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# DISTRICT HEATING ELECTRIFICATION USING DECENTRALIZED HEAT PUMPS

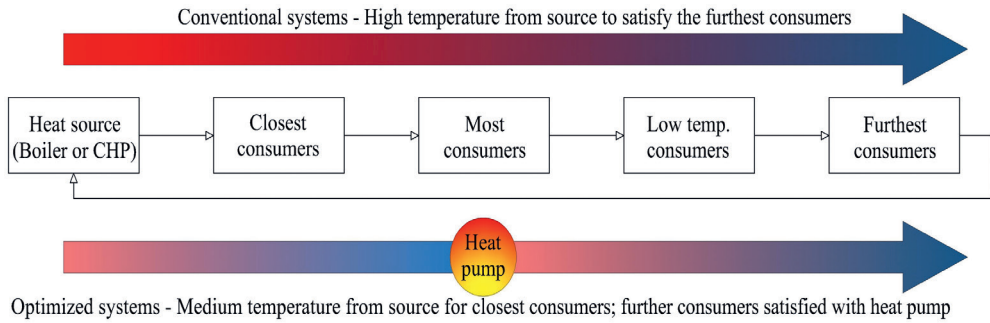
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**Abstract** – In context of energy sector development into more decentralized manner, more attention is being focused on optimization of existing energy distribution networks. One solution, which is being increasingly researched is energy hubs, which produce, distribute and store multiple energy types, including heating. District heating for many moderate climate zone cities is essential during heating season, as well as the heat utilization from cogeneration plants, thus minimizing energy waste. Energy hubs benefit from locally produced energy over centralized approaches, which induce transmission losses in case of electricity. Similar approach is considered for district heating, replacing the high temperature heating to low-temperature heating, by installing heat pumps, since increased temperatures and distances increases the losses, thus reducing the efficiency of the system. Therefore, non-conventional solutions are modelled for a case study of small city in Latvia. Modelling is conducted in optimization model of TIMES, which is being provided with real data based on 3D physical modelling of losses and heat demands based on historical data. Physical calculations will be based on real master plan of the renovation project in said city. TIMES model is scenario-based tool; thus, it will provide most optimal result of the provided options, which include current system and its modifications with heat pumps in different locations in system. Scenarios will be evaluated by their economic and ecologic parameters, especially operational costs, GHG emissions and heating losses. Hypothesis is that current centralized biomass-based heating system can be optimized with heat pumps, thus reducing losses as well as operational costs. Based on this research results, overall energy hub modelling will be based on the same city, including electricity and other demands from consumers, as well as solar and wind energy production.

**Keywords** – *Decentralized energy system; Energy Hub; heat loss; low temperature heating; sustainable community; TIMES model; optimization*



District heating conceptual scheme with conventional solutions and optimized system concept

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