Cost of Heat Pumps Table in Scotland (Feb 2022)

nesta

Impact of lowering upfront costs and running costs for Scotland

Property type	**Baseline** Current *(without subsidies, grants, policy changes or improvements)*	**Reduce the upfront cost of a heat pump by £7,000** (Equivalent to Home Energy Scotland loan)	**£7,000 discount *plus* all three conditions for improving running costs** Shift levies in 2022, increased efficiency, and heat pump tariff			
			Typical Heat Pump (35-40°C)		**High Temp. Heat Pump** (65-75°C) Upgrade limitations	
			Low Upgrade Cost	**High Upgrade Cost**	**Low Upgrade Cost**	**High Upgrade Cost**
	Whole life cost per year relative to gas (£)					
Smaller home • Flats – medium (50-100m^2) *(excl. converted flats or maisonettes)*	Heat pump **£770** more	Heat pump **£300 more**	Heat pump **£120 less**	Heat pump **£90 more**	Heat pump **£70 less**	Heat pump **£140 more**
Medium home • Terrace / converted flat / maisonette (100-150m^2) • Post-1950 semi-detached and post-1990 detached (<150m^2)	Heat pump **£970** more	Heat pump **£500 more**	Heat pump **£110 less**	Heat pump **£100 more**	Heat pump **£40 less**	Heat pump **£170 more**
Large home • Detached – large (150-200m^2)	Heat pump **£1,420** more	Heat pump **£950 more**	Heat pump **£20 less**	Heat pump **£220 more**	Heat pump **£90 more**	Heat pump **£330 more**

Notes:
See the longer report (Table 2 and Box 1) for further detail on notes, sources, and assumptions. For Scotland, an SPF of 2.45 was used. SPF values for variable-speed air source heat pumps in Scotland are estimated to be 2.4–2.6 (Abid et al 2021; Meek, C. 2021). Heating demands for housing archetypes are increased slightly for the higher end of Scotland's prevalent archetypes: 10,000kWh; 14,800kWh; 23,500kWh (Scottish Government 2020). The amount for the grant reducing upfront costs was increased to £7,000 to match a proposed amount for the Home Energy Scotland loan which offers up to £10,000 (£2,500 loan plus up to £7,500 cashback). Tariff amounts were kept the same as Great Britain averages except that the daily standing charge was increased from 23.5p/day to 25p/day (North Scotland's influence primarily).

The same low and high upgrade cost ranges are assumed for either a typical home to achieve a low flow temperature (35°C–45°C) or a very energy-inefficient home to achieve minimum temperatures for a high temperature heat pump (65–75°C). Low upgrade costs estimated to range £530–£1,590. High costs ranging £3,710–£5,300. The high cost upgrade scenario models properties that require either cavity and loft insulation or underfloor insulation alongside replacement of several or all radiators, piping, and TRVs; or, underfloor heating with minimal insulation and radiator replacements. The low cost scenario models the replacement of a few radiators and minimal insulation or draught-proofing. Cost values utilised were derived from Cambridge Architectural Research (2017) and Delta-EE (2018), adjusted to £2021, and current online estimates for quotes.

Although a previous report by Energy Systems Catapult on behalf of Nesta modelled that external wall insulation is likely necessary for heat pumps (4-6kW, 55°C) to maintain thermal comfort consistently for Scotland's most prevalent housing archetype (pre-1914 flats, including tenements) there is potential that less extensive or less expensive works may be sufficient for a majority of units, particularly mid-floor flats. Two reasons for the discrepancy include the use of a U-value for walls (1.88 W/m^{2}K) slightly higher than that more commonly observed *in-situ* (1-1.6 W/m^{2}K) and limitations set for emitters. Potential works include installing emitters prioritising radiative heat (baseboard/ceiling radiant panels or longer wall radiators, if underfloor is restricted), using split systems with both warm air and hydronic emitters, or targeted works such as improving joints and wall sections around windows. If cost-effective retrofit works are unable to decrease the mean flow temperature required for a typical heat pump below 55°C (limiting SPF to 2.0), then a high temperature heat pump may actually be more efficient (SPF 2.1-2.3), mitigating whole life costs. If higher capacity heat pumps are determined applicable alongside such measures, flats with greater heat demand due to their geometry (ground floor, exposed corners) would ideally be paired with higher relative allocation of any solar PV available (tenements having limited roof space). A similar study has modelled that even without wall insulation a high-temperature heat pump (75°C) may still achieve sufficient thermal comfort for more than half the units in a tenement building (Millar, Burnside, and Yu 2019).