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How Integration and Decentralization Within DHC Systems Can Lead to the DeCarbonisation of Cooling and Heating?

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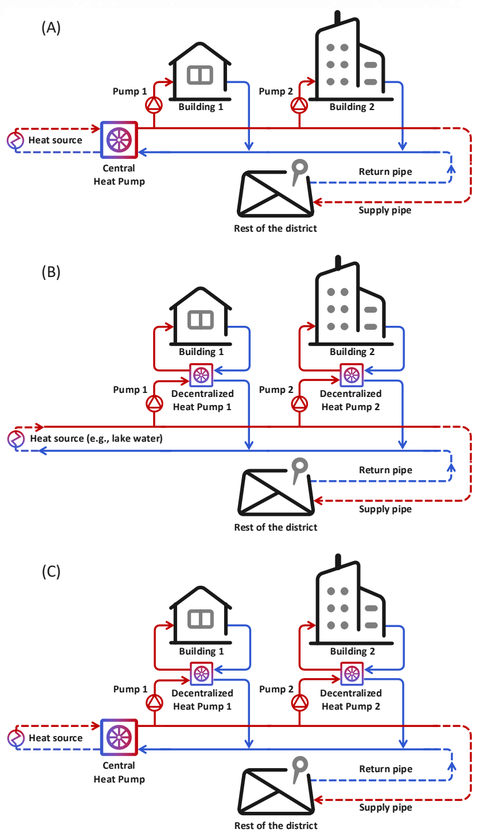
Introduction

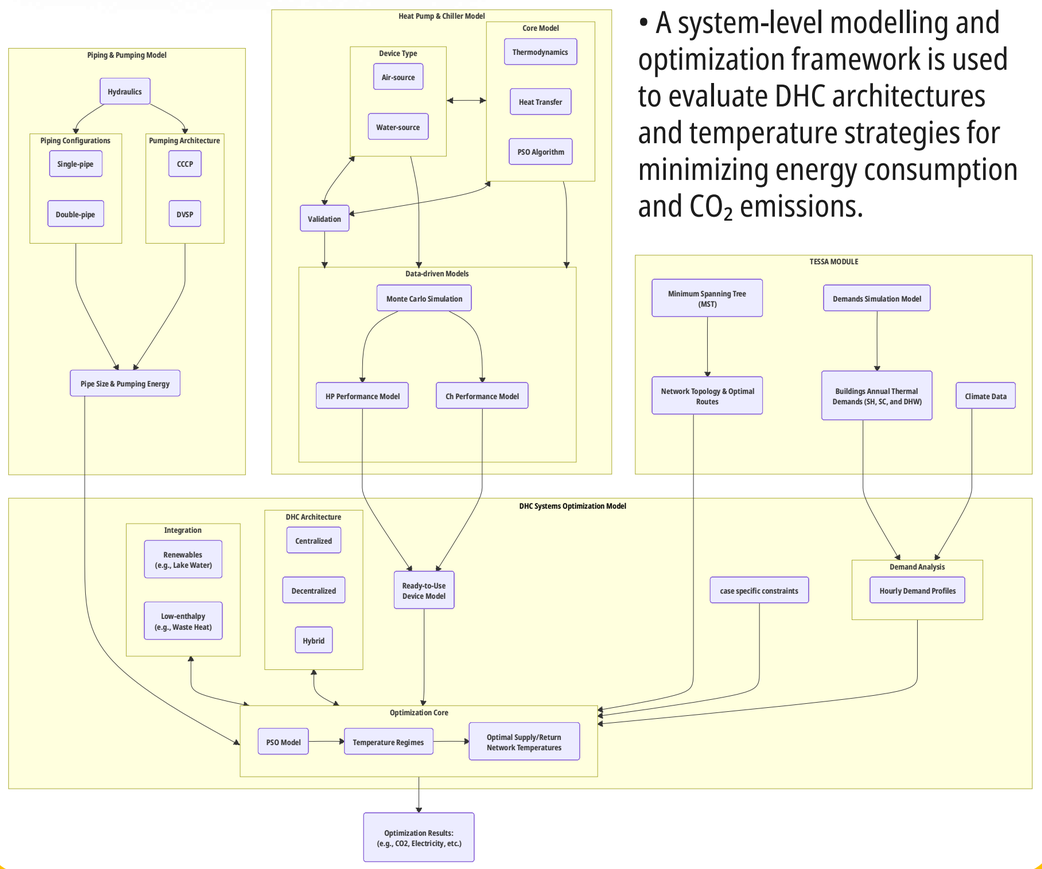
- Integration and decentralization in District Heating and Cooling (DHC) systems enable deep decarbonization through system-level optimization.
- Low-temperature networks integrate renewable and low-enthalpy heat sources while improving heat pump efficiency and reducing distribution losses.
- Hybrid architecture combines centralized and decentralized components, enabling large-scale electrification, flexible temperature management, and ultimately lower energy consumption and CO_2 emissions.

Architectures



(A) centralized, (B) decentralized, and (C) hybrid system architectures.

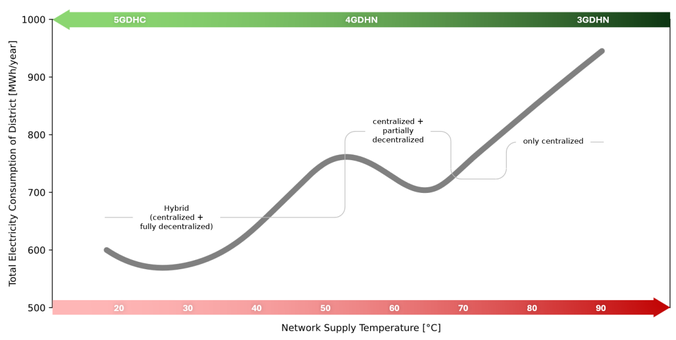
Methodology



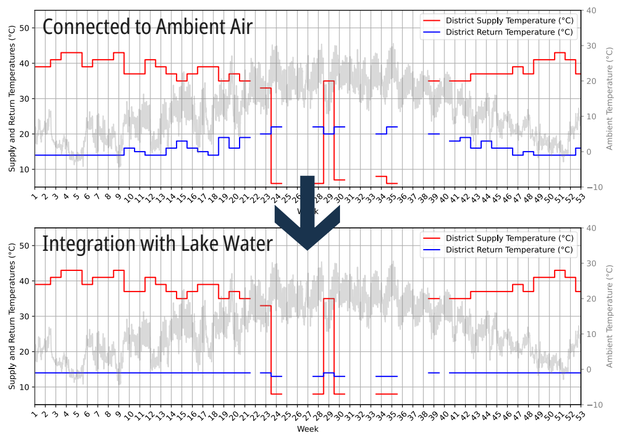
- A system-level modelling and optimization framework is used to evaluate DHC architectures and temperature strategies for minimizing energy consumption and CO_2 emissions.

Results

Decentralization



Integration



Heating Cooling

P&D Project (Boreholes):

~550 + 0

Optimization Model (Ambient Air):

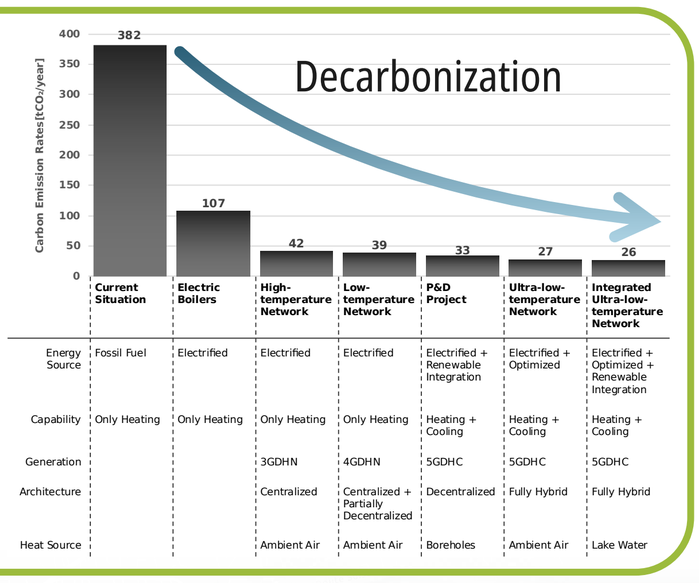
441 + 38

Optimization Model (Lake Water):

431 + 0

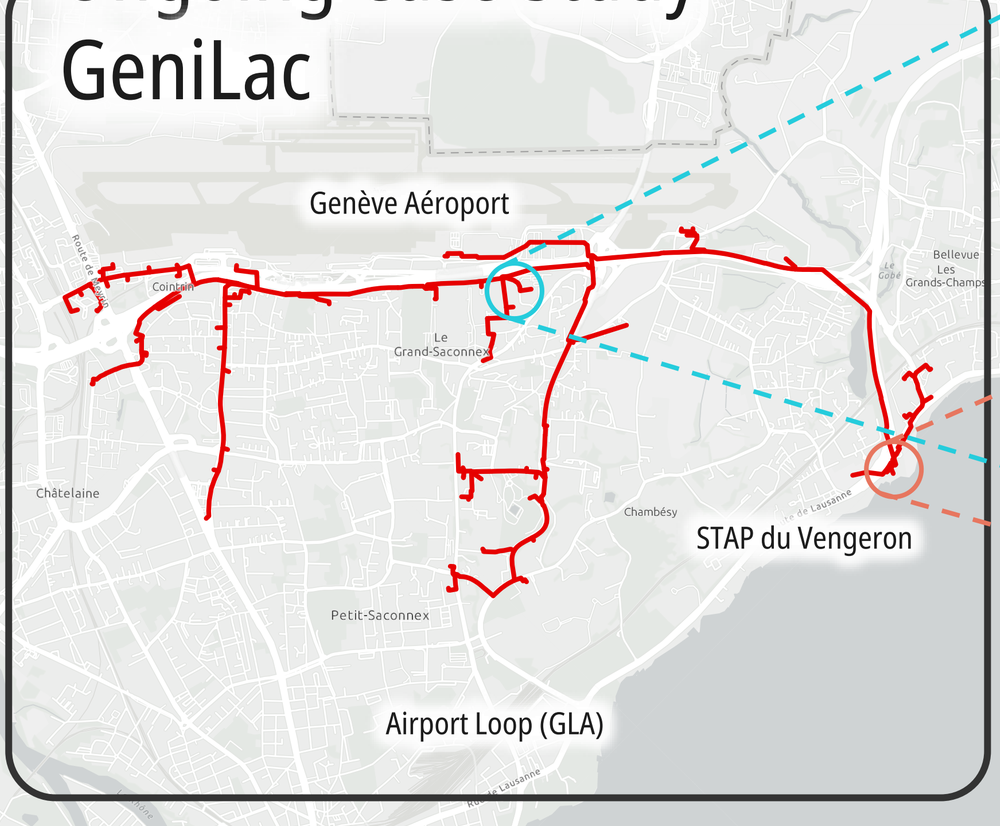
[MWh/y]

Decarbonization

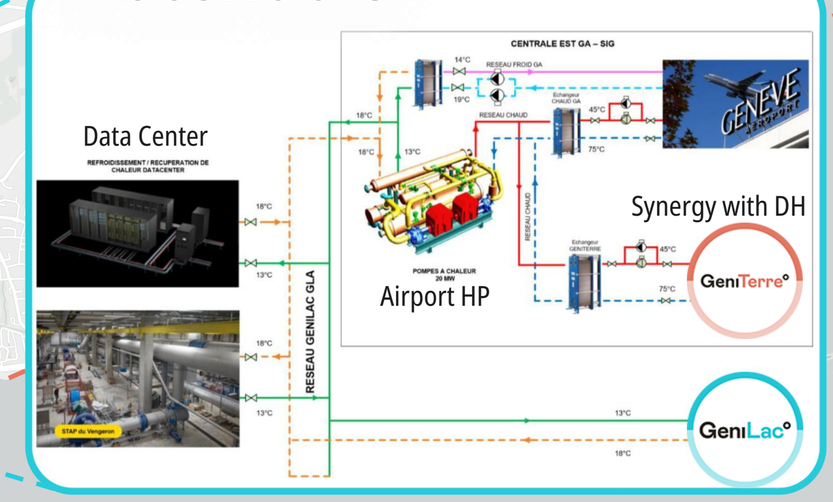


These results were obtained from a Swiss case study in **Grandvaux**.
The same models, considering the case-specific constraints and conditions, are currently being further developed for an ongoing case study: **GeniLac**.

Ongoing Case Study GeniLac



Potentials



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