Open District Heating

Recover excess heat and sell it to Fortum Värme

There is a large amount of surplus heat in Stockholm that no one is making use of. With Open District Heating we can recover the heat instead of using fans to carry it away. Our innovative business model enables companies to convert costs into revenue. We offer long-term and transparent terms for trade in excess heat and surplus capacity in heating and cooling systems.

Large as well as small companies and businesses, whatever their circumstances, can participate in the scheme to sell their excess heat to Open District Heating. The aim is always to achieve profitability and efficiency for both suppliers and Fortum Värme.

All companies and businesses which have excess heat and are located close to our district heating or district cooling networks are able to sell energy to us at the market price. While we have been developing the new business model for recovered heat we have simultaneously been laying the foundations for the next generation of urban energy systems. We hope that Open District Heating will in future lead to more sustainable cities in Sweden and internationally.

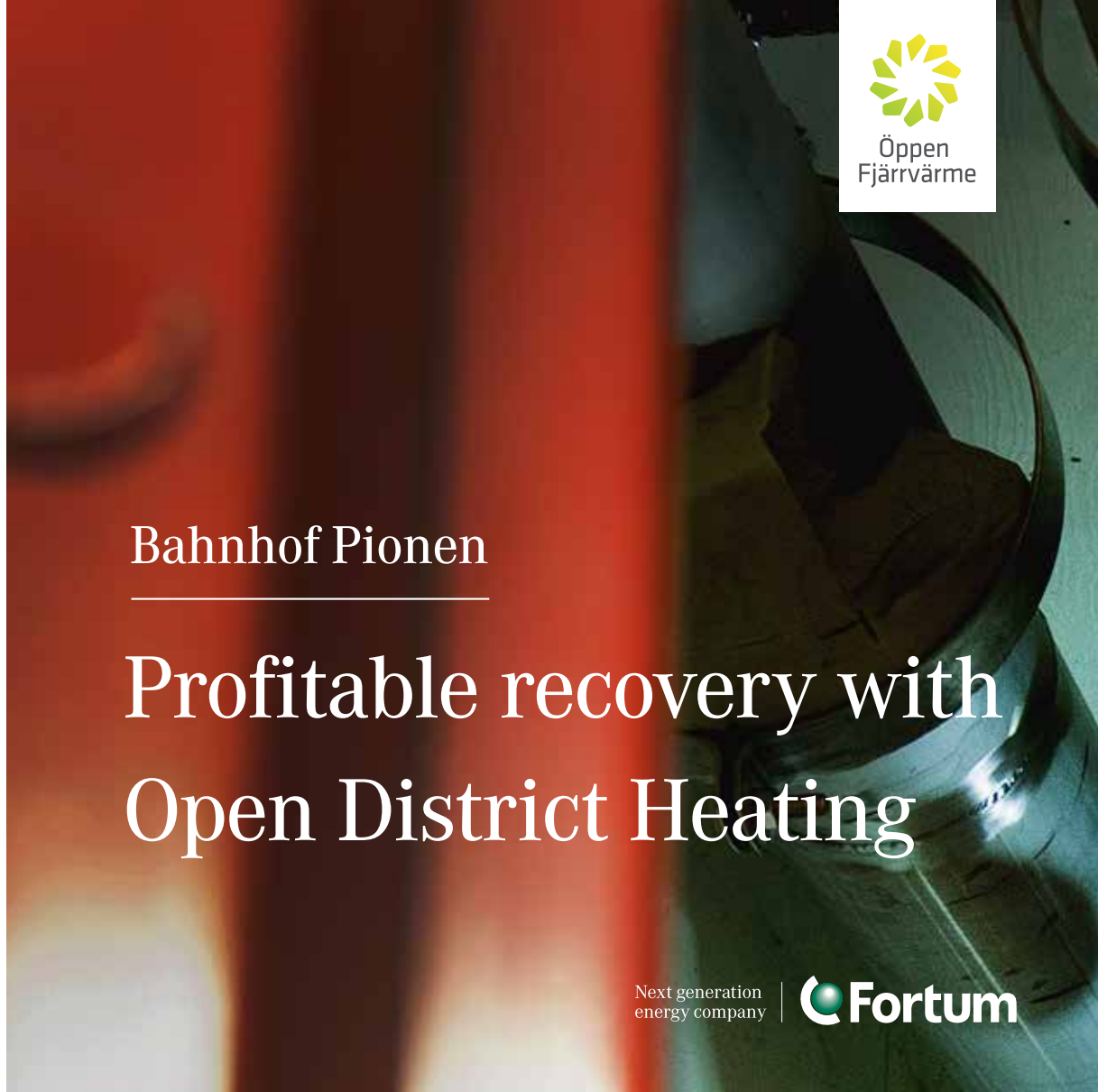
Open District Heating has been developed by Fortum Värme together with, among others, the City of Stockholm, Bahnhof, Coop, ICA, Stiftelsen Stora Sköndal and Hemköp.

The value of Open District Heating to data centres:

- cost-effective solution for process cooling
- opportunity to create redundancy in the cooling system for increased reliability
- heat recovery forms part of sustainability efforts

Next generation energy company | Fortum

PHOTOGRAPHY: KRISTINA SAHLÉN



Öppen Fjärrvärme

Bahnhof Pionen

Profitable recovery with Open District Heating

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Bahnhof Pionen

Open District Heating gives the data centre a competitive advantage

Below the Vita Bergen park in Södermalm in Stockholm, the internet supplier Bahnhof has transformed an old rock cavity into a futuristic data centre, Bahnhof Pionen. The space now houses row upon row of cabinets, filled with computer equipment put there by Bahnhof's customers. And the cabinets are heated up. With increasingly densely packed and powerful hardware, a modern data centre becomes very energy intensive and the cooling system has to be dimensioned to handle this.

When Bahnhof took over Pionen in 2007 and rebuilt the rock cavity into a data centre, conventional cooling equipment was installed. The excess heat from the cooling plant facility was carried away by fans and released into the air outside the door to Pionen, where a characteristic plume of steam revealed that the business inside was wasting heat.

But already from the start, Bahnhof was thinking about doing something better with the surplus heat. There was enough surplus to provide heating to hundreds of apartments and Pionen is located in one of Sweden's most densely populated areas, in Södermalm in Stockholm. So why not re-use the energy? At the same time, Fortum Värme was looking for pilots for its project Open District Heating, which gives companies an opportunity to sell their surplus heat to the city's district heating network.

> We liked the overall impression of Open District Heating in terms of the financial, environmental and technological benefits it offers.
>
> Gustav Bergquist,
> Chief Technology Officer, Bahnhof

The solution was a new installation in which two heat pumps connected in series are used to cool Pionen. A new pipeline, 67 metres long, has been built to connect Pionen to the district heating network. Bahnhof now delivers its excess heat directly to the district heating network.

The amount of compensation that Fortum Värme pays Bahnhof for the supplied heat depends on the outdoor temperature. On a cold winter's day one megawatt hour can be worth ten times as much as on an ordinary summer's day. Bahnhof still knows that it has made a good investment.

Bahnhof has deliberately chosen to locate its server halls in central locations. Primarily because it enables the company to be close to its customers. But the sale of excess heat via Open District Heating has also resulted in a new way of looking at the financial aspect which strongly supports Bahnhof's strategy. Bahnhof believes that the financial conditions for IT operations will change substantially thanks to the opportunity to sell energy.

Sustainability aspects are also becoming increasingly important. Today customers of the IT companies demand that suppliers ensure that their production is sustainable and adapted to the environment, which gives Bahnhof yet another clear competitive advantage.

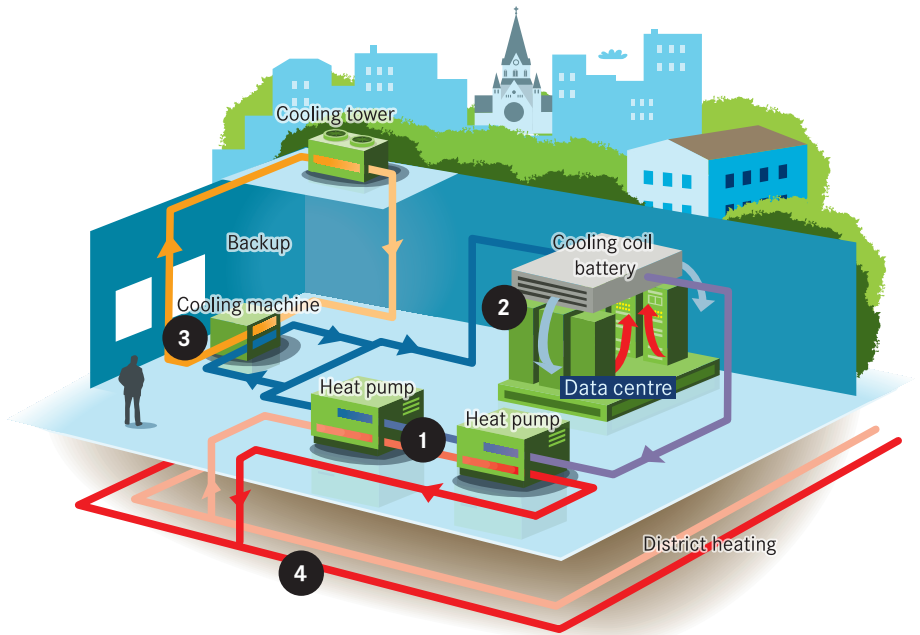
> We are talking about a new business model that makes it more financially viable to build a data centre near a district heating network than on a site where land is cheap.
>
> Gustav Bergquist,
> Chief Technology Officer, Bahnhof

2007: When Bahnhof opened the data centre Pionen the excess heat was released as a plume of steam straight into the street.

2014: Today the surplus heat is recovered and sold to Stockholm's district heating network.

Facts

Open District Heating for Bahnhof Pionen



1. 2 Carrier heat pumps connected in series. Cooling output 690 kW. Heat output 975 kW.
2. Data centre with cooling coil batteries.
3. Existing cooling machine with cooling tower (back up system).
4. Heat deliveries to the district heating network.

Installation

- In the data centre Pionen in Södermalm in Stockholm, Bahnhof has installed a cooling plant for primary cooling of the data centre which delivers the excess heat to the district heating network.
- The cooling facility comprises two cooling machines/heat pumps (Carrier 30XWH 802-HT) connected in series, with a total cooling output of 694 kW and a heat output of 975 kW. The plant is oversized to allow for an increase in the supplied output of the data centre as well as higher energy density.
- Fortum Värme has connected the property to the district heating network via a new, 67 meters long distribution pipeline (DN125). During normal operation the plant supplies heat of around 600 kW with a delivery temperature of 68 degrees Celsius.
- The heat pumps are constructed for pressure class PN16 on the condenser side so that they can be directly connected to the district heating network. The distribution pump for district heating overcomes not only the pressure drop in pipes and components but also a pressure difference between the supply and return pipes.

Operation

- The plant is controlled by regulating the temperature on both the cold and the warm side of the heat pump. On the cold side, the cooling agent must maintain the correct temperature. In case of failure the back up system, which comprises Bahnhof's old cooling machines, starts up.

Finance

- Bahnhof has invested a total of SEK 3.4 million in the new cooling plant, including heat pumps, pipe installation, hot tapping, electrical work, control equipment, construction and insulation.
- Fortum Värme has invested SEK 1.3 million in the new supply pipeline from Bahnhof's plant to the district heating network.