FLEXYNETS

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Learn more about the project
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Fifth Generation, Low Temperature, High Exergy Heating and Cooling Network

Traditionally, District Heating and Cooling (DHC) networks distribute energy from a centralized generation plant to a number of remote customers, suffering from:

1. Significant heat losses
2. Unexplored integration potential of different available energy into the network
3. High installation costs.

FLEXYNETS will **develop, demonstrate and deploy** a new generation of intelligent DHC networks that **reduce energy transportation losses** by working at "neutral" (15-20°C) temperature levels.
Reversible heat pumps will be used to exchange heat with the DHC network on the demand side, providing the necessary cooling and heating (contemporary if needed) for the buildings.
Moreover, the heat normally rejected (by building, supermarkets' chillers, data centers and industrial processes) will be fed into the network by the heat and recycled by other heat pumps that are producing domestic hot water.
Working at low temperatures reduces the heat losses to the ground, increasing the network efficiency.
In urban contexts, not exploiting district heating yet, this new generation networks can represent the main heating and cooling system. In cities already making use of them, low temperature DHC networks can also use thermal energy from the return pipes, which otherwise is considered as waste heat by the utilities. This allows them to sell additional energy with the same infrastructure and makes the network more efficient.

FLEXYNETS DHC NETWORKS REDUCE PRIMARY ENERGY CONSUMPTION FOR SPACE HEATING AND COOLING BY 50% COMPARED TO ACTUAL STANDARDS

FLEXYNETS' MAIN TOPICS:

1. REDUCE TRANSPORTATION ENERGY LOSSES

By using a carrier fluid working at "neutral" temperature levels (between 10 and 25°C) a massive reduction of energy losses can be obtained. Reversible heat pumps and chillers can be used to exchange heat with the DHC network on the demand side, reducing insulation and transportation costs of the pipes employed.

2. INTEGRATE EFFECTIVELY MULTIPLE ENERGY GENERATION SOURCES

FLEXYNETS will integrate effectively multiple generation sources (including high- and low-temperature solar thermal, biomass, cogeneration and waste heat from industry) where they are available along the network, by managing energy at different temperature levels and assuring optimized exergy exploitation.
In case of high temperature sources (up to 250°C), they can be used to drive an Organic Rankine Cycle turbine producing electricity and lower temperature heat (between 50°C and 90°C).

3. EXPLOIT INNOVATIVE THERMAL CAPACITY DESIGN

FLEXYNETS will use a mix of conventional and innovative thermal storages. The combination of low temperature seasonal storages and mid daily storages will be analysed to understand interaction and profitability when buildings' loads, weather and climatic conditions change.
This will make it possible to utilize a large amount of excess heat.
Thermal energy can be stored at daytime in winter by increasing the carrier temperature. The stored energy can be employed at night-time by allowing the average network temperature to decrease back. The same approach could be used in summer.

4. DEVELOP CONTROL STRATEGIES AND POLICIES

Within FLEXYNETS, control strategies will be assessed that assure a thermal balance among diffused heat generation, storage and utilization. Interaction between thermal and electric systems will be addressed both on the supply and demand side.
Moreover, policies will be elaborated to decide when electric and thermal energy is to be gathered locally or exchanged (both purchased and sold) with the electricity grid and gas networks.
With the FLEXYNETS, customers assume both the role of energy consumers and producers.

BENEFICIARIES:

1. District heating networks operators.
2. Equipment and components for district heating networks producers that are interested in testing their products in pseudo-real conditions.
3. Local administrators interested in developing policies dedicated to encourage the use of low temperature waste heat and in making more efficient the traditional district heating networks.