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I. Andrić, J. Fournier, B. Lacarrière, O. Le Corre, P. Ferrão

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The impact of global warming and building renovation measures on district heating system techno-economic parameters

Andrić, I. 1,2,3,a, Fournier, J. 2, Lacarrière, B. 1, Le Corre, O. 1, Ferrão, P. 3

1 IMT Atlantique, Dept. Energy Systems and Environment, GEPEA, UBL, F-44307 Nantes, France
2 Veolia Recherche & Innovation, 78520 Limay, France
3 IN+ Center for Innovation, Technology and Policy Research, Instituto Superior Técnico, 1049-001 Lisbon, Portugal

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Abstract

Due to changing weather conditions caused by the global warming and building renovation measures triggered by new building energy efficiency policies, building heat demand in the future is likely to decrease. This effect could consequently impact the techno-economic parameters, feasibility and environmental performance of district heating (DH) systems.

The main goal of this study is to evaluate the impact of global warming and building renovation on operational (heat generation) and economic parameters of district heating systems. As a case study, a prototypical district was created based on the district of St. Félix, which is located in Nantes (France). Weather and building renovation scenarios were developed for the 2010-2050 period, with a ten-year time step. Heat demand for all scenarios was calculated with a model based on thermo-electrical analogy, previously developed and validated by the authors, while the network techno-economic parameters were calculated using a tool developed by Veolia Research and Innovation for the internal corporate use.

The results indicated that the decrease of heat demand proved to be the highest after the first year of renovation (2020), decreasing by 52% of the reference value (2010). Accordingly, DH linear heat density decreases below the profitability minimum for traditional district heating networks. The participation of natural gas peak boiler in heat production increases over the studied period, while the participation of base load biomass boiler decreases, due to the fact that the number of hours with heat demand below the technical

a Corresponding author: IN+ Center for Innovation, Technology and Policy Research, Instituto Superior Técnico, Av. Rovisco Pais 1, 1049-001 Lisboa. Email: ivan.andric@tecnico.ulisboa.pt
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