

The installer skills gap in the UK heat pump sector and the impacts on a just transition to net-zero

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Summary

The UK heat pump sector is set to play an integral part in the transition to net-zero in the UK, with the Climate Change Committee anticipating that, to reach 2050 climate targets, 17 million UK homes may have a heat pump installed (CCC, 2019). At the same time, the sector currently has low levels of technology deployment, and might be hindered by a skills gap in the sector. This research aimed to understand the nature and scale of potential skills gaps, its drivers and implications for a 'just transition' (i.e. fair and equitable transition) to net-zero.

Through literature review and interviews with industry stakeholders, the research found that the decision-making environment around the skills gap is complex, and:

- **There are many barriers for the UK heat pump sector, including a significant installer skills gap.** Barriers include high capital cost of installations, lack of consumer demand, little government clarity or support, and low levels of education and knowledge of the technologies. The relative levels of threat posed by the skills gap compared to other barriers for the sector is unclear.
- **Younger and older generation of workers are most exposed to the risks of an industry skills gap.** Young people could benefit greatly from growing job opportunities in the sector if problems such as low wages for apprenticeships, inconsistencies in quality of training and lack of routes into the sector were addressed.
- **The skills gap could pose significant negative implications to consumers.** Consumers installing heat pumps could face a significant financial threat from an industry skills gap, specifically lower income households, through capital and running cost implications.

Currently, the skills gap and its impacts is widening social inequality and hindering growth of the UK heat pump sector. Policy makers, training providers and the heating industry must address the skills gap to ensure sustainable and equitable employment opportunities in the sector and to support the UK's ambitions for a just transition to net zero.

1. Introduction

1.1 A high stakes transition

In response to the threats of climate change, the United Kingdom (UK) has pledged to reach net-zero greenhouse gas emissions by 2050. Meeting this commitment requires a fine balancing of a wide range of technical, economic and social factors (BEIS, 2019).

The transition to net zero must be managed in a way that does not widen societal inequalities. The concept of a 'just transition' to net zero is closely linked to climate justice, which views climate change from a human rights perspective and aims to share the benefits and burdens of climate change and its resolution equitably and fairly (UN, 2015). In the 1980s, the closure of UK coal mines left many workers and communities behind (TUC, 2019) and the ramifications of this transition are still felt by these communities today (Foden et al., 2014). More recently, the UK Government COVID-19 pandemic response can also demonstrate lessons for the climate change response. The Institute for Fiscal Studies found that the UK policy response to COVID-19 has resulted in much greater impact on the bottom tenth of earners due, for example, to their greater exposure to shut down sectors, whilst the highest earners have been in a period of 'forced savings' of their disposable income, widening inequalities (Blundell et al., 2020).

[These findings show how crisis response and socio-economic disruption can be most damaging to the most vulnerable in society. The imperative to learn lessons of the past and deliver a just transition to net-zero is clear.](#)

1.2 The UK heat pump sector and net-zero

The Climate Change Committee (CCC) highlighted that heat pumps should be an integral part of the route to net-zero (CCC, 2019). From 2025, gas boilers in new builds will be banned, replaced by heat pumps (HPA, 2021). The UK Government has set an ambition to install 600,000 heat pumps per year by 2028 (Environmental Audit Committee, 2020). This requires significant scale up: in 2019 there were 35,000 heat pumps sold in the UK (HPA, 2021).

The Heat Pump Association (HPA) has responded to the challenge of upscaling deployment of heat pumps, highlighting that the *"limiting factor now is the current skills gap"* (HPA, 2021). In 2019/20, the UK heat pump sector employed around 2,000 workers (Eunomia, 2020). This is much lower than anticipated by a UK Government Renewable Energy Roadmap published in 2011 which estimated that 150,000 jobs could be supported by the UK heat pump and biomass heat sector by 2020 (UK Government, 2011). The HPA estimates that there will be a potential requirement for 69,500 heat pump installers by 2035 to meet net zero ambitions (HPA, 2020). [There is a vast disconnect between where the heat pump industry is today, compared to where it needs to be, to deliver the systems transition anticipated for reaching net zero.](#)

This research examined the skills gaps in the UK heat pump sector and implications for a just transition to net zero. Decarbonising heating is of particular importance to the just transition because of the close links to fuel poverty and public health, and the potential impact on employment and jobs. [By understanding how to achieve widespread deployment of heat pumps whilst supporting a just transition, the decarbonisation of heating can realise some of the potential wider benefits of decarbonisation.](#) The just transition concept *"describes both where we are going and how we get there"* (Climate Justice Alliance, 2021), making it a uniquely well-suited lens through which to study the skills gap in the UK heat pump sector.

2. Research Methods

The research was informed by desk-based literature review supplemented by six semi-structured interviews with industry stakeholders conducted in Summer 2021. Representatives interviewed included: 2 x heat pump installers (I), 1 x trade organisation (TO), 3 x training organisations (T). Given that there are several ways to classify and measure skills gaps (Jagger et al., 2013) and the nature of justice is subjective (Pirie, 1983), different perspectives were anticipated depending on the context in which the stakeholder is involved in the industry (Cresswell & Cresswell, 2018). We adopted the American Society for Training and Development definition of a skill gap (Singh and

Sharma, 2014) to identify where the current capabilities of the UK heat pump industry fall short of the skills needed to reach the UK's goals, as defined by the CCC scenarios (CCC, 2019).

3. Results, analysis and discussion

3.1 Installer skills gaps

Figure 1 shows how many heat pump installers are needed each year to achieve the deployment goals of the sector, through to 2035 (HPA, 2020). The gap between the current installer base of 1,800 heat pump installers (HPA, 2020) and the quantity of certified installers required to meet the goals of the sector constitutes a significant skills gap.

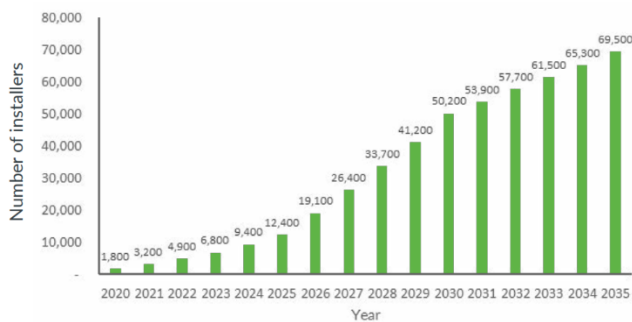


Figure 1: Potential number of heat pump installers needed each year, up to 2035 (HPA, 2020)

All interviewees agreed, identifying that the main skills gap hampering the sector is of heat pump installers. Interviewees expressed varying levels of confidence as to how possible the UK ambitions (to be carrying out 600,000 installations by 2028, Environmental Audit Committee, 2020) could be. Interviewees *I1* and *T1* expressed appreciation for the sheer scale of the challenge posed, although *I1* cited a previous call to double the market in a 12-month period, which the industry managed to successfully meet. On the other hand, *T1* and *I2* stated that they thought the challenge was too great, and the sector could not meet that ambition considering its current trajectory.

The installer workforce must possess the quality of skills required to build a heat pump market which is reputable and is sustainable. The HPA describes that the workforce must be able to install systems which “work effectively and protect consumers” (HPA, 2020). Interviewee *T1* highlighted that although there are only

around 1,200 certified installers currently, there are some installers operating in the sector who have no certifications, and that a lot of heat pump installations are non-compliant with industry standards. It is not possible to directly infer those non-compliant installations are carried out by non-certified installers, but this does highlight that there is a need to improve and maintain standards whilst growing the workforce (see Section 3.3.4).

The expectation of the HPA is that any growth in the installer base will begin with the upskilling of traditional heating system installers. There are currently more than 100,000 registered gas engineers in the UK. They have the fundamental prerequisites for heating systems, which can be built upon to allow a switch to installation of heat pumps (HPA, 2020). Speaking on the Local Zero podcast, Dr Richard Lowes highlighted that compared to traditional heating systems, “a heat pump requires double the amount of work to install”, meaning that the industry will need approximately double the amount of manpower (Lowes, 2021). Therefore, even in a scenario whereby all current gas engineers upskill into heat pump installation, a significant gap would be expected to exist. In order to grow the installer base further, there is a need for new market entrants.

3.2 Drivers of skills gaps

3.2.1 Disconnect between training and industry

Both installers interviewed emphasised that, compared to traditional heating systems, heat pumps require a complex mix of skills including plumbing, heating system engineering, pipefitting, electrical and refrigeration skills. In contract, training provider *T3* described heat pump installation as “not very complex so there are a lot of tradespeople and contractors who could carry out this work” and *T2* highlighted that installers actually “install a heat and hot water system... heat pump is a misnomer”. It seems there is a potential disconnect between training providers and the realities of installation, which could be perpetuating challenges in providing appropriate skills for the sector. Installer *I2* suggested that training bodies and those who are writing courses for the sector should utilise the skills of those who have experience

in the industry, to ensure that the training is fit for purpose. This requires partnerships and knowledge exchange to be actively supported within the sector. This would not only optimise training provision, but encourage understanding and awareness between different parts of the sector.

3.2.2 Lack of long-term government signals

Training provider *T2* indicated that a key driver of the skills gap is a lack of coherent, long-term signals from government, complicated by everchanging regulations, frameworks and targets. When the government changes policy direction, or do not put policy into practice, those who have made the effort to get trained to install heat pumps return to installing gas boilers. A prime example of this is the ambition to install 600,000 heat pumps per year by 2028. The target was announced as part of “The Ten Point Plan for a Green Industrial Revolution” in 2020, and highlighted as one of the key policy impacts of the plan (BEIS, 2020c). However, in 2013, the CCC had already advised that the UK should aim to install 600,000 heat pumps per year by 2020, to meet 2050 targets (CCC, 2013). Simply, the UK government hadn’t put anything in place to deliver on the recommendations of the CCC in 2013, nor following the Ten Point Plan. [Both T1 and T2 highlighted that a lack of long-term government signals, or plans to put policy into practice, has served to directly undermine the legitimacy of government signals to industry. These signals are key to inspiring confidence in installers to upskill into the heat pump sector.](#)

3.2.3 Installers don’t see demand

Trade organisation *TO1* stated that the perceived cost of a heat pump system for consumers can be “a showstopper”, but that consumers might get a return on investment in the long run. For installers though, *TO1* maintains that the capital cost is still too high, so they have no incentive to move away from their current market, to one which there is low demand for. Training provider *T1* also highlights the importance of demand visibility for installers to buy into the market. *T1* finds that demand is increasing now, but that it is far behind where it needs to get to. *T2* described the relationship between installers getting trained and

consumer demand as a “chicken and egg” situation, i.e. which comes first: installers getting trained, or consumers demanding installers? This relationship has the potential to turn into a vicious cycle, whereby a lack of consumer demand leads to few installers getting trained, which means there are fewer installers to actually carry out work, further reducing consumer demand. This also demonstrates the strong interconnection between the various barriers to the sector and the need for incentives or enablers. [There is a need to tackle cost barriers for consumers, in order to increase demand and subsequently encourage upskilling to reduce the skills gap.](#)

3.3 Implications for a just transition

3.3.1 Job quality

One of the key ambitions of a just transition is to ensure that new jobs created are of an equivalent, or higher standard to current markets (TUC, 2019). Interviewees installer *I1* and trade organisation *TO1* described how diverse a career path could be followed in the sector, starting at an entry level/apprentice position and working up through, for example, managerial, design or technical consultant routes. Both also described the potential transferability of the skills developed, with *I1* stating how skills “*can be transferred from one company to another, or from one sector to another*”.

That said, speaking on the BetaTalk podcast, industry expert Nathan Gambling, explains that skills outcomes depend heavily on training environment. Gambling describes a challenge with apprenticeships currently is that they are often carried out with “*generally low skilled employers*”, which generates low skilled workers. Speaking of the existing training system, Gambling adds: “*we teach them to pass exams... they are not going to remember most of that knowledge... the real learning happens out in the workplace, it always has done*” (Gambling, 2021a).

The problems described by Gambling demonstrate how crucial the employer is in developing skills for a just transition. A gap in the quality of skills of the existing workforce has a potentially damaging trickle-down effect for the job quality of the next generation

of workers. [If people are not equipped with the skills required to perform effectively at work, they are much less likely to succeed and progress in their careers](#) (UK Government, 2018). This not only causes problems for workers, exposing them to risks associated with poor job quality, but employers also risk undermining their own efforts to grow the sector, by damaging industry reputation and consumer acceptance of heat pumps.

3.3.2 Apprenticeships

Apprenticeship wages are very poor (£4.30 per hour, UK Government, 2021b). Further, apprenticeships often have no long-term commitment after qualification. A sector skills gap and associated increased labour capacity together with lack of long-term market certainty could be driving the use of apprenticeships simply as a source of cheap source of labour. [Targeting long-term funding towards employers, to enable them to take on apprentices and pay a living wage would reduce labour injustice.](#)

3.3.3 High capital cost of installations

A skills gap has a direct impact on the cost of heat pump installation. Research on the heat pump manufacturing supply chain in the UK found that, of potential cost reductions in heat pump installations, 50% could come from non-equipment costs including having better trained installers (Eunomia, 2020). [Increased cost to consumers is an expected impact of a skills gap](#) in the low carbon industry due to increased reliance on subcontractors and overtime to get the work done (Jagger et al., 2013).

Training provider T2 highlighted that at present, heat pump systems can cost £5,000 more than a gas boiler up front, but that the impact of capital costs of systems vary from household to household. Social housing providers are likely to be able to cover the higher capital costs of systems and the early adopter households are *“the people who get the funding in the short term, at the beginning, and they are the ones who had the money to do it in the first place”*. Therefore, households, who could have likely afforded a high capital cost installation in the first place, benefit from savings from government funding. This bears similarity with outcomes from the UK Feed in Tariff, where higher

income homeowners, most able to afford solar PV, accessed financial benefits (Strielkowski et al., 2017).

[If capital costs of heat pumps do not decrease, lower income households are likely to be disadvantaged](#) further by either a gas boiler ban, or a tax on fossil fuels, with social justice ramifications. Tackling the skills gap could directly reduce capital costs of installations, as well as helping to create a ‘mass market’ scenario, which has the potential to further reduce capital costs by 20% (Eunomia, 2020). Experience from Sweden and Finland has shown that capital costs only need to reduce so much that fossil fuel heating is no longer the cheapest option, for there to be a rapid change in the market (Energy Saving Trust, 2021c). By closing the skills gap could drive down costs and subsequently minimise injustices.

3.3.4 Poor quality of installations

Interviewees highlighted how the installer and designer skills gaps are negatively impacting the quality of installations. Installer I2 reported that they were called out to remediate a heat pump installation in a new build, after the homeowner explained *“we don't know how to use this and the rooms never seem to be warm, yet our bills are extortionate, what do we do?”*. Trade organisation TO1 has observed similar responses from households after installation, with households reporting a *“a system that takes ages to warm up and it costs an awful lot of money to run”*. Training provider T1 also stated: *“there's a huge shortage of skills now... the impact centre of that is just horrific installations which don't service the consumer. I mean ultimately it is how you quantify that, and predominantly that will be high running costs”*. Poor quality installations not only have negative consequences in terms of social justice, but also contribute to negative societal perception of the technology, which risks delaying technology uptake (see Section 3.3.5).

Lower income households spend a higher proportion of their income on energy (HM Treasury, 2020), thus are more sensitive to increases in energy bills than higher income households. [Poor heat pump installation due to skills gaps could exacerbate fuel poverty.](#) To minimise these impacts, and to achieve widespread deployment without a properly trained workforce, training provider

T1 suggests the government should offer ‘running cost’ subsidies. Such a subsidy would be required to be a long-term commitment from government, over the lifetime of a heat pump, which can be around 20 years, or longer, depending on how well maintained a system is (Renewable Energy Hub, 2020). However, any drawback of funding could push people into fuel poverty, and does not tackle the root of the problem. ‘Use of skills’ is an integral part of decent work, which is a key factor of a just transition. Encouraging an unskilled workforce, where workers are not encouraged to grow and use their skillset, may reduce the quality of jobs created through the transition, and ultimately does not align with tenets of the just transition.

3.3.5 Installer competency and access to training

Interviewees identified that poor installations have a damaging effect on industry reputation. Installer I2 identified that *“heat pumps are getting an awful lot of bad press”* as a result of poor installations and the need for remediation action. Both training providers T2 and T3 suggested that a ‘competency card’ scheme should be adopted in the heat pump sector, something which Skills Development Scotland (SDS) also indicated would be of benefit to the low carbon sector generally (SDS, 2020).

Four interviewees identified cost and loss of income as a barrier to taking up training opportunities. Not only are workers expected to pay for training courses, but they often are forced to take time off work to take the courses, according to interviewee TO1 and T1, losing out on significant earnings.

T1 believes that subsidising training is a key to ensuring everyone has a chance to access it. These findings echo those of the HPA, who suggested that the Government should develop a £1.5M voucher scheme to help the first 5,000 installers go through their upskilling course (HPA, 2020). That said, two respondents highlighted that there is a reluctance from older workers to actually take up training opportunities. According to installer I2, older workers often think *“what’s the point in me upskilling?”* which I2 empathises with, saying: *“fair enough... they’ve got about another twenty years left out on the tools, what’s the point?”*. On the Local

Zero podcast, Nathan Gambling says that the *“average age of your heating engineer will be about 50... mainly self-employed... they have a good thing going so why would they want to transition to something which will upset the apple cart?”*, stating that they often only have left a *“few more years till they retire”* (Gambling, 2021b).

There is a growing industry need for the retention and upskilling of these existing skilled heating engineers, not only to be part of the heat pump installer base, but also to play a part in training the next generation of installers to a high standard. [Incentivising upskilling for all age groups and ensuring that training is affordable and worthwhile will support a sustainable, self-propagating workforce.](#)

4. Conclusions and recommendations

There is an installer skills gap in the UK heat pump sector. The skills gap has several causes, including lack of consumer demand, poor government signalling and a disconnect between training and industry. Currently, the skills gap and its impacts is widening social inequality and hindering growth of the UK heat pump sector. Policy makers, training providers and the heating industry must address the skills gap to ensure sustainable and equitable employment opportunities in the sector and to support the UKs ambitions for a just transition to net zero.

4.1 Inequalities caused by a skills gap

The anticipated impacts of a persisting installer skills gap in the heat pump sector are wide reaching, beyond simply jobs, employment and – crucially – emissions reduction. Examining the skills gap through a social justice lens has explicated impacts across a range of stakeholders, including consumers and workers.

The skills gap presents inequalities to households or consumers by causing:

- Heat pump installations that are not to industry standard, damaging industry reputation and increasing energy bills – thus potentially exacerbating fuel poverty.
- Increased capital cost of heat pump installations, making them unaffordable to lower-income groups

and reducing uptake. Higher income households are more likely to be early adopters, taking advantage of any government grants which are typically wound down over time.

The skills gap, and its drivers, causes inequalities for workers and young people, too:

- Workers must pay to be re-skilled, and take unpaid leave to complete training. Lack of long-term government signals, or plans to put policy into practice, have made investment in training too high risk to workers.
- A gap in the quality of existing workforce skills (due to lack of access to fully comprehensive training, or lack of requirement) can hinder career success and job satisfaction, and can have trickle-down effect for the job quality of the next generation of workers, i.e., young people.
- Poor apprentice wage, lack of job security and a general lack of routes into the sector is reducing uptake of apprenticeships and enhancing the risk of apprentices being treated as cheap labour. This particularly impacts young people.

4.2 Recommendations to tackle the skills gap

Addressing the skills gap in UK heat pump sector requires action by policymakers, training providers and the heating industry. We make the following recommendations to support a sustainable, self-propagating workforce.

UK government must provide long-term policy signals to incentivise the heat sector and incentivise workers to invest in training and re-skilling. This should include:

- Longer-term funding towards apprenticeships, enabling employers to take on apprentices, pay a living wage, and provide longer term employment routes.
- Incentives for upskilling for all age groups and ensure that training is affordable and worthwhile.
- Provide financial incentives to support heat pump uptake that do not widen social inequalities.

The **heat pump sector** and **training providers** must:

- Place equal importance on the existing skills gaps as well as potential future gaps. Otherwise the skills gaps risks becoming a self-perpetuating cycle; where a poorly skilled existing workforce trickles down to the next generation of installers.
- Work closely with installers to ensure that the training provides appropriate skills.
- Consider a system similar to 'competency card' to ensure high quality installations.

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For a copy of the full dissertation, please contact zoe.branford97@gmail.com

References

- Blundell, R., Dias, M.C., Joyce, R., Xu, X., 2020. COVID-19 and inequalities.
- CCC, 2013. Fourth Carbon Budget Review – Part 2. The Cost-effective Path to the 2050 Target.
- Climate Justice Alliance, 2021. Just Transition A Framework for Change.
<https://climatejusticealliance.org/just-transition/>
- Committee on Climate Change (CCC), 2019. Net Zero Technical Report. London.
- Creswell, J.W., Creswell, J.D., 2018. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage, Los Angeles.
- Department for Business Energy and Industrial Strategy (BEIS), 2019. UK Becomes First Major Economy to Pass Net Zero Emissions Law.
<https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law>
- Department for Business Energy and Industrial Strategy, 2020c. The Ten Point Plan for a Green Industrial Revolution.
<https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution/title>
- Energy Saving Trust, 2021c. Submission to BEIS Committee Inquiry into Heat Pumps. London.
- Environmental Audit Committee, 2020. MPs turn up the heat on Government’s ambitions to install 600,000 heat pumps every year. UK Parliament.
- Eunomia, 2020. Heat Pump Manufacturing Supply Chain Research Project. London.
- Foden, M., Fothergill, S., Gore, T., 2014. The State of the Coalfields.
- Gambling, N., 2021a. BetaTalk Podcast: How to Train the Army of Engineers Needed to Decarbonise Heat.
- Gambling, N., 2021b. Local Zero Podcast Zero-carbon homes: building a supply chain and workforce.
- Heat Pump Association (HPA), 2021. The essential role of the heating installer on the road to net zero.
<https://www.heatpumps.org.uk/the-essential-role-of-the-heating-installer-on-the-road-to-net-zero/>
- Heat Pump Association (HPA), 2020. Building the Installer Base for Net Zero Heating.
- Jagger, N., Foxon, T., Gouldson, A., 2013. Skills constraints and the low carbon transition. *Clim. Policy* 13, 43–57.
<https://doi.org/10.1080/14693062.2012.709079>
- Lowes, R., 2021. LocalZero Podcast: Too Hot to Handle? Decarbonising heat in homes and industry.
- Pirie, G.H., 1983. On Spatial Justice. *Environ. Plan.* 15, 465–473.
- Renewable Energy Hub, 2020. Heat Pump Maintenance. A Complete Guide to Heat Pumps 2020.
<https://www.renewableenergyhub.co.uk/main/heat-pumps-information/maintenance-of-heat-pumps/>
- Singh, M., Sharma, M.K., 2014. Bridging the Skills Gap: Strategies and Solutions. *IUP J. Soft Ski.* 8, 27–33.
- Skills Development Scotland, 2020. Climate Emergency Skills Action Plan 2020-2025.
- Strielkowski, W., Štreimikienė, D., Bilan, Y., 2017. Network charging and residential tariffs: A case of household photovoltaics in the United Kingdom. *Renewable & Sustainable Energy Reviews.* 77, 461-473.
- TUC, 2019. A just transition to a greener, fairer economy. London.
- UK Government, 2011. UK Renewable Energy Roadmap. London.
- UK Government, 2018. Good Work Plan. London.
- UK Government, 2021b. Employing an apprentice. Gov.UK. <https://www.gov.uk/employing-an-apprentice/pay-and-conditions-for-apprentices>
- United Nations (UN), 2015. The Paris Agreement.