Comfortably warm
Pleasantly cool with
Mine water

MINE WATER, A BASIS FOR SUSTAINABLE ENERGY

WWW.MIJNWATER.COM

October 2015
Minewater Heerlen
Workshop New Concepts Geothermal EraNet

Development of carbon neutral areas with thermal smart grids and geothermal

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1. System development:
   - Minewater 1.0 (past)
   - Minewater 2.0 (present)
   - Minewater 3.0 (next step)
   - Summary

2. Roadmap to carbon neutral areas
Minewater Heerlen
Location Minewater Project
Minewater 1.0
Pilot (2008–2013)

- Traditional network (tree)
- Only heat and cold supply
- Simple change-over-system
- Minewater as source
- Bivalent energy stations (HP + Boilers + Chillers)
- Mijnwater owner and operator grid

CO₂-Reduction 35 %
Minewater 1.0
Minewater as source

Minewater as source = limited capacity or depletion
Minewater 2.0
Clusters of buildings (since 2013)

- Hydraulic cloud network
- Instant heat/cold exchange
- Minewater as storage
- Fully demand driven
- Bidirectional wells
- Multiple sources
- All electric (100% HP)
- Mijnwater owner/operator network & energy stations

CO₂-Reduction 65 %
Minewater 2.0
Minewater as storage

Minewater as storage = regeneration = no depletion = increase capacity
Minewater 2.0

Smart grid: 3 levels of control

- Building Temperature
- Cluster Flow
- Minewater Pressure
Minewater 2.0
Smart grid: Exchange!

Artist impression Minewater 2.0 with geographically dispersed Minewater Installations (MI)
Minewater 2.0
Advanced process control

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Minewater 3.0
The NEXT step!

Balancing with.....

Time

CO$_2$-Reduction 80-100 %

INTELLIGENCE
Minewater 3.0
STORM (Self-organizing Thermal Operational Resource Management)

INTELLIGENT TOP LEVEL CONTROL FRAMEWORK

- Self-learning
- Adaptive

Week/month

- Heat
- Cold

Season

- Peak shaving
- Valley filling

Market interaction

Power

Time

- €MWh

Cell/cluster balancing

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with Mine water

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Summary

- Transition Minewater project Heerlen into a hybrid sustainable thermal smart grid:
  - Cloud structure (3 levels of control/decentralized)
  - Exchange (reuse; prosumers)
  - Storage (time)
  - Multiple sources (hybrid)
  - Intelligence (Demand & supply side management)
  - All-electric
  - Integratable with (smart) electricity grid
  - Low-exergy (LT-heating & HT-cooling)

- Increased CO$_2$-emission reduction:
  - 1.0: 35%; 2.0: 65%; 3.0: 80–100%

- Concept replicable for future DHC-systems:
  - Not restricted to old mining areas
  - Blueprint for sustainable thermal smart grids