Unlocking the barriers to low carbon heat: an industry view

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*About UKGBC*

The UK Green Building Council (UKGBC) is an industry network with a mission to radically improve the sustainability of the built environment, by transforming the way it is planned, designed, constructed, maintained and operated. As a charity with over 400 member organisations spanning the entire sector, we represent the voice of the industry’s current and future leaders who are striving for transformational change.

*Background to this paper*

In June 2020, UKGBC Chief Executive Julie Hirigoyen and members of the policy team met with Minister Kwasi Kwarteng, who was keen to learn more about the construction and property sectors’ views as to the barriers to investment in low carbon heat and potential solutions.

Following that meeting, UKGBC convened an industry-wide workshop to explore these issues in more detail – with a particular focus on domestic new build, non-domestic new build and commercial retrofit. This paper presents the findings of that workshop and makes recommendations for driving enhanced uptake of low carbon heating solutions.[[1]](#footnote-1)

*The overarching picture:*

Barriers to investment in low carbon heat

Certain barriers are more pronounced in new build than in retrofit – and indeed some will be more evident in the commercial as opposed to domestic sectors. However, the majority of barriers are common to all sectors, and we capture these here.

* Supply chain skills
  + The market for air source heat pumps is still immature.
  + Linked to this is a fear among larger developers that there simply aren’t enough installers out there to enable them successfully to complete large developments using heat pumps alone.
  + Additional training and skills (especially in the SME sector) are required to deliver quality installations (though skills are noticeably further developed in the non-domestic sector, due to the prevalence of air conditioning systems). Incorrect design, sizing and installation are key problems. The need for low temperatures also creates new design and integration challenges for builders and mechanical and electrical contractors, who need to work together more collaboratively.
  + The supply chain for maintenance, management and repair is not well established (apart from reversible heat pumps used for commercial air conditioning). Where occupants have experience of poor maintenance and inadequate repairs, this will undermine confidence in the products.
  + Silos in the supply chain mean that heat pump installers won’t necessarily advise of the need for optimal insulation. Heat pumps operate sub-optimally in poorly insulated buildings, which can result in the business case for installing them being undermined.
  + There can sometimes be a problem of overspecification of heating technologies and a lack of focus on ensuring the highest levels of fabric efficiency, optimal orientation, natural ventilation, solar shading, etc. before installing complex ‘kit’.
  + Low carbon heat is not properly rewarded in SAP. This can lead to its being overlooked by designers, as SAP is often used *de facto* as a design tool, even though that is not its function.
* Occupant demand/awareness/confidence
  + In both new build and retrofit markets, there is a huge lack of awareness of low carbon heating technologies and how to operate them to best effect.
  + This is exacerbated by a lack of awareness among estate agents, surveyors and valuers.
  + There are limited data about the operational performance of heat pumps, and supplier claims can often be overly optimistic.
  + A lack of accreditation/certification schemes puts a brake on consumer confidence. Also, unlike the gas and electricity markets, heat networks are currently unregulated.
  + Current EPCs both ignore actual operational performance and also use out-of-date carbon emission factors. This means they provide very poor information to occupiers and landlords and do not reflect the benefits of using a low carbon heating system.
  + There are misaligned incentives as between developers, occupiers, energy managers. Why would a developer install low carbon heating solutions when they won’t be using the building? And on the flip side, those that will be responsible for maintaining and managing the technology in the future are rarely involved in the design or commissioning stages of a building.
* Cost

The costs, both capital and operational, associated with the installation of low carbon heating were identified as a key barrier.

* + The capital cost of a heat pump – both for new build and boiler replacement – is significantly higher than a gas boiler. Particularly in the housing market, where prices are often at the very ceiling of what people can afford, anything that adds to cost will be off-putting.
  + Likewise operational costs are higher, due to the higher cost of electricity.
  + Currently the effective carbon tax on electricity is around three times higher than that on gas, as the Climate Change Levy rate for electricity has not been reduced in line with the recent decarbonisation of electricity.
  + Concerns were raised that the £4,000 cost cap attached to the new Clean Heat Grants may disincentivise widespread heat pump deployment.
  + More broadly, there is a lack of Government incentives – both in the new build and retrofit markets – to encourage the installation of low carbon heating solutions.
* Lack of a clear Government trajectory/policy signals
* By far the most often cited barrier to greater investment in low carbon heating is the lack of a clear Government policy trajectory for decarbonising heat in buildings. For example, what is the anticipated role for hydrogen use for heat via the gas network; will the electrification of heat become the dominant Government objective; what role is there for the further development of heat networks? This is critically important as there are only two heating system replacement cycles between now and 2050 – so concerted action to decarbonise heat must start in the first half of the 2020s, and must be signalled well in advance.
  + As noted above (under ‘Occupant demand’), both Building Regulations and EPCs are predicated on the modelled, as opposed to operational, performance of buildings. They also use out-of-date carbon emission factors. This means that they neither reflect nor incentivise low carbon heating solutions.
  + Uncertainties around the future of gas decarbonisation (in particular the roles of hydrogen and biomethane) lead many industry players to take the view that all-electric buildings are the ‘safest’ (albeit more expensive) option currently. However, there are concerns that they might end up having ‘backed the wrong horse’, as happened with the widespread deployment of biomass boilers
* Other
  + *Planning issues*

While the installation of an Air Source Heat Pump now falls under permitted development in all four UK nations, there are slightly different criteria as regards the size of the external compressor, the distance from neighbouring buildings or boundaries, etc. Restrictions regarding externally mounted equipment, conservation areas and proximity to listed buildings further complicate the picture.

* + *Heat Networks*
* The efficiency of an Air Source Heat Pump increases with lower temperature heat networks. A lower temperature network is also more flexible in that different technologies can be added on to it at a later stage, capturing heat from e.g. sewage, solar, water, air.
* The complexity of legal agreements for community/district heating networks was raised more than once.

Solutions

Participants posited the following potential solutions to the barriers identified in the previous section. Taken together, they would play a significant role in driving greater investment in and deployment of low carbon heating solutions.

* Supply chain skills
  + Implement a comprehensive and widespread training programme. This will include training new installers as well as retraining gas engineers. As part of a green recovery programme, it could also involve upskilling furloughed or newly unemployed workers, or those looking to requalify from sectors impacted by COVID.
  + This needs to be matched by the creation of an appropriately trained workforce for maintenance, management and repair.
  + In order to minimise the cost difference between heat pumps and gas boilers, it is critical that installers understand the need for fabric performance to be optimised and energy demand thereby reduced. A thermal store can also help reduce peak demand.
  + Clearer guidance on sizing needs to be produced, perhaps through BS or CIBSE.
  + There are a number of countries (e.g. the Nordic countries, France and Italy) where the installation of low carbon heating (particularly heat pumps) is much further advanced than in the UK. We should learn from international best practice.
* Occupant demand/awareness/confidence
  + Develop an end user engagement strategy, using local authorities, media, etc. to build awareness.
  + Linked to this, it is critical to build awareness of the fact that heat pumps can both provide cooling in the summer (something that will be increasingly needed), as well as heating in winter – something that gas boilers can’t do.
  + Develop appropriate accreditation/certification schemes – or build on those that already exist. Address the unregulated nature of heat networks through the introduction of a registration scheme similar to the NERS, WIRS and GIRS registration schemes that currently operate in the electricity, water and gas connection sectors respectively. As regards quality assurance, the CHPQA could readily be built on. Existing certification/registration schemes, like F Gas and Gas Safe, also serve as useful models.
  + Swift and effective systems of redress need to be put in place for when things go wrong.
  + There should be better training for estate agents, valuers and surveyors to enable them to better understand these technologies and factor their low carbon benefits into building valuations.
  + There should be greater involvement in the design and commissioning stages of buildings of those that will be responsible for running and maintaining the technologies once the building is handed over. This should include ESCOs where appropriate.
* Cost
  + A comprehensive strategy to build demand will start to bring costs down.
  + Work with major manufacturers who are already producing heat pumps and other systems to ensure an ‘off the shelf’ market for low carbon heating technologies.
  + Financial incentives – consideration should be given to:
    - a reduced rate of VAT on low carbon heating technologies
    - access to low cost debt, especially for the SME sector
    - variable business rates dependent upon operational performance (again this should be most attractive to the ‘tail end’ of the commercial sector, for whom CSR, GRESB or TCFD reporting simply don’t figure)
    - Scrappage schemes, particularly if they can incentivise low carbon retrofit at a point before existing equipment is life-expired.
  + Additionally, some form of carbon pricing is required to offset the discrepancy between gas and electricity prices. The most obvious solution in the short term is to rebalance the Climate Change Levy to reflect the relative carbon intensities of gas and electricity.
  + If heat networks were regulated, they could attract infrastructure funding in the same way that currently regulated networks do.
* Lack of a clear Government trajectory/policy signals
  + It was noted that the Government’s commitment to the net zero agenda – and the increasing awareness of this in some segments of the marketplace (especially the non-domestic sector) – is starting to influence those that are designing buildings now, as they seek to avoid assets being stranded or devalued in the future. However, in order to influence every corner of the marketplace, the signals from all parts of Government need to be clear and consistently repeated.
  + The most important first step is for the Government to publish without delay a comprehensive Heat & Buildings Strategy, paving the way for a variety of heat solutions, both for new build and the existing stock. It must contain a broad suite of measures and policies designed to incentivise and support the roll-out of low carbon heating solutions. It should also reflect the fact that there will be regional differences in the deployment of different solutions – for example, while it looks unlikely that there will be widespread deployment of hydrogen for building-level heating in the foreseeable future, there may be some parts of the country where it will have a role to play in the short to medium term.
  + SAP as an assessment tool must be updated to better reflect up-to-date carbon factors. It should also become a more dynamic and responsive tool, which can change more swiftly to reflect technology developments and changes in the carbon intensity of the grid. As the landscape of energy provision changes, it must also be able to capture peak demand periods. Consideration should be given to incorporating an incentive into SAP, so that additional scores are given for future-proofing homes so that they are less likely to require retrofitting in the future.
  + Building on this, EPCs should start to use actual performance data, e.g. smart meter data. Consideration should also be given to changing the EPC methodology to better reflect and incentivise low carbon solutions.
* Other
  + *Planning issues*

Review – and as far as possible streamline – planning requirements in relation to the various issues listed under ‘barriers’.

* + *Heat networks*
    - Set a date by which all new heat networks should be low temperature.
    - There is a need for standardised legal agreements. We understand that work to develop these is currently ongoing through the Heat Networks Investment Project.

*Some sector-specific barriers and solutions:*

* Domestic hot water

There was widespread agreement that the efficient generation of domestic hot water by heat pumps is challenging, as Health & Safety Executive guidance requires storage of domestic hot water at a temperature of at least 60°C. This is not compatible, especially in colder weather, with the fact that heat pumps are at their most efficient when the temperature difference between the heat source and the hot water being produced is as low as possible. As a result, if heat pumps are required to deliver domestic hot water at the currently required temperature, they have to operate at considerably less than optimal efficiency.

This problem has in large part been solved in the commercial sector where a separate system can be installed because there is space to do so. But it is still a real challenge in the domestic sector. Possible solutions include:

* + Reducing hot water demand through increased user awareness and smart metering;
  + a review of the water regulations;
  + the development of higher temperature heat pumps.

However, this is an area that needs much further work.

* Commercial retrofit

In addition to the general barriers and solutions already identified, there are some issues that are specific to the retrofit sector.

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| **Barrier** | **Solution** |
| There is still relatively little experience of using heat pumps for heating. There is a perception that this will require high levels of intervention. | Owners, occupiers and facilities managers need to be trained and shown that heat pump installation can be done with relatively little intervention (e.g. by retaining the current emitters and distribution system). |
| The absence of operational ratings leads to a lack of information and agency on the demand-side because tenants have no access to data on energy performance and associated carbon emissions and therefore can’t exercise their market power when choosing space. On the supply-side, developers see little demand and are therefore not pushed to develop better-performing buildings. This problem is exacerbated by the landlord/tenant split, whereby landlords don’t pay the energy bills and so have no incentive to invest in more effective systems, while tenants do not have control over the building/HVAC systems. | Introduce mandatory operational ratings for the non-domestic sector. The most often cited scheme is NABERS in Australia, which has seen CO2 emissions fall by 32% since 2005 and energy productivity in offices increase by over 40% since 2001. This is because developers and investors began to see better returns from highly rated buildings, which have become an investment standard. Tenants meanwhile have seen lower costs of occupancy, higher workforce productivity and reputational advantages. Particularly pertinent to this paper is the fact that the NABERS rating methodology rewards low carbon (electric) heating systems.  We welcome the fact that BEIS will be consulting on the introduction of mandatory operational ratings. As part of this, consideration should be given to the introduction of league tables to further drive reputation-enhancing action. |
| Payback periods are too long to enable a good business case to be made. This is particularly the case with short-term leases. | Introduce retrofit incentives (for more detail, see ‘cost’ solutions above). There may also be a role for grants to pump-prime the market (cf. the newly announced Green Homes Grants scheme). |

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1. We are grateful to the Net-Zero Infrastructure Industry Coalition for some additional material [↑](#footnote-ref-1)