Accounting for climate change-induced change in space heating demand: case of Denmark

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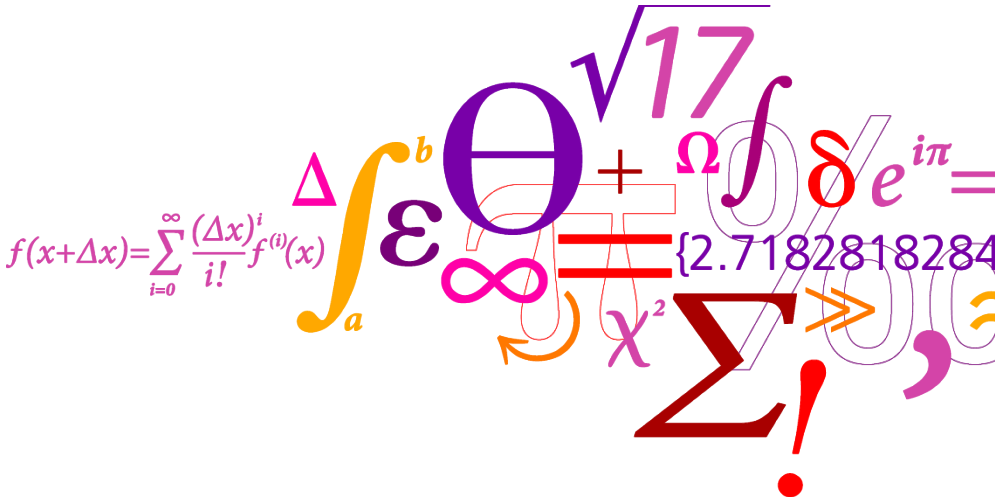

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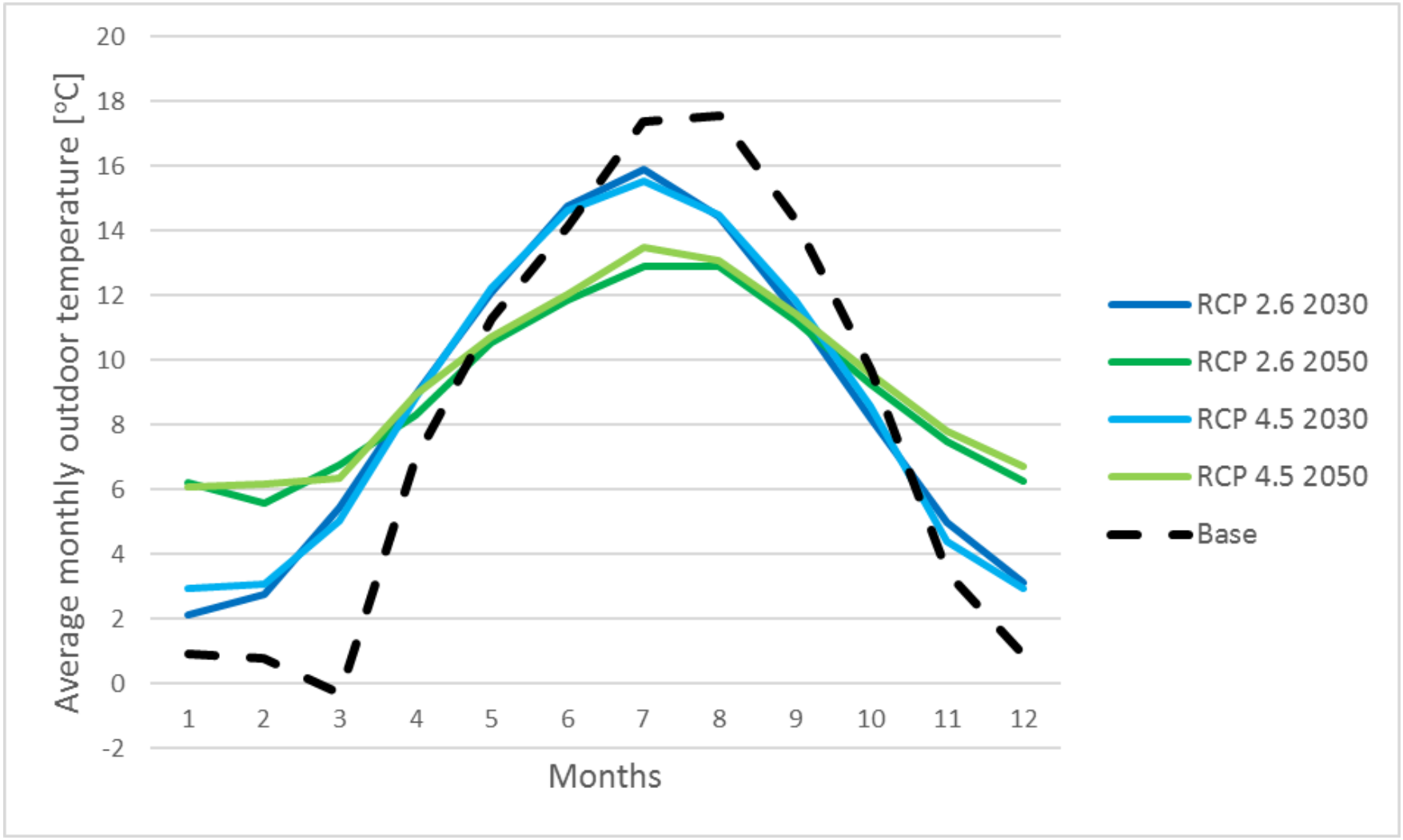
Background

- The development of the heating and cooling demands depends on the construction and demolition rates, energy efficiency standards of newly built and renovated buildings as well as behavioral factors.
- The factor which has the major influence on the future heating demands **is the outdoor temperature.**
- Development of the outside air temperature is very uncertain, but it is very unlikely that today's temperature patterns will remain the same in the long-term horizon.
- The Danish experience is that every 1 degree Celsius increase reduces the heating demand by 7%.

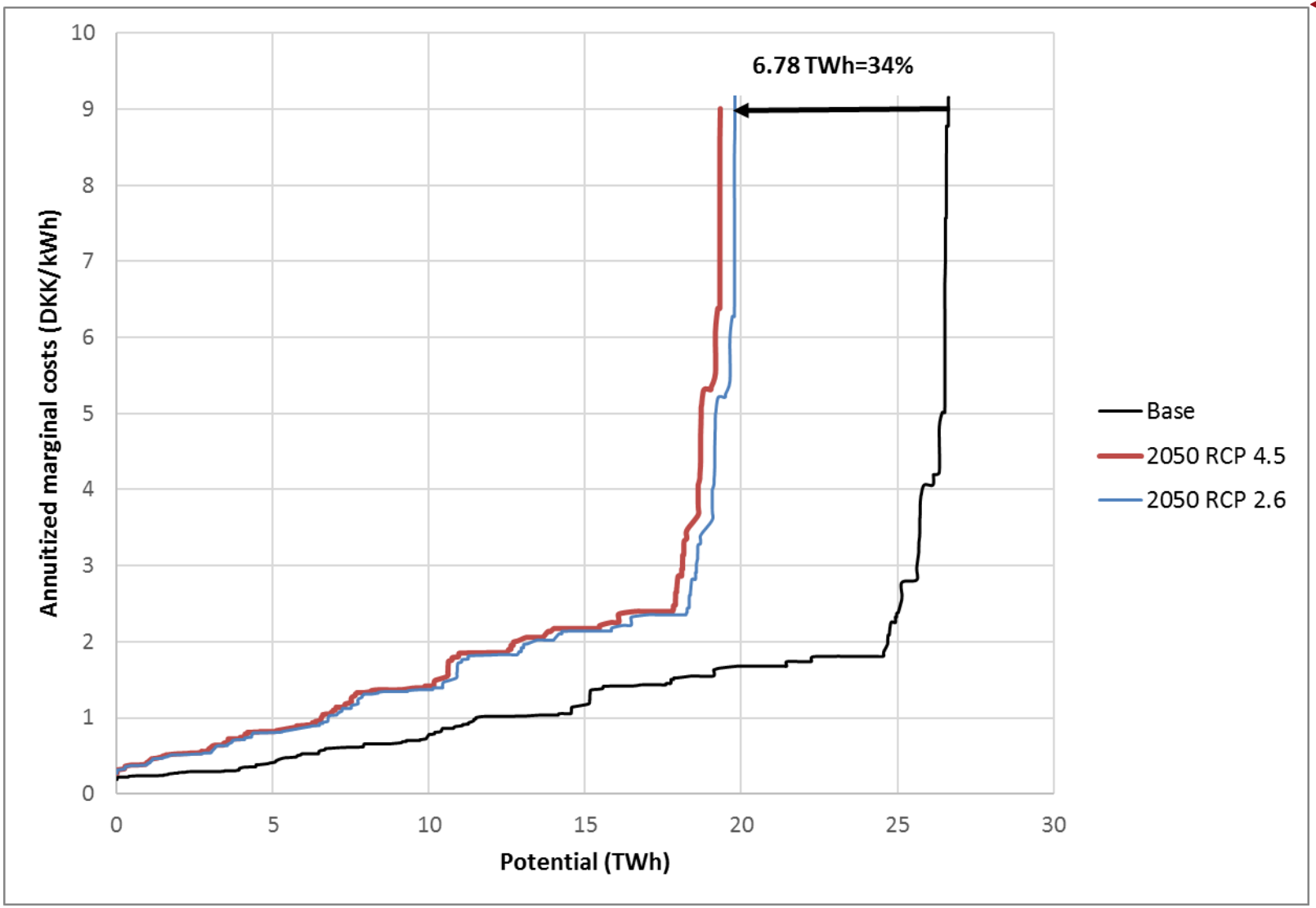
Methodology

- HDD are calculated for 9 climate models and 2 climate scenarios (RCP2.6, RCP4.5) for every 11x11 km cell from 2010 to 2050 in 5 year steps.
- Future heating demands are calculated by **scaling existing heating demands** with the ratio of future and current HDD for each 11x11 km cell.
- Not all cells are equaly imporatnt – it is important where are the heating demands located. Heating demands are calculated for every 11x11 km cell based on age, use and known location.
- Average values from 9 climate models and 2 climate scenarios are used to create inputs to TIMES-DK

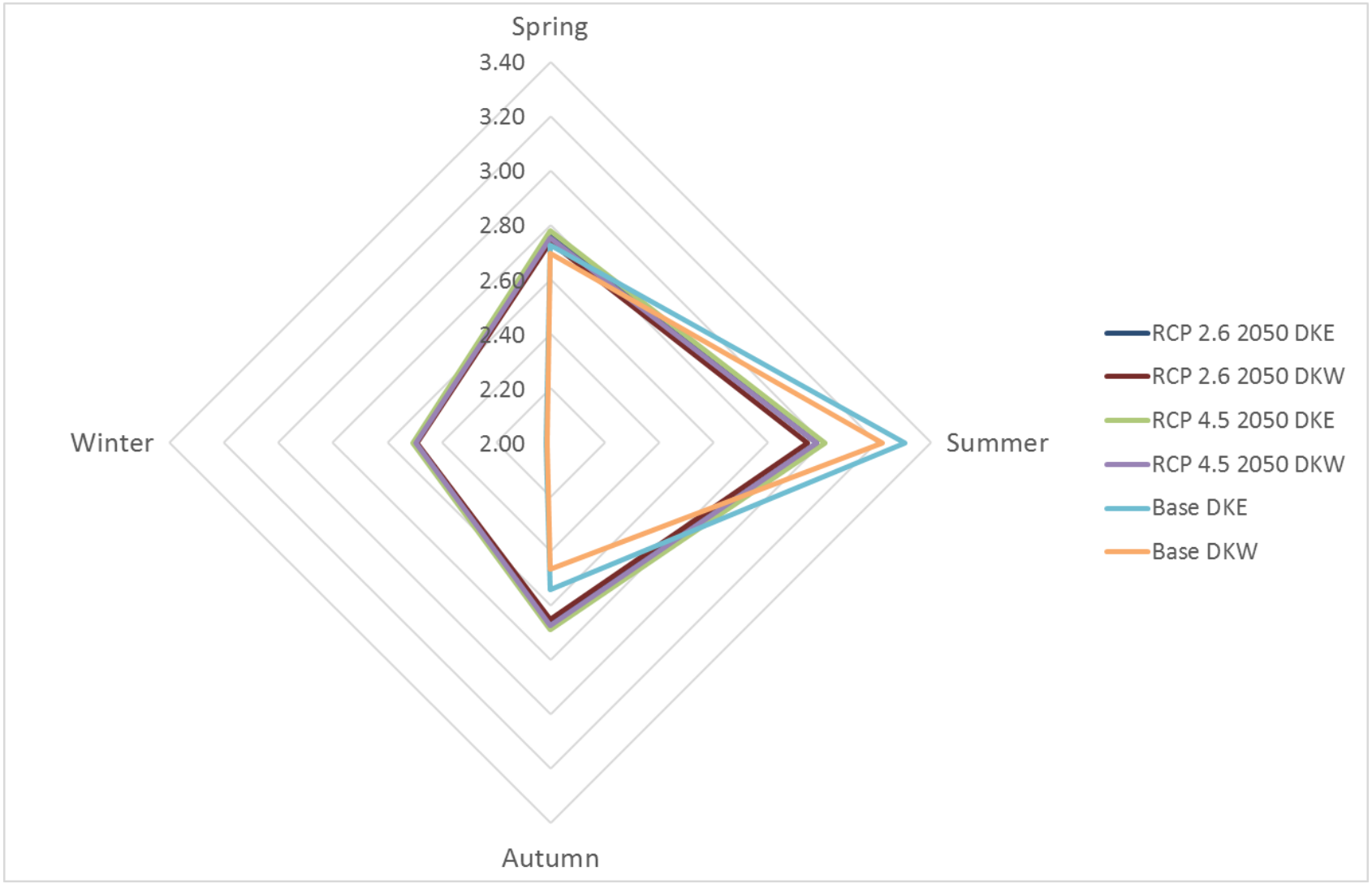
Outdoor temperatures



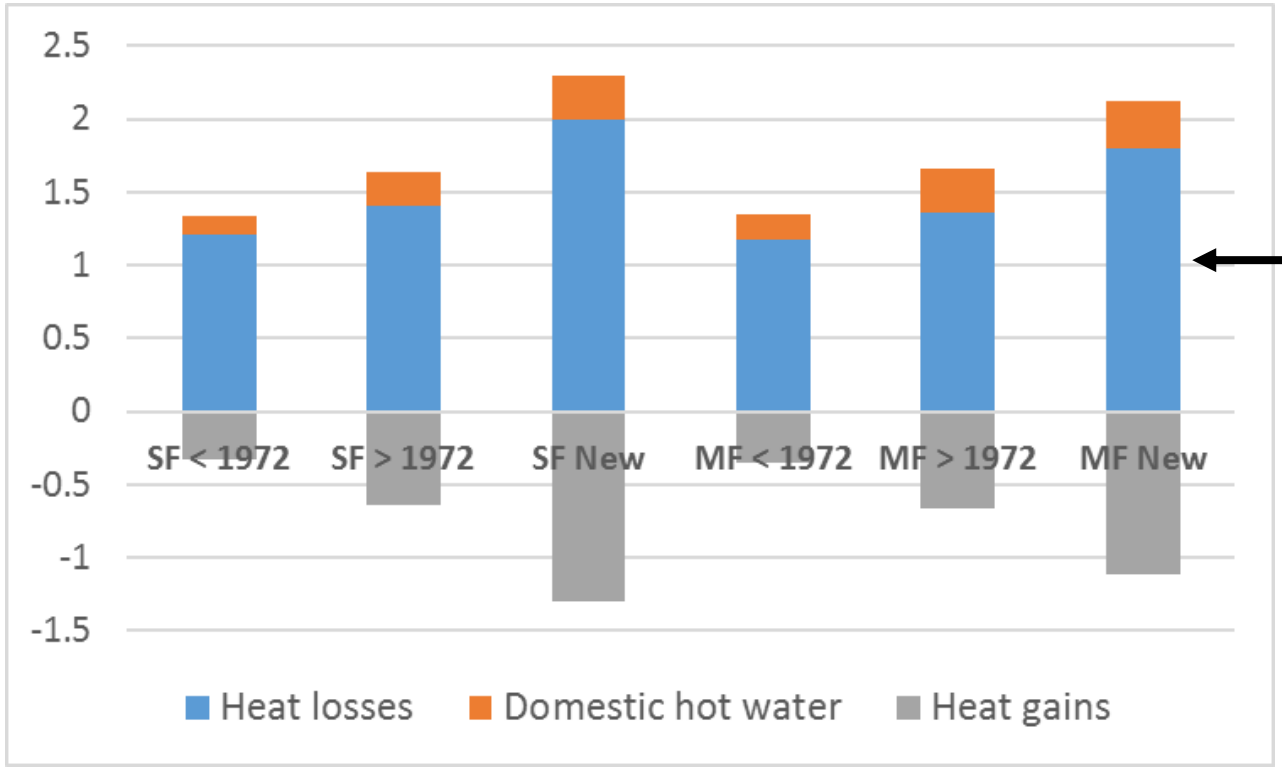
Potentials and costs of heat savings



COPs of air-source heat pumps



Caling of heating demands



Scaled with HDD

Expected results

- Cheaper system
- Less heat savings
- More ASHPs
- Lower heating demand
- Larger (faster) reduction of CO_2 emissions

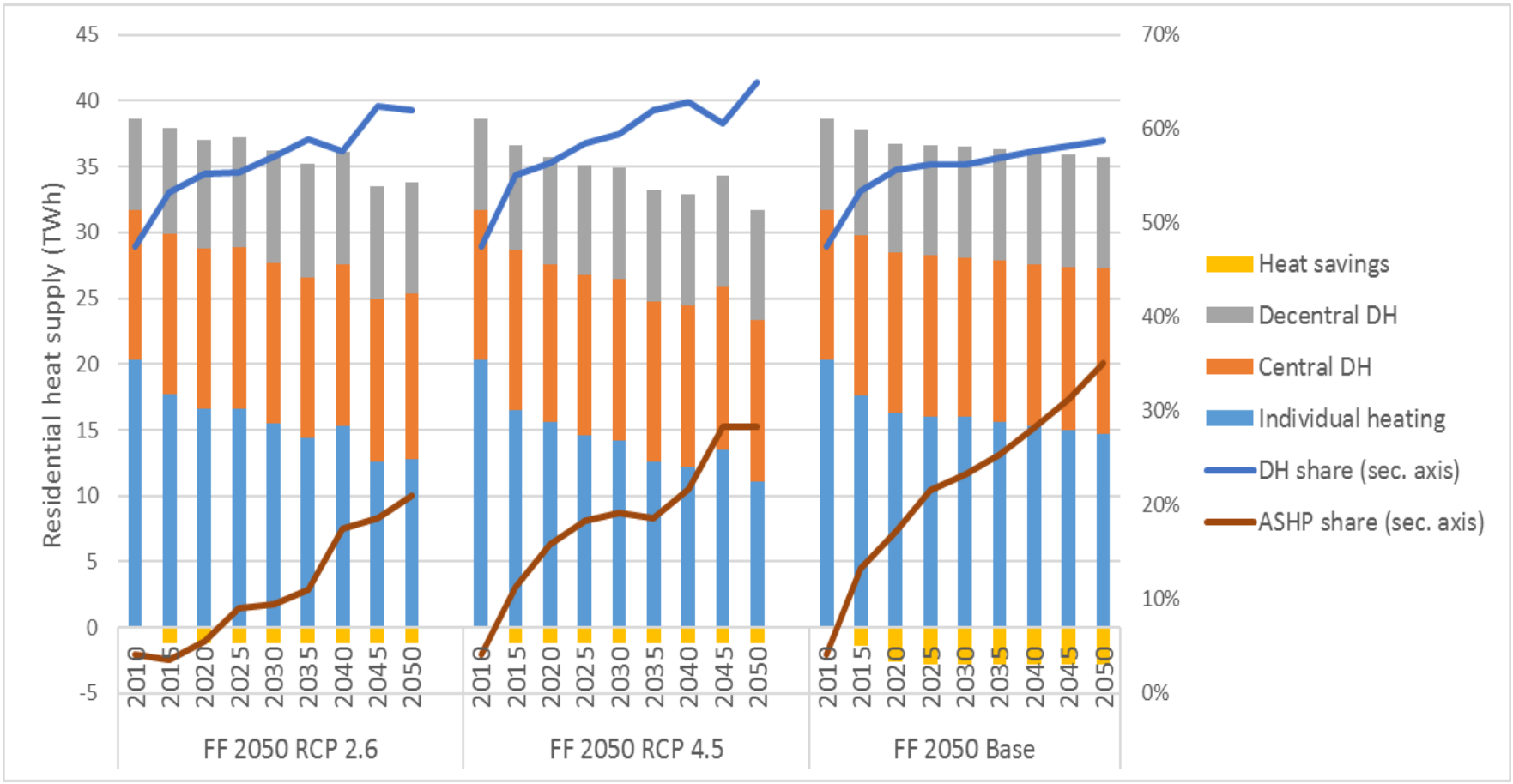
Analysed scenarios

- No constraints + No climate change/RCP 2.6/RCP 4.5
- Fossil fuel free 2040 + No climate change/RCP 2.6/RCP 4.5
- Fossil fuel free 2050 + No climate change/RCP 2.6/RCP 4.5

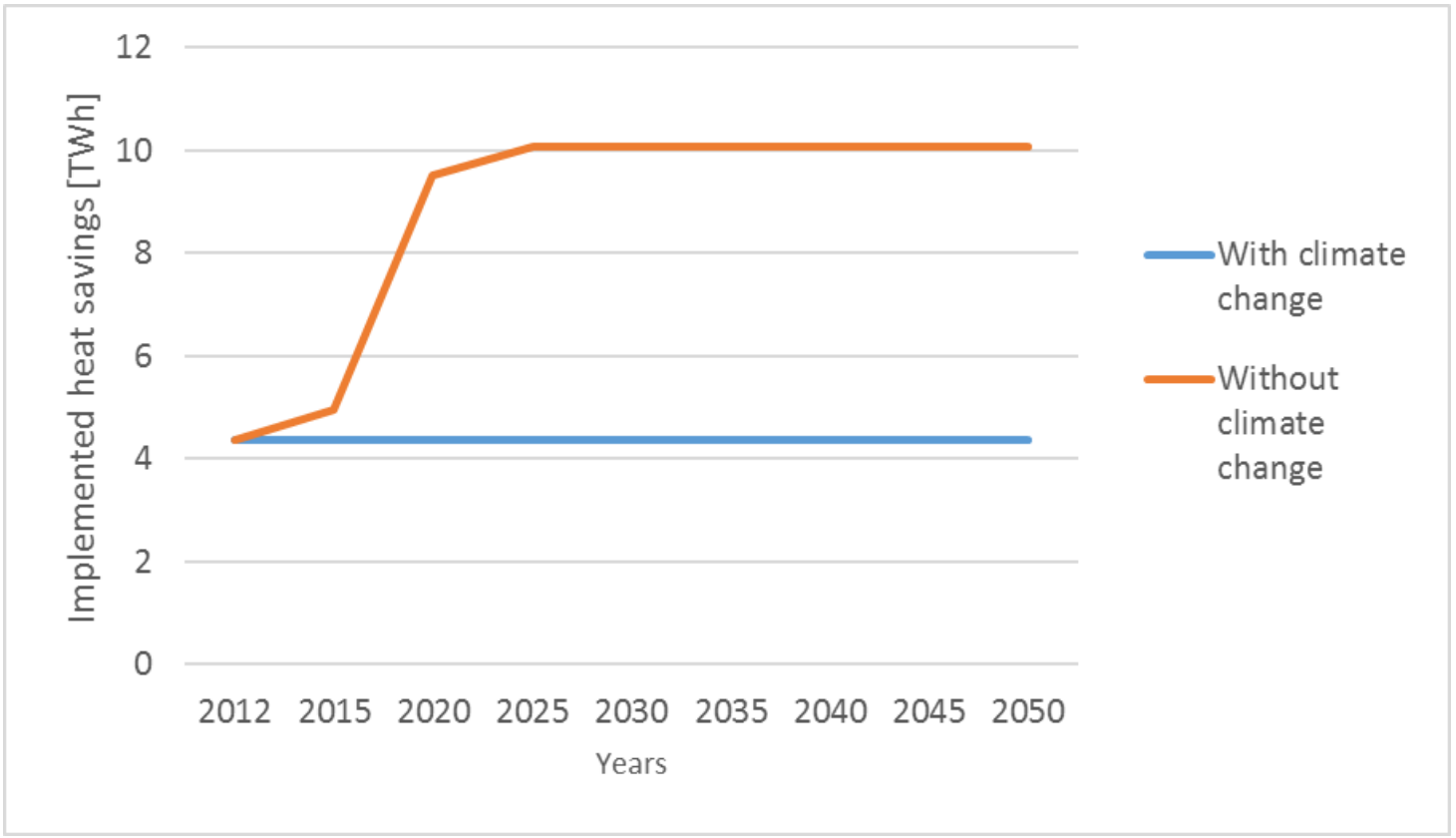
Analysed scenarios

- No constraints + No climate change/RCP 2.6/RCP 4.5
- Fossil fuel free 2040 + No climate change/RCP 2.6/RCP 4.5
- **Fossil fuel free 2050 + No climate change/RCP 2.6/RCP 4.5**

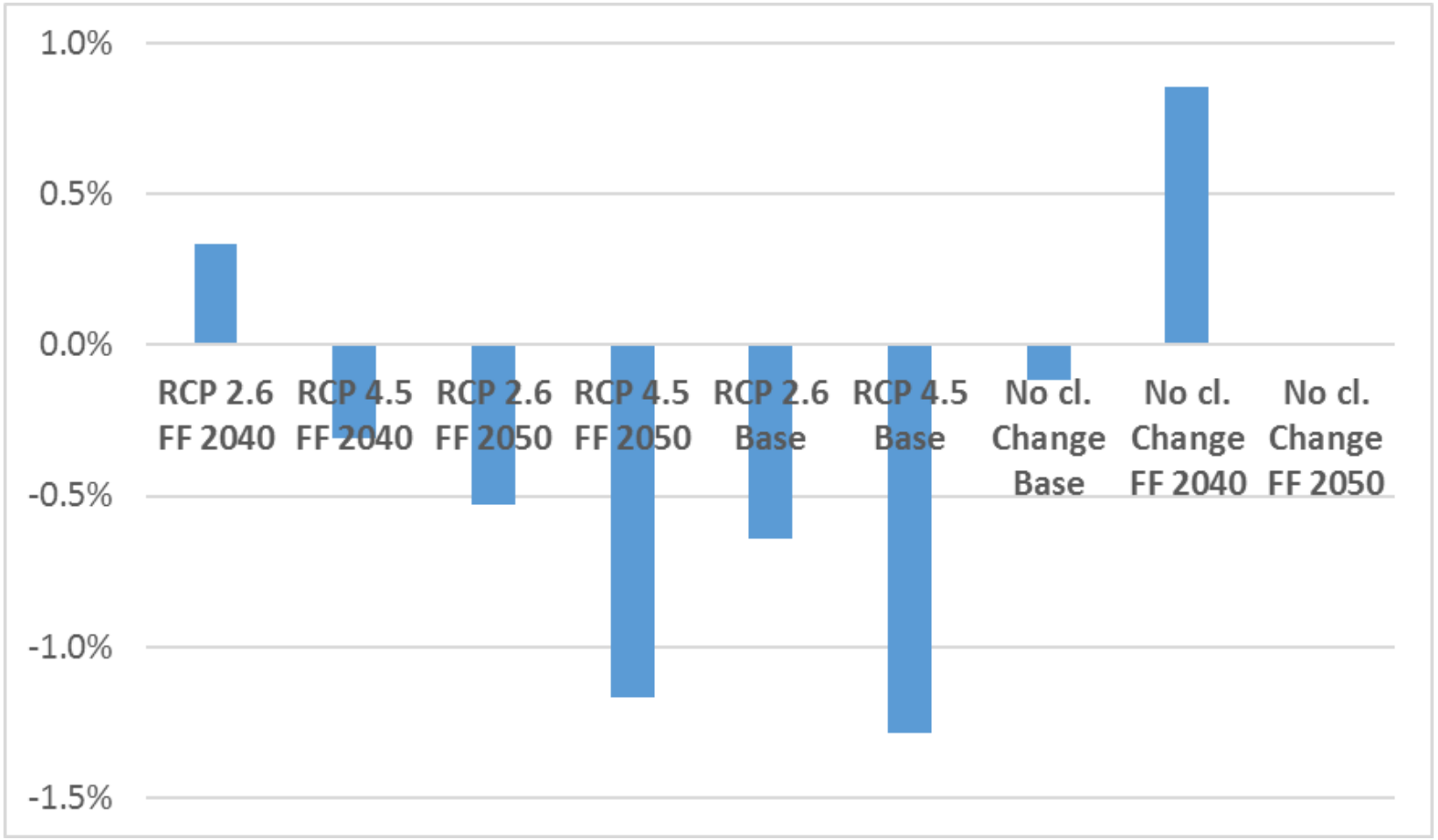
Residential heat supply



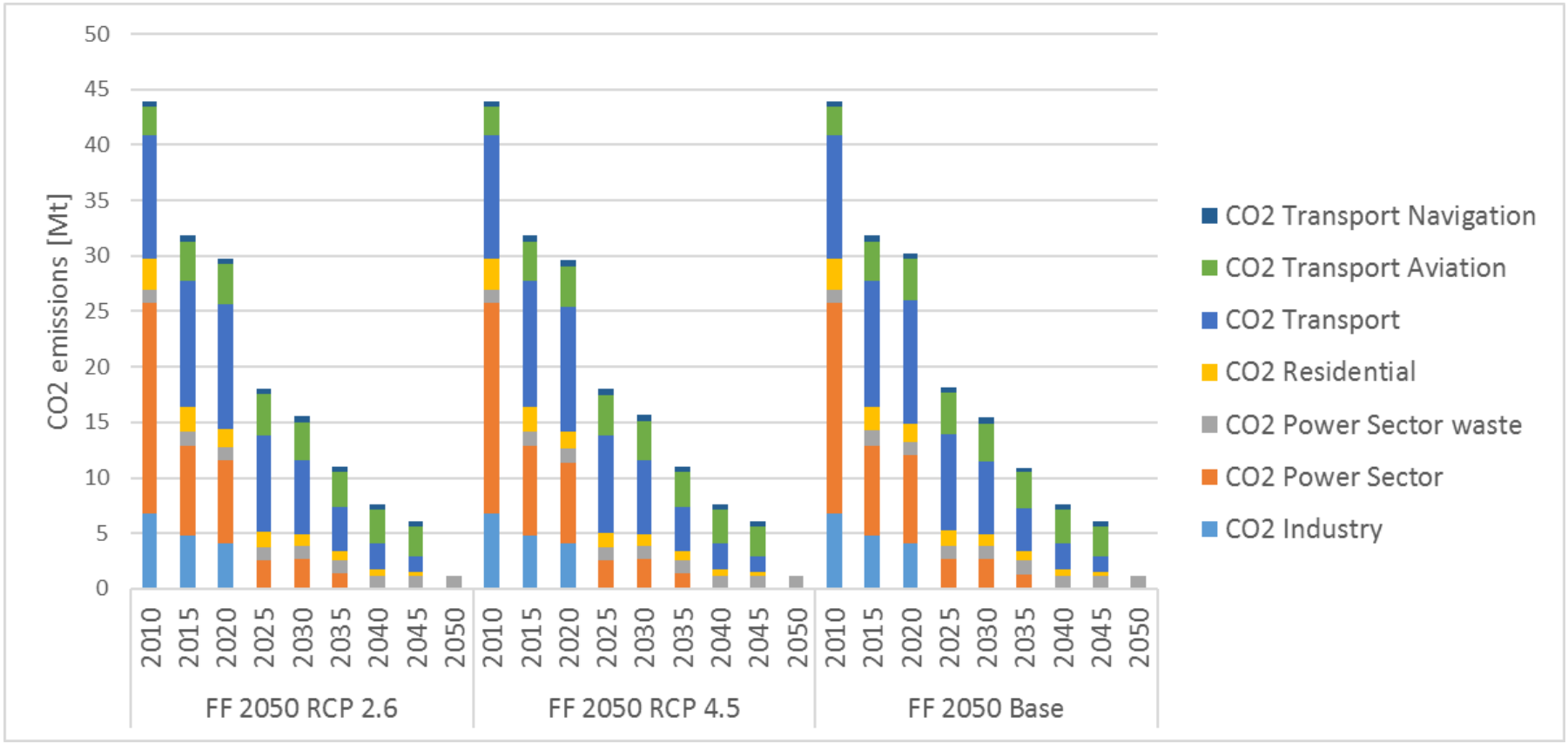
Residential heat savings



Objective function



CO_2 emissions



Obtained results

- Cheaper system - Yes
- Less heat savings - Yes
- More ASHPs – No
- Lower heating demand - Yes
- Larger (faster) reduction of CO_2 emissions – No
- Are the results transferable to other countries?

Thank you for your attention

- Questions
- Answers
- Comments
- Suggestions

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