

Impact of REMA on the electrification of heat

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Executive Summary

This research project investigated the impact of locational pricing on the roll out of heat pumps in the UK. The research highlights that locational pricing can create market conditions which better reflect the true cost of generating and delivering electricity, however, it can also lead to higher heat pump operating costs in regions with projected high heat demand. Key findings reveal that locational pricing could result in significant geographical disparities in heat pump operating costs due to varying electricity prices across different zones. Further work is required to develop policy to alleviate high operating costs and to promote flexible operation of heat pumps.

REMA impact on heat pump roll out

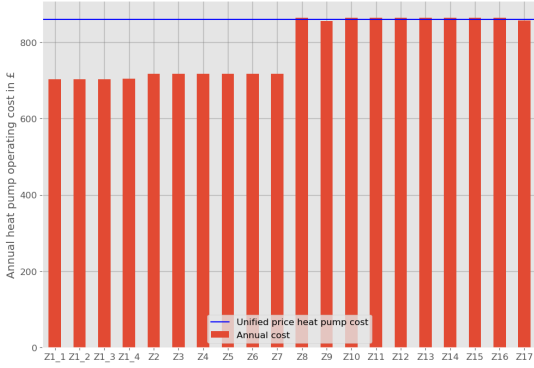
This research assessed the reforms in REMA on their potential for the highest impact on the roll-out of heat pumps in the context of UK government targets of 600,000 heat pump installations by 2028. The main approaches outlined in REMA are reforming to a net zero suitable wholesale market; markets suited to the roll out of mass low-carbon power; incentivising investment in flexibility technologies such as by introducing locational pricing; ensuring capacity adequacy; and reforming ancillary services which enable operability. Locational pricing was chosen for further assessment from the set of proposals in REMA due to several factors: impact on running costs; promoting efficient electricity use; geographical influences; flexible demand response; and alignment with decarbonisation.

Methods

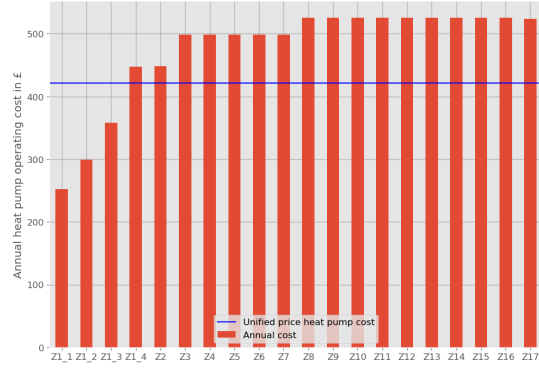
Various methods were used to quantify the varying heat pump operating costs in different locations using power system modelling and models for heat demand and heat pump performance. PyPSA-GB, a future power model of GB, and Octopus Agile calculations were used to quantify both unified pricing and locational pricing retail tariffs, and then models were used for quantifying the heat pump performance and heat demand of a single detached household. A method for assessing system-level heat pump roll out was also employed. The type of locational pricing assessed in this work was zonal pricing, and involved dividing the GB power market into 20 distinct zones. Analysis was undertaken for 2020 and 2035 to aid understanding of the impact on the heat pump stock currently and in a net zero power system.

Results

Figure 1a and Figure 1b illustrate the contrasting heat pump operating costs in 2020 and 2035, displaying a notable difference between zonal prices and unified prices.



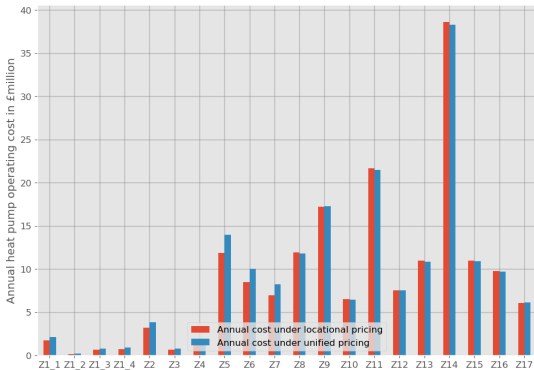
(a) Heat pump operating cost in 2020.



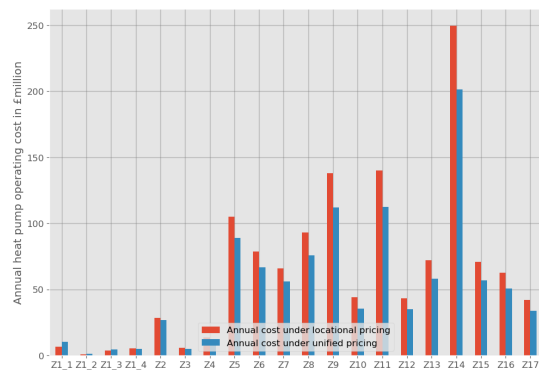
(b) Heat pump operating cost in 2035.

Figure 1: 2020 and 2035.

Figures 2a and 2b show the cost implications of unified and locational prices on the system-level heat pump roll out for 2020 and 2035 respectively.



(a) Heat pump cost in each zone in 2020.



(b) Heat pump cost in each zone in 2035.

Figure 2: System-level heat pump cost in each zone in 2020 and 2035 for locational pricing (red) and unified pricing (blue).

For 2035 the national annual heat pump operating costs are £1,046 million under unified pricing compared to £1,271 million under locational pricing. It is critical to consider that this analysis only considers wholesale costs, which is projected to increase under locational pricing under most assessments, and does not account for the benefits of reduced balancing costs and increased opportunities for flexibly operating heat pumps.

Conclusion

Locational pricing can create market conditions which better reflect the true cost of generating and delivering electricity and this can support the wider deployment of heat pumps, however, it can also lead to higher operating costs in certain regions and create uncertainty for heat pump users. This research emphasises the need for careful consideration of the geographically-dependent economic impacts and consumer-facing challenges of locational pricing. It suggests incorporating strategies to alleviate high operating costs and promoting flexible operation of heat pumps.