

VÄRTAVERKET SUPPLIES RENEWABLE ENERGY TO MOST OF STOCKHOLM USING HEAT PUMPS



Summary of the project

Värtaverket in Stockholm is one of Europe's largest plants for production of district heating, district cooling and electricity. Located in center of town makes Värtaverket a well-known part of Stockholm's city profile. It's a top modern world unique cogeneration plant attracting international visitors. Värtaverket also includes Ropsten which is a heating plant consisting of several heat pumps centered in the harbor by the sea.

- Four heating plants where the boilers are powered on both oil and electricity (816 + 153 MW)
- Three cogeneration plants running on oil/biooil (607 MW), coal (454 MW) and biofuel (380 MW)
- One gas turbine running on oil for electricity production (180 MW)
- One district cooling plant including heat pumps/ chillers (24 MW cooling and 36 MW heating during winter)
- Two heat pumps (Total 50 MW heat) running on electricity but also heat from flue gases.

“A TOP MODERN WORLD UNIQUE COGENERATION PLANT ATTRACTING INTERNATIONAL VISITORS.”

- Including Ropsten there is 10 additional heat pumps (21-22 MW heat each); two electric boilers (80 MW) and one more district cooling plant (50 MW).
- In total, a fuel and electricity input of approximately 2750 MW.

Värtaverkets first heating plant has been in operation and connected to the district heating grid since 1969. The plant has gradually expanded and today it covers most of Stockholm's heat demand.

With its 370 km long distribution network and its 35 400 m³ water circulating, Värtaverket is delivering heat and cooling all year. Heat is mainly produced by



cogeneration plant and/or heat pumps, depending on fuel and electricity prices and heat demand. When it's cold outside there are hot water boilers to put in operation to supply district heating. A non-pressurized hot water accumulator holding up to 40 000 m³ water are used to equalize variations in the network. The accumulator stores up to 2 GWh of heat.

The district cooling plant consists of four chillers with heat pumping capacity during winter. The chillers always deliver cooling during operation. The heat that usually goes to waste in the process of cooling district cooling water is used by the heat pumps in the winter and in the summer the heat drops into the sea. During summer the four chillers produce a total of 48 MW cooling and during winter in heating mode 24 MW cooling and 36 MW heat. In the summer the cooling capacity is greater due to lower temperature in the condenser.

There is a total of 12 heat pumps and four chillers, also used for heat production, in Värtaverket including Ropsten. These are using heat from the nearby sea to produce district heating. Together they have an approximate heat output on 300 MW. All heat pumps are filled with R134a, approximately 208 tonnes spread on 12 heat pumps and four chillers.

Värtaverket produces renewable energy to approximately 190 000 apartments and electricity to be able to run 150 000 electric cars. This results in reduced carbon dioxide emissions by 130 000 ton in one year in Stockholm. The renewable electricity competes with fossil power generation in the Nordic region and Europe. This results in 460 000 tonnes less carbon dioxide per year.

Results

- The clean air of Stockholm is much thanks to the energy efficient technology at Värtaverket
- Utilization of heat in nearby waters
- High energy efficiency producing both heat and cooling using heat pumps
- Covering most of Stockholm's heat demand

FACTS ABOUT THIS PROJECT

Building type: Residential and commercial buildings

Heated floor area [m²]: Up to 190 000 apartments

Heat source: Sea water, biooil/oil, biofuel, coal, electricity, flue gas

Location: Stockholm, Sweden

Company: Stockholm Exergi

Link to web page or report:

<https://www.stockholmexergi.se/content/uploads/2018/04/Milj%C3%B6rapport-V%C3%A4rtaverket-2017.pdf>

(in Swedish)

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**IEA Technology Collaboration Programme on
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