Sound business case

Mijnwater B.V. offers commercial services to building owners for sustainable energy support. The building owner pays a standing charge for the minewater connection and runs his own heat pumps on the mine water source. Or Mijnwater is also owner and operator of the energy plant (heat pumps included). In that case advanced energy saving and further improvement of the hybrid sustainable energy structure is in reach at a very low CO_2-burden. The fees for the heat and cold supply are based on avoided costs by using gas boilers, electrical chillers and avoided additional measures for meeting the strict Heerlen energy performance regulations.

CO_2-exhaust is reduced by 65 % for the connected buildings

In the roadmap to energy neutral - in 2040 as a local ambition - a diversion can be made in measures on building, on area and on national level. On each level the most cost effective measures can be taken, where Mijnwater is covering the area level. As such the design of buildings is less costly and more architectural freedom is provided. Moreover areal claims for sustainability are reduced (e.g. wind mill planning, large biomass cultivation, increased electrical infrastructure, etc.). In establishing a thermal grid Mijnwater is investing in reduction of energy use and in improving the efficiency of green support. Based on the energy bill - 50% of conventional energy costs due to saving measures in the buildings - the expenditures for internal comfort are shifted from the import of fossil fuels to investments in green infrastructure. For the Heerlen region this sums up to a saving of € 360 million per year, while CO_2-exhaust is reduced by 65 % for the connected buildings.

Comfortably warm
Pleasantly cool
with Mine water

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MINE WATER, A BASIS FOR SUSTAINABLE ENERGY
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MINE WATER

STARTING POINT FOR SUSTAINABLE ENERGY IN HEERLEN

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HOW IT ALL BEGAN...

In the twentieth century the Dutch government dug a vast system of mine passages in and around Heerlen for the extraction of coal. Coal mining was the most important economic base for the Oostelijke Mijnstreek (eastern mining region) and Heerlen in particular.

History repeats itself. Where once miners worked in blood, sweat and tears to provide our nation with the fossil energy needed, today we stand figuratively on their shoulders to generate to sustainable energy of the future.

Underground water reservoir

Tens of thousands of miners and their families and those in related sectors lived from the mining industry. After the closure of the mines in the period 1965-1974 the tunnels filled with groundwater, which was heated by the earth naturally. The deeper in the earth, the higher the temperature of the water. Yet decades passed before research was conducted into the development of low temperature sources in the coalfields, now a mine water reservoir.

Renewable energy production with thanks to former miners

In 2003 the municipality of Heerlen conceived the plan to do some exploratory drilling for the appraisal of potential renewable energy production. During the planning stage (2003) the project gained valuable knowledge from former miners who knew exactly where to drill straight into the ground to depths of up to 700 metres to bring the water to the surface. Following the closure of the mines the entrances – the mine shafts – were completely blocked off with concrete and debris, referred to as a 'plug'. This precluded any possibility of pumping up the mine water directly through the mine shafts.

It soon turned out that the geothermal source – the mine water – could be used to meet future energy needs. Not only did the deep groundwater prove suitable for heating buildings, but the cooler water closer to the surface could also be used to cool buildings and homes, effectively recovering heat energy. That was the start of a successful initiative of the municipality of Heerlen – the Mine Water project.

First mine water geothermal plant

In 2005, with support from the EU and Agentschap NL, five wells were drilled and an underground piping system stretching approximately 8 kilometres was built to circulate water. In 2008 the first mine water geothermal plant in the world, Gen Coel in Heerlerheide, was put into operation and the first connection serving approximately 30,000 m² of indoor space was established. Not long after followed the connection to Statistics Netherlands (CBS), with 22,000 m² of indoor space.

The future

In the meantime the Mine Water project has developed into an independent company Mijnwater B.V. with 7 connections and several under preparation. The company is an active partner in the field of innovation with partners throughout Europe. Focusing on the future but well aware of its past.

The municipality of Heerlen is proud of this achievement. Heerlen and the region has taken an ambitious commitment for energy transition: energy neutral in 2040. Again Mijnwater B.V will take up its role. Energy transition is not about talking but about acting. Heerlen takes action!

Jordy Clemens
Alderman for Education, youth, cultural heritage and sustainability, Municipality of Heerlen

A hybrid sustainable thermal smart grid for heating and cooling

Some buildings, like older dwellings, are in a nearly constant need of heat, while others, like data centers, need cooling. Might both be connected by a thermal grid the heat surplus of the data center will serve the heat demand of the neighbour, who in turn produces cold for the first. In Heerlen the thermal smart grid is organized in clusters linked to a mine water backbone. The cluster grids are designed as a two-pipe system with ultra low heat (26-28 °C) and high temperature cooling (16-18 °C).

Each building -or building area- is connected to a decentralized energy plant with heat pumps, additional renewable energy support and/or energy buffers. These energy plants are to feed the building demand, but also maintain the temperature conditions in the grid. The backbone serves to exchange energy between the cluster grids and is linked to an underground mine water reservoir. Production wells supply the shortage of heat and cold to the mine water backbone. Surplus of heat and cold will be stored in the reservoir through injection wells. In the future all wells will become bidirectional for synchronous production and injection of mine water and for capacity enlargement.

Low losses and high efficiencies due to the low exergy principles within the system

By the mine water reservoir a huge (geo-) thermal storage capacity is available. More than two million m^3 of water can be charged with a temperature variation of 10 - 15 °C, which gives the capacity of over two million Tesla power walls. Moreover the thermal mass in the buildings and the grid is utilizable and additional buffers on building and cluster level are used. By this storage capacity a shift of energy exchange in time is possible. Through long-term seasonal buffering summer heat (from cooling or solar collectors) can be stored for the winter time. By mid-term buffering (weeks/month) peaks can be significantly reduced within cluster grids to increase the capacity. Following from the thermal mass connected to a large cloud of heat pumps the hydraulic grid is able to stabilize fluctuations in the electricity grid caused by green electricity generation (e.g. solar/wind power). Important for advanced management of energy is a high level of intelligence. Optimized monitoring and control strategies enable high efficiencies at lower investment and exploitation costs. Heerlen is partner in the Horizon2020 project STORM, which is developing a top-level control framework for thermal grids (http://storm-dhc.eu).