Review of: "Increasing Renewables and Building Retrofit in a Coal-Based Cogeneration District Heating System"

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Potential competing interests: No potential competing interests to declare.

I welcome the efforts of the authors to analyze the impact of decarbonization pathways of the heat district network in Prishtina, which is a very challenging and important topic in my opinion.

However, I am not quite convinced by the formulation of the research question and would agree with other reviewers that the novelty brought by this paper seems limited since no real methodical development of the model is clearly described.

In the case study, I am missing some important information regarding:

- how realistic the scenarios of heat district network expansion in Prishtina are (topology of the city? Heat demand map) and the heat demand reduction potentials?
- what the final supply water temperature in the heat network is and how it impacts the operation of the grid and the heat loop/heating surface of the supplied homes? Are there any industrial customers connected to the network that will still need heat at high temperatures, and if yes, how is this case handled?
- what the yearly amount of district heat to be provided by heat pumps vs. coal CHP is? Are the heat pump and the CHP system providing heat at the same temperature to the network, or is mixing taking place? What is the COP of the heat pumps? And the heat source?

In general, looking at the results, the focus of the paper seems to be set on the electricity grid perspective: some information regarding the thermal capacity of the CHP plant would be useful, and the time-dependent results of heat demand and supply of the year for each technology in order to understand (among others) how the storage systems are integrated in the district heat network?

At last, I was wondering why no completely green option for the coal CHP is discussed (fuel switch to biomass, etc.), and I think that cost aspects should be mentioned in the further developments since the cost impact of the different pathways is highly relevant for implementation.

Here come a few additional redactional comments:

- “The fourth generation will also be a perfect solution for integrating low-temperature heat sources and large-scale heat pumps coupled with thermal energy storage tanks.”

→ To qualify the fourth generation of heat networks as "a solution" is not very accurate, in my opinion. I would replace it with “will allow the integration of low-temperature heat sources”. The connecting word "also" in the same sentence could be removed since the integration of low-temperature sources is mentioned in the previous sentence.

- In my opinion, "even" can be removed in the following sentence since 68% is actually not a small share: “The results show that even in scenarios with a high refurbishment rate, between 23% and 68% of built-up areas, depending on city topography, are suitable for district heating supply in 2050.”
- "The paper concludes that the annual cost of district heating is approximately 18% lower than that of an individual natural gas boiler and approximately 30% cheaper" => maybe an addition "in average for the studied area," and that the result of the cost assessment is subjected to fluctuate for other assumptions on fuel prices, etc.