



District heating as key enabler for climate neutrality in Gothenburg

Gothenburg, Sweden

IN A NUTSHELL

The Gothenburg municipal power company has built an accumulator tank for short-term heat storage and optimising energy supply and demand while reducing the city district heating network's fossil fuel dependency.

Energy transition governance in Gothenburg

Following the Paris Agreement, Gothenburg aims to become climate neutral by 2030. To meet this challenge, the city has explored different opportunities for its citizens to address climate change. For instance, Gothenburg was one of the first cities to issue green bonds in 2013 to help finance sustainable and innovative projects and strategies. The city is also a signatory to the EU Covenant of Mayors commitment to reduce 40% of its GHG emissions by 2020 compared to the levels in 1990.

In 2021, Gothenburg published its local climate plan "[Environment and Climate Programme for the City of Gothenburg 2021-2030](#)". Through this programme, the city intends to lay the foundations for transitioning to an environmentally sustainable and climate-neutral society by 2030. While the strategy has three main points of focus – nature, climate and people – one of the principal targets is the transition of the city's energy supply. Gothenburg's development of a clean energy system is characterised by several heating and power plants that produce both heat and electricity through the partial use of fossil fuels.

Decarbonising the energy system

Gothenburg is currently working with its municipally-owned local power company, Göteborg Energi, to decarbonise its energy system and become climate neutral by 2030. Göteborg Energi provides Gothenburg with both electricity and heat and owns and operates the sole district heating and cooling (DHC) network in the city. The 1,350 km network supplies heating and cooling to over 90% of apartment buildings and to around 12,000 detached homes and factories, businesses and public buildings. The district heating and cooling network is supplied by heat recuperation from waste incineration, oil refinery activities and electricity production.



Accumulator tank next to the Rya combined heat and power plant © Björn Ekbohm

GOTHENBURG



Statue of Poseidon, Gothenburg © Frida Winter

Population: 604,829 (2020)	Area: 447.84 km ²
Signatory to the Covenant of Mayors since: 2008	Overall CO₂ emission reduction target: 40% (CoM target) Climate neutrality by 2030

District heating in Gothenburg was first introduced in 1950 and since 1980 the city has invested in promoting clean energy generation using biomass (19%) and heat recuperation. Today, only 11% comes from fossil fuels and the city aims to be wholly reliant on renewable energy by 2025. To achieve this goal, between 2018 and 2021 Gothenburg and Göteborg Energi constructed a thermal energy storage tank to integrate thermal energy storage in the district heating system. This allows the district to accumulate thermal energy during summertime when demand is lower.

Setting up thermal energy storage capacity

Built next to the company's combined heat and power (CHP) plant in the city's harbour, the tank works in principle like a thermos flask. It measures 56 meters high and 23 meters in diameter and can hold around 23,000 cubic meters of water heated to 100-110 °C, using energy from any available heat source. The objective of the tank is to create a thermal energy buffer for when energy demand is higher. During peak hours, instead of starting the gas-driven CHP plant, the stored thermal energy can be used to heat the city's buildings and reduce or eliminate the need for burning fuel. The thermal accumulator has a capacity of 1 000 MWh of energy, sufficient to heat up to 70 houses for an entire year.

By reducing fossil fuel dependency during peak hours, the thermal tank contributes to reducing CO2 emissions from heating. The heat source for the tank will be the nearby CHP plant, which will be fuelled by biogas as well as wood chips and forestry waste.

By 2025, the tank will store heat derived entirely from renewable and recycled energy sources, reducing the need to burn biomass (with a positive impact on air quality) and increasing the share of recycled heat in the district heating system.

Lessons learned

A few lessons can be drawn from the construction of the thermal tank with respect to its use for cities of a certain size. Firstly, the capacity of the accumulator must match the size of the district heating network to create real benefits and, secondly, heat and power price fluctuations over the years must be taken into account in terms of economic benefits. Gothenburg is considering additional future measures, such as largescale geothermal energy and improving energy efficiency in buildings to reduce the overall need for heating. The fossil fuel-fired generation plants will be decommissioned or converted to renewable fuels by 2025 in order to achieve the city's goal. A challenge for such a transition is the investment required, which must be made in a relatively short period.

USEFUL LINKS

- » [Timelapse video of construction:](https://www.youtube.com/watch?v=Ili6aUVirmc)
- » [Video of the project \(in Swedish\):](https://www.youtube.com/watch?v=Cbliy4OVtRY)



1,000 MWh of energy storage for a full tank

130 MW maximum power

100-110 °C water temperature in the tank

100% renewable and recovered energy in the DHC by 2025



FINANCING THE PROJECT

- + **Göteborg Energi:** SEK 150 million (EUR 14.7 million)
- + **Expected RoI:** 10 years (2018)



CONTACT

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