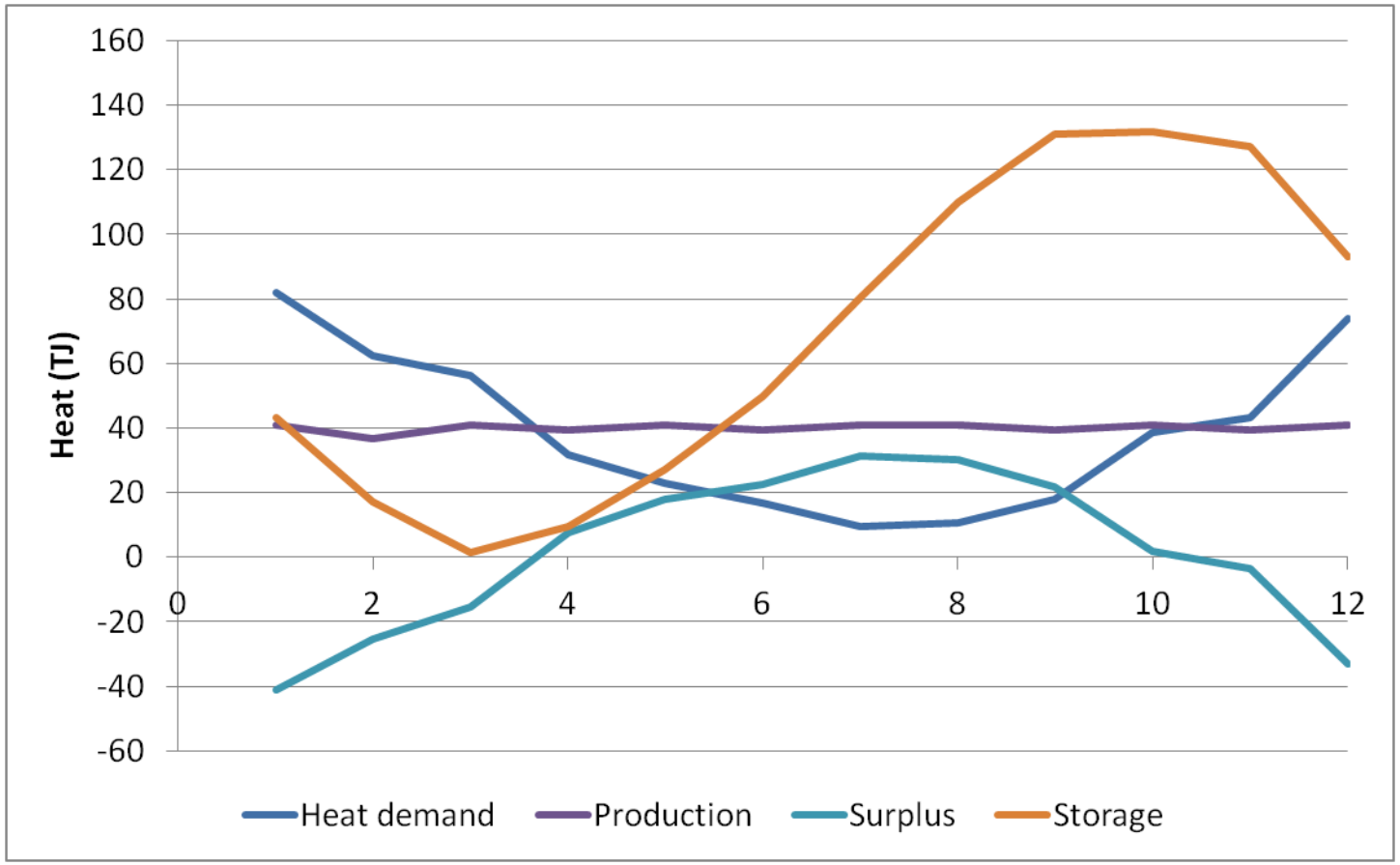
Overview of the concept
First step : Excess heat of steel industry as heat source



Phase I + Phase II : Load duration curve for the full potential of the steel factory without storage for the city of Genk

	EUR ($x10^6$)
Network cost	31
Substations cost	8
Cost for installations in production site	8
Total	**47**

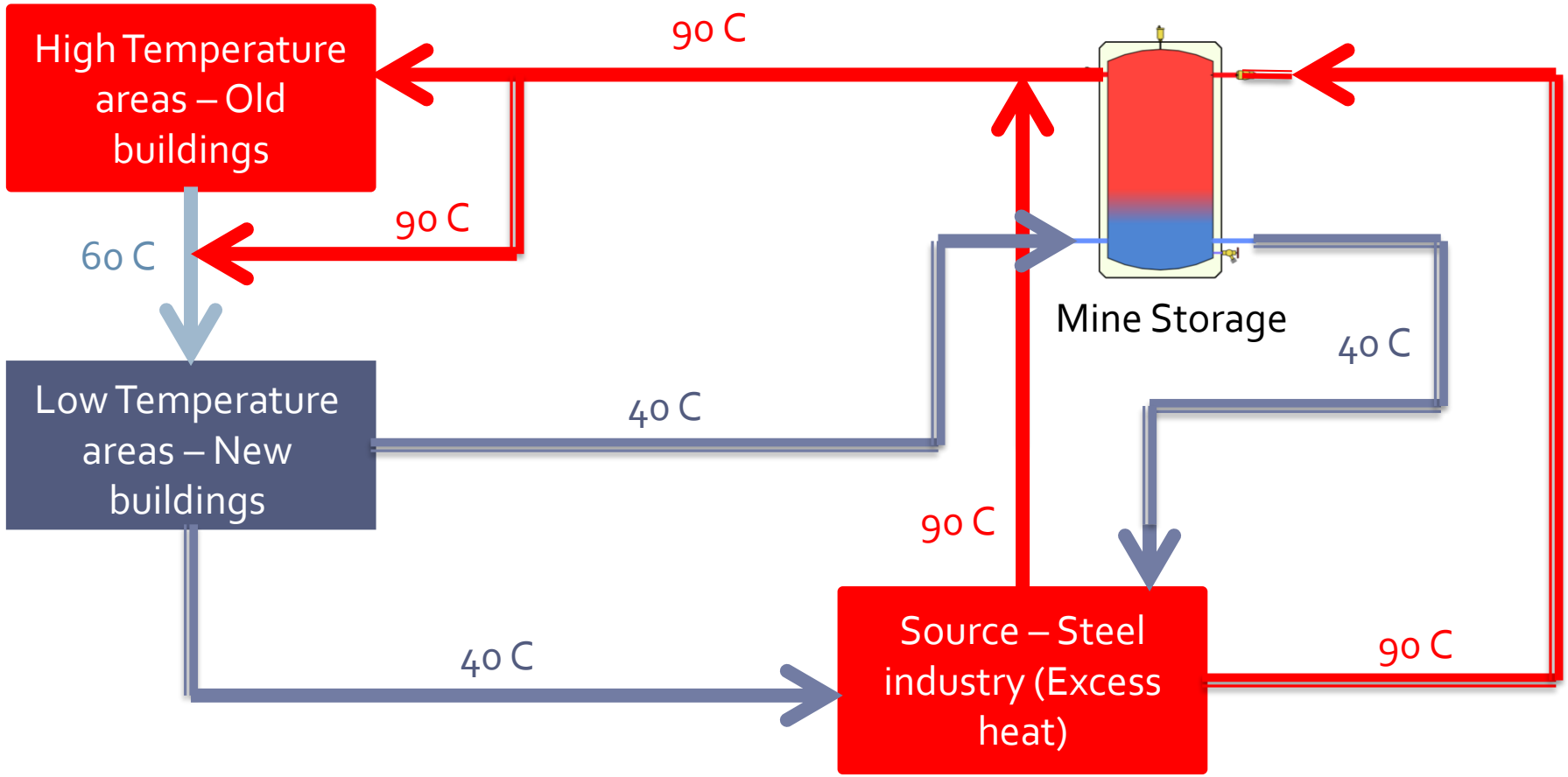
Overview of the concept
Second step : Addition of storage



Energy	130TJ
DT	30/ 50°C
Volume	1 / 0.6Mm3
Cost (pit storage)	16M€

Assuming 45% of losses

Overview of the concept
Proposition of a cascade network for the LT district

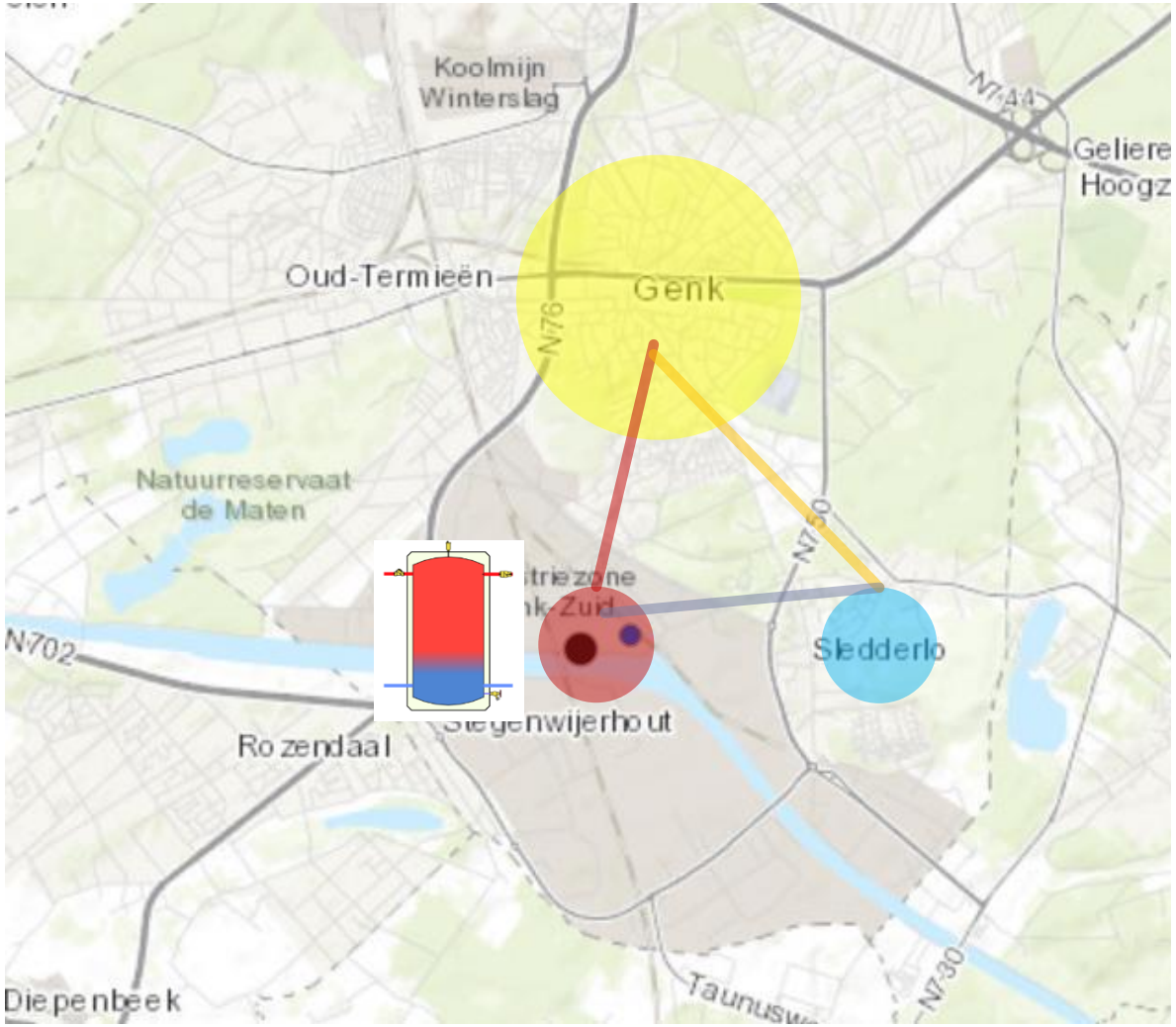


Planning of the DHN

- Total overview

Heat demand	Distribution cost capital	Substation cost
TJ/km2	EUR/MWh	EUR/MWh
85	20.47	7.69
210	10.76	7.69

Total Cost (Meuros) for genk	60
Total Cost (Meuros) for Hasselt	50
Total Cost (Meuros) for storage	<16



Organisational steps and measures

- Involving customers
- Involving local authorities
- Framework conditions , policy makers

- Building energy efficiency measures – Regulations
- Premium tarifs for DH
- High tax on fossil fuels
- Integrate DH pipe works when developing new cities

Thank you!