

# Large biomass CHP plant in Stockholm, Sweden

One of the largest biomass fired combined heat and power plants in the world

<b>Year of implementation:</b>	2016
<b>Location:</b>	Värtahamnen Stockholm, Sweden
<b>Technology:</b>	Based on efficient combustion by circulating fluidized bed (CFB) technology with high steam data to obtain high electricity through heat ratio. Energy is recovered from the flue gas before the stack by condensing water vapor in the flue gas. Flue gas emissions are very low.
<b>Principle feedstocks:</b>	Forestry residues and wood wastes
<b>Products/markets:</b>	Heat (district heating) and electricity
<b>Technology Readiness Level (TRL):</b>	TRL 9 – actual system proven in operational environment

## DESCRIPTION

Fortum Värme supplies on annual basis approximately 8,300 gigawatt-hours (GWh) heat to the Stockholm district heating grid, 400 GWh district cooling and 1,500 GWh electricity. District heating covers well over 80% of overall heating demand in Stockholm. The aim is that district heating in Stockholm will be entirely produced from renewable and recovered energy no later than 2030.

An important step to reach this goal is the new biomass fired CHP plant (KVV8) at Värtaverket, situated in the harbour of Stockholm, which represents a proof of concept when it comes to large scale production of sustainable district heating. It is a large scale set up in an urban environment with high demands on local environmental performance (in terms of emissions, smell, water treatment, noise, safety, transport movements). The plant has a production capacity of 280 MW heat and 130 MW electricity, making it one of the largest biomass fired CHP plants in the world. The plant will produce 750 GWh of electricity and 1,700 GWh of heat each year – enough to heat nearly 200,000 apartments. The project will reduce CO<sub>2</sub> emissions related to heat provision in Stockholm by about 126,000 t/per year. The global CO<sub>2</sub> emissions will decrease by 650,000 tons annually, based on an assumption that fossil power production within the north Europe power grid will be replaced. The project represented a total investment of around 500 MEuro.

The fuel, which is produced from waste and residues from the forestry industry, is transported to Värtahamnen mainly by ships and trains. The plant's biomass demand is 12,000 m<sup>3</sup>/day and 3 million m<sup>3</sup>/year. About 60% arrives by boat and is imported from the Baltic Sea area; around 40% arrives by train and is mostly domestic. All fuels will be verified according to FSC Controlled Wood.

<b>Stakeholders involved:</b>	<p>Fortum Värme is jointly owned by Fortum and the City of Stockholm (50/50).</p> <p>Other stakeholders involved: employees, shareholders and investors, policy makers, customers, neighbours, NGOs</p>
<b>Contribution to Sustainable Development Goals:</b>	<p>The project contributes to the following SDGs:</p> <ul style="list-style-type: none"> <li>• SDG 7 (sustainable energy), producing sustainable district heating for nearly 200,000 households per year;</li> <li>• SDG 13 (climate change), reducing CO<sub>2</sub> emissions in Stockholm by about 126,000 t/year, and global emissions by 650,000 t/year with renewable electricity being produced and exported to Europe. This reduces the need for electricity produced from fossil fuels.</li> <li>• SDG 3 (healthy lives), setting up the plant in an urban environment with high demands on local environmental performance. It represents an advanced modernization of the district heating system in Stockholm that will use fuel more efficiently and significantly reduce emissions.</li> <li>• SDG 15 (sustainably managed forests), with Fortum Värme being the first energy company in Europe to have the Forest Stewardship Council's (FSC) Chain of Custody (CoC) certification. All fuels will be verified according to FSC Controlled Wood by 2016 and by 2020 the goal is that 50 % of the fuel is sourced from FSC certified forestry.</li> </ul>
<b>Employment:</b>	<p><i>No information available</i></p>
<b>Replicability and scale-up potential:</b>	<p>The plant is the largest in the world originally designed for 100% biofuel and combined production of electricity and district heating.</p> <p>It demonstrates that it is possible to build such facilities in large cities that have district heating systems. Alternatively, focus can be on electricity production but then the heat from the turbine must be cooled off as in a thermal power plant.</p>
<b>Success factors:</b>	<p>Using waste products as a fuel</p> <p>CO<sub>2</sub> reduction targets in Stockholm and Sweden. The project delivers a major contribution to decarbonize heat/energy provision in Stockholm</p> <p>Accessibility (harbor)</p>
<b>Constraints:</b>	<p>Regular flow of fuel transports by ships and trains. The plant has high fuel demand (12,000 m<sup>3</sup>/day and 3 million m<sup>3</sup>/year).</p> <p>Värtaverket is close to residential areas which puts high demands on noise reduction, safety and a good dialogue.</p>



*Värtaverket biofuelled CHP plant in Stockholm*

<b>Info provided by:</b>	Mats Strömberg, Fortum
<b>More information:</b>	<p><a href="https://www3.fortum.com/about-us/our-company/our-energy-production/our-power-plants/vartaverket-chp-plant">https://www3.fortum.com/about-us/our-company/our-energy-production/our-power-plants/vartaverket-chp-plant</a></p> <p><a href="https://www.fortumvarme.se/content/uploads/2017/11/Fortum-V%C3%A4rme-Annual-Green-Bond-Report-2016-pdf.pdf">https://www.fortumvarme.se/content/uploads/2017/11/Fortum-V%C3%A4rme-Annual-Green-Bond-Report-2016-pdf.pdf</a></p> <p><a href="https://www.andritz.com/resource/blob/242422/57f35b59873193b445ec8004fec7338b/pp-power-systems-powerfluid-vaertaverket-story-data.pdf">https://www.andritz.com/resource/blob/242422/57f35b59873193b445ec8004fec7338b/pp-power-systems-powerfluid-vaertaverket-story-data.pdf</a></p> <p><a href="https://bioenergyinternational.com/heat-power/biomass-and-the-city">https://bioenergyinternational.com/heat-power/biomass-and-the-city</a></p>