NOVEMBER 2022

Running cost analysis

Heat pumps and gas boilers

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The cost effectiveness of using a heat pump versus a gas boiler

The current gas price crisis has seen rises in both electricity and gas bills[1] but analysis by the Building Research Establishment (BRE) to accompany our latest report – *Decarbonising heat in Britain's buildings* – suggests that despite this the running cost of a good performing heat-pump is still comparable to a new gas boiler.

We looked at government data for a typical home energy bill in 2021 published by the Department for Business, Energy and Industrial Strategy (BEIS). We found that a heat pump would cost £180 per year more to run than a gas boiler. For the same home today, in October 2022, under the tariffs set in the Government's Energy Price Guarantee, we found that a heat pump would cost £100 less per year to run for the same home. This comparison includes the saving a household will make by no longer paying a gas connection standing charge.

The Energy Price Guarantee will run until April 2023. Prices into 2023 could continue to be highly volatile. Nonetheless, our analysis and modelling of two sets of estimates for the Ofgem Energy Price Cap into quarters two, three, and four of 2023 suggest that the heating costs for a typical home remain comparable, with the heat pump costing more to run than the gas boiler for some quarters in 2023, and less in others.

Prices are currently very volatile, and this is only a picture, for one type of home based on the current price and possible price scenarios through to next year. The relative costs could readily change again. And our analysis only considers running costs – for current gas boiler users there are of course capital costs to pay for the equipment and installation of a heat pump.

The removal of the gas standing charge from homes that switch to heat pumps is a key contributor to the savings we identified. Some households may be charged for gas disconnection and need to change from gas to electricity for cooking – which may cost more to do.

Energy prices going forward

Government should consider how it sets levies and price caps and on domestic supply to account for the differential between gas boiler and electric heat pump running cost. As a rule of thumb the running costs for a good performing air source heat pump in this analysis are much more favourable when electricity unit prices are no more than three times gas unit prices.

Technical notes

It is important to note that this analysis considers one home that has a typical level of space and water heating demand. It is a home that is sufficiently insulated so that it can run a heat pump that:

- Provides space heating at below 55C;
- Is installed and set up correctly with weather compensation;
- And is used by householders who know how to use the system effectively.

These are critical considerations. We compared our assumed efficiencies to those achieved in a 2013 Energy Saving Trust field trial where many heat pumps had low operating efficiencies because of poor insulation and installation standards. Using these efficiencies, the heat pump had higher running costs than the gas boiler.

Our analysis did not take account of possible further additional savings from time-of-use electricity tariffs under which owners of heat pumps with hot water storage tanks run the heat pump at times of cheaper tariffs.

[1] Because the price of electricity is determined by the price of the gas used in large scale electricity generation

Assumptions:

Gas boiler performance: 20kW combi condensing boiler. Space heating efficiency 88.4%, hot water efficiency 75.5%. Gas usage: 12,900 kWh / year heating, 400 kWh / year cooking.

Air source heat-pump performance: space heating efficiency: space heating efficiency 292%, hot water efficiency 292%. Electricity usage: 3,790 kWh /year heating, 270 kWh year cooking.

We based our analysis on a manufacturer's performance data for a typical air to water heat pump - the Daikin EBLA09DA3W. According to BRE's DAPHSE, this heat pump puts out 8.49kW when it is -4.7 degrees outside with a flow temp of 55 degrees C. Gas boiler performance data is taken from the Products Characteristic Database for the Worcester Greenstar 2000, one of the most efficient gas boilers available on the market.

Cooking

The running cost difference does not account for switching from gas to electricity for cooking. We estimate that the running cost of cooking by switching from gas to electric cooking could be £40 more with the Energy Price Guarantee tariffs.

Gas disconnection charges

Some suppliers will disconnect your gas meter free of charge, although others may charge you a minimum of £110 for the service.

Tariffs

		Unit charge p/ kWh	Standing charge £ / year
BEIS QEP for 2021	Gas	3.42 kWh	£99.00
	Electricity	19 kWh	£88.57
Energy Price Guarantee from Oct 2022	Gas	10 kWh	£102.2
	Electricity	34 kWh	£167.9