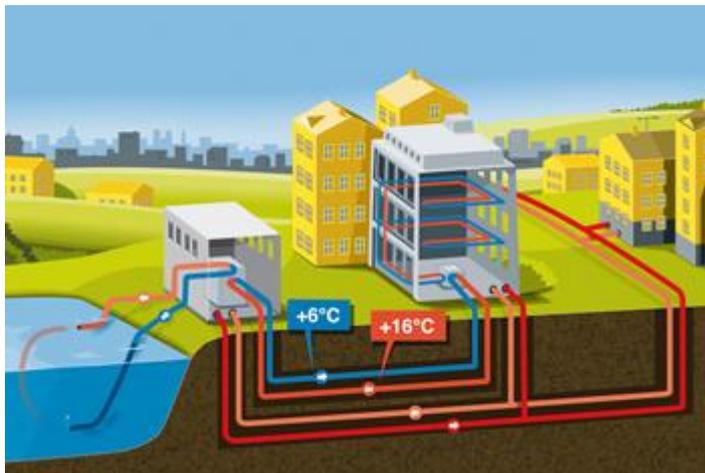


District Cooling System that uses heat



Main sector

- District energy
- Smart electricity

Overview

Currently, the heating system of the pilot area panel buildings is based on district heating networks with heat exchangers in boiler rooms. Hot water is produced locally with individual boilers that use electricity. The new district cooling system that will be installed in ca. 22 pilot buildings will use residual heat for producing water, which will be supplied through the existing district heating network. More specifically, this system will be based on a heat pump that, installed to return the flow of the district cooling system, will produce heat for the district heating system by using residual heat from cooling.

The district cooling system will use free solar energy from PV panels to cover a part of the cooling system's energy demand. As such, the use of fossil electric energy for producing hot water with electric boilers will be replaced with residual heat and electricity produced by PV panels. The solution will meet consumer demands for thermal indoor comfort and domestic hot water while retaining high energy efficiency and share of renewable energy. Piloting this district cooling system will be accompanied by an in-depth monitoring application (see more under [ICT solutions](#)) based on smart meters that collect real-time data on energy consumption and thus demonstrate the effectiveness of the solution.

The construction works of Fortum Tartu's district cooling plant and network were completed in May 2016. The first customer who joined the network was a shopping mall. The plant is located next to river Emajõgi, allowing to use river-cooled chillers that are a part of the high-performance production solution. Water from the river is used for free cooling from October to April. At the moment, Tartu's district cooling network is 1.6 kilometers long. The district cooling project will decrease the need of electricity by 70% annually compared to local cooling solutions. The decrease in electricity use will benefit the environment by reducing CO₂ emissions by 70%, i.e. 6,000 tons a year. The district cooling plan reduces the use of primary energy by more than three times.

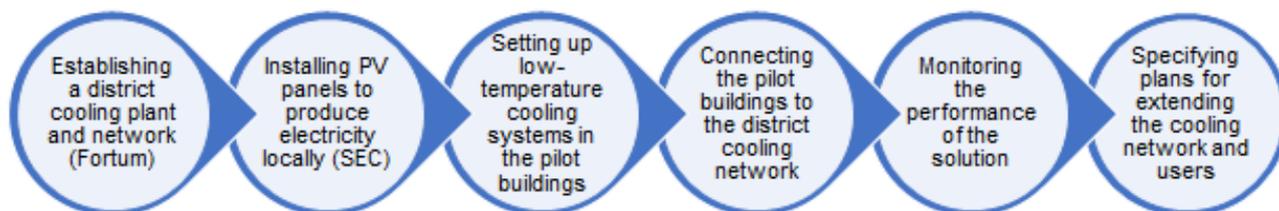
Business model

The main industry partner of this solution, AS Fortum Tartu, has a biofuel CHP plant in Tartu that ensures that most of the heat used in district heating is produced from renewable fuels. The total cost of the new cooling system investment is EUR 5.7 million, including a new cooling plant with the capacity of 13 MW. In cooperation with the SmartEnCity project, solar panels were installed to produce electricity from the plant’s own energy needs.

Citizen engagement

Informing the pilot area residents about the renovation activities and discussing any issues with them has been a crucial part of the planning and implementation process. For boosting participation and interest in the project, several measures have been taken into use, including regular information meetings, technical consultations and forum discussions (see more under [citizen engagement solutions](#)).

Process



Benefits

- Connecting a (commercial) property to the district cooling network removes the need for refrigeration equipment and additional cooling units on rooftops
- Increased resource and energy efficiency
- Transferring thermal energy that is in the wrong place to the place where it is needed
- Increased business reputation from using an environmentally friendly cooling solution
- Job creation
- Autonomy of fossil fuels and independence of energy supply
- Reduction of carbon emissions
- Increase in grid stability
- Stable long-term return on investments

Stakeholders

Owner of the solution	AS Fortum Tartu
Service/technology provider	AS Fortum Tartu
Users	Local businesses, property owners
Investors	AS Fortum Tartu, H2020



Investment/Finance

Ca. 6.4 M €

Potential for replication

District cooling systems are very beneficial in areas with dense population and high cooling demand. Besides residential buildings, there are plenty of businesses and shopping centers that all need cooling. In Tartu alone, Fortum has approximately 800 business customers and 75,000 residential customers in district heating who now have the opportunity to benefit from district cooling.

The factors that contribute to the solution's success in Tartu include:

- Tartu's city center is sufficiently populated;
- New buildings ensure the area's high energy density (ca. 7 kW/m);
- Fortum Tartu owns a riverside property;

The river water can be used for cooling from autumn to springtime and for cooling turbo compressors in summertime.

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