Seawater stored in rock in Stockholm provides efficient district cooling

With a water-filled rock chamber beneath Kungsholmen in Stockholm, the energy company Fortum has been able to substantially increase capacity in the city’s network for district cooling. The ordinary cooling plants can be phased out, and both high electricity needs and the risk of leakage of ozone-depleting substances will disappear along with them.

Traditional cooling machines are heavy consumers of electricity and may also, for example, contain freons. District cooling, which works like district heating but in reverse, is a good alternative.

The energy company Fortum, with support from the climate investment programme Klimp, has raised the capacity of the district cooling network by constructing a water-filled rock storage chamber beneath Hornsberg in Stockholm. The storage chamber was commissioned during the summer of 2009 and has made it possible to phase out cooling machines from the connected properties. The project is a good example of how smart energy distribution can lead to substantial improvements in efficiency.

**POSITIVE ENVIRONMENTAL AND ECONOMIC IMPACTS**
- At full capacity, electricity consumption can be reduced by 45 GWh per year.
- Cooling machines with a combined output of more than 80 kW can be switched off.
- Reduction in greenhouse gas emissions of 5,000 tonnes of CO2 per year.
- No leakage of ozone-depleting refrigerants.
- Reduced noise when cooling plants are removed.
IMPLEMENTATION

A rock chamber of 50,000 m³ was blasted beneath Kungsholmen in central Stockholm. The rock chamber was then filled with clean water that had been cooled using cold water from the bottom of the Baltic Sea. Cooling was delivered to the customers through heat exchangers and a pipe network to the connected properties. The large volume allows for what is known as 24 hour storage, where cooling can be topped up during the night so that it can meet day-time needs.

Storing cooling over the 24 hour period is not a new technology. However, laying the whole system below ground level is unusual and makes it possible to raise the capacity of the district cooling network even in densely populated areas. The large environmental gains are dependent on access to free cooling, for example from seawater or waste cooling with nearby installations.

The automatic phone and SMS text message service warning local residents of new blasting operations was greatly appreciated. The rock blasted away in construction was used to create a shoreline in the new Hornsbergs Strand housing estate. The facility has received a number of study visits and has also attracted attention in the daily and specialist press and on radio and television.

POTENTIAL AND FUTURE BENEFIT

There is a great global need for energy to cool buildings, including in countries in the temperate region. Energy-saving technical system solutions such as remote cooling offer great potential in many countries. District cooling can offer an energy-efficient and environmentally sound alternative to traditional cooling plants.

WHY BEST PRACTICE

The project has shown through its unique 24 hour storage that the capacity in a district cooling network can be substantially raised. Placing the installation in a rock chamber makes it possible to build stores within built-up areas. The results of the project indicate that there are good prospects of disseminating the technique to other places with extensive needs for district cooling. Fortum anticipates that continued connection to the district cooling network will reduce the need for conventional cooling plants by around 15 MW per year.

FOR FURTHER INFORMATION

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Contractors/providers:
SWECO designed the rock works.
Skanska Sverige AB blasted the rock chamber.
Skandinavisk Termoekonomi AB designed the technical installation.

The project on the Internet:
www.fortum.se/hornsberg
www.stockholm.se/klimatmiljo/klimat/det-har-gor-vi/algarderna

For further information on Best Practice:
www.naturvardsverket.se/mir
www.swedishepa.se/bestpractice

FACTS

Klimp Stockholm 2004
Action 2.0
Environmental investment: SEK 115.1m
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