

Energy Efficient Scotland: The future of low carbon heat for off gas buildings

A call for evidence

FINAL response from the Energy Saving Trust, 19 June 2019

1. What evidence can you provide of low carbon heat technologies being taken up without government support?

As an organisation that delivers a number of low carbon heat support programmes on behalf of the Scottish Government we have significant evidence relating to low carbon heat technologies being taken up with government support and relating to the difference that the available support makes. We do not have any evidence to suggest that any more than a small minority of householders will take up low carbon heat technologies without support.

The relevant evidence that we have provides some interesting insights and is as follows:

- **Data from the evaluation of the Scottish Government's Home Energy Scotland loan scheme (renewables) which provides loans to owner-occupiers and private landlords to install renewable technologies (including some low carbon heat technologies) and evaluation of the Home Energy Scotland renewables specialist advice service.** This data includes the percentage of owner-occupiers who said (in response to a survey) they would have gone ahead with the installation of a renewables system even if the loan scheme had not been in place.

Of those customers (of the HES loan scheme who installed a renewables system) that responded to the survey associated with the most recent evaluation of the loan scheme¹ :

- 46% would not have installed the measure without the loan.
- 24% would have installed the measure but the availability of the loan enabled them to do this sooner.
- 18% would have installed the measure in some form but the loan enabled them to choose a higher quality system.
- 11% would have installed the same measure in the same timescale regardless.

The evaluation data also includes a breakdown of this data by technology (see figure 1 below). It is important to note however that the number of respondents installing some technologies is small (for example only 7 respondents had installed a ground source heat pump) and this should be taken into account when interpreting the data.

¹ Customers who were paid a loan between November 2017 and August 2018.

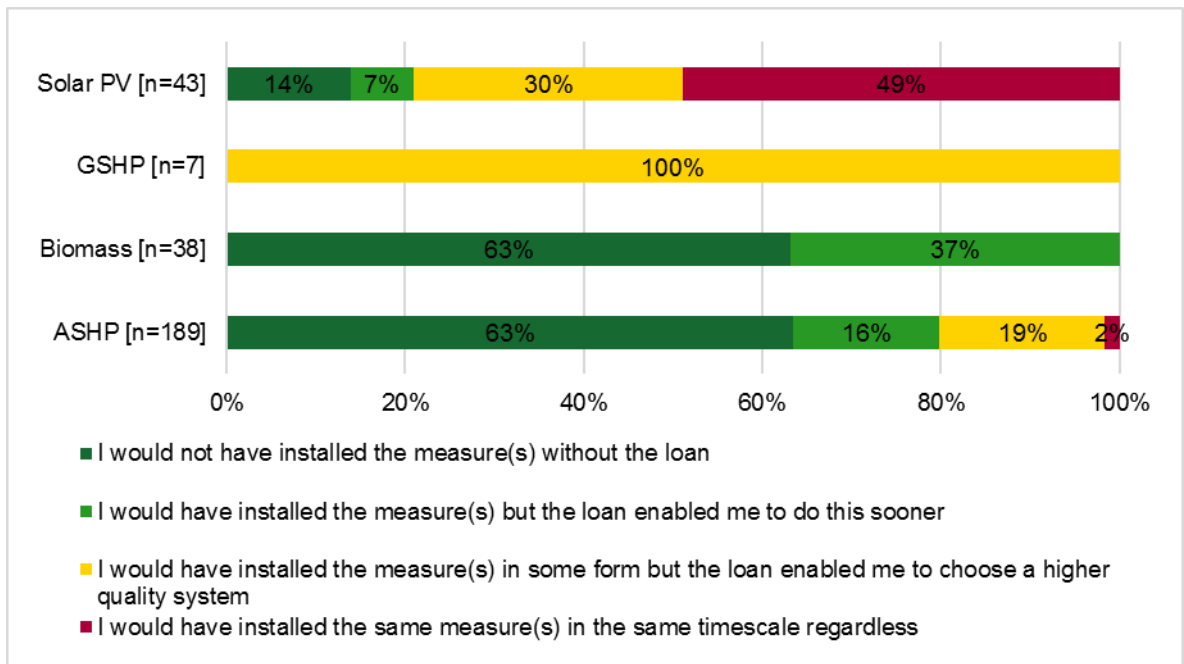


Figure 1: Home Energy Scotland Loan Scheme – impact of loan scheme in decision to install a renewables system

The evaluation also found that 28% of all loan recipients said that take up of the loan had freed money which was then spent on other renewable energy or energy efficiency technologies.

Many customers who take out a HES loan also apply to the RHI and previously to the FITs scheme. The evaluation shows that many feel that the RHI, and previously FIT, payments enabled them to afford their loan repayments. Of customers who received a loan:

- 13% felt they would not have been able to afford the loan repayments without the FIT/RHI payments
- 63% felt that the payments helped them to afford the loan
- 2% said it was not a factor as they weren't aware of FIT/RHI at the time
- 21% said they would have been able to afford the loan repayments regardless.

Customers of the Home Energy Scotland specialist renewables advice service (some of whom will have taken out a Home Energy Scotland loan and some of whom will have not) were also asked about the influence of finance schemes such as RHI and FITs. Of all those applicable 52% had applied for RHI and a further 32% were planning to apply. Customers were also asked which forms of support they attributed most to their decision to install a measure. The forms of support most frequently attributed to the decision to take action were FITs/RHI (58%), followed by the specialist renewables advice home visit (54%), the HES loan (52%) and remote (phone) advice (44%). These results are summarised in figure 2 below.

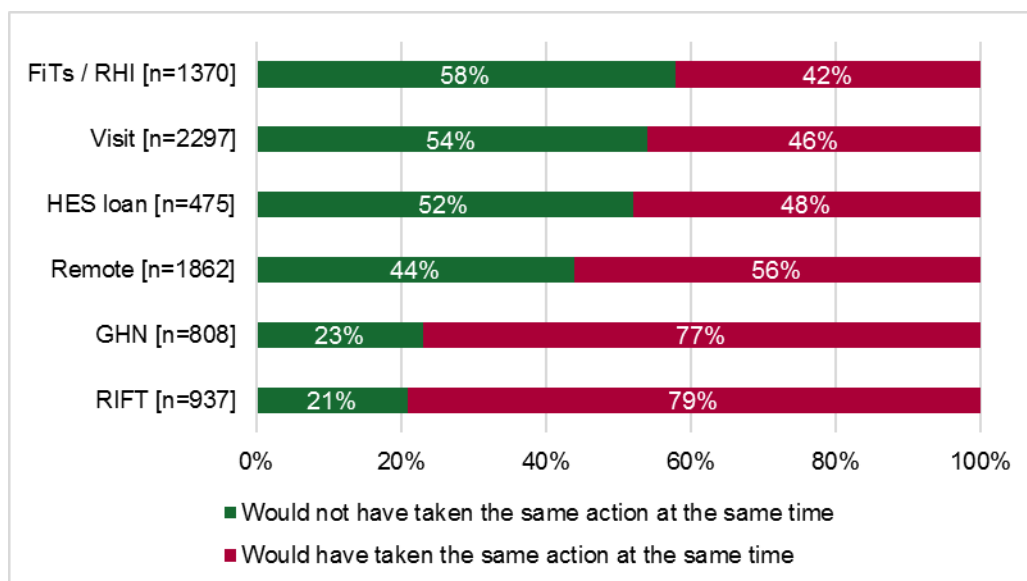


Figure 2: The forms of support attributed to the decision to install a renewables system (Note: FiTs/RHI = Feed in Tariffs/Renewable Heat Incentive, Visit = home visit, HES loan = Home Energy Scotland Loan, Remote = phone advice, GHN = Green Homes Network, RIFT = Renewables Installer Finder Tool)

The evidence presented above highlights the important role that the support provided by *both* Scottish Government and UK Government plays in influencing householders' decisions about whether to install a renewable heating system or not. Home Energy Scotland loans overcome the barrier of high upfront costs associated with renewable heating systems while the RHI makes the long term case more viable for householders. The evidence suggests that combining the two forms of support has been very successful in Scotland with the data presented above suggesting that 76% of customers who received a loan felt that the RHI helped them to afford the loan.

The evidence also highlights that Scottish Government support plays an important role in bringing forward the installation of some systems, in ensuring better quality systems are installed (than would have been the case in the absence of the loan scheme) and in freeing up funds which are then spent on other renewable energy or energy efficiency technologies.

- Evidence from research undertaken by the Scottish Government's Supply Chain Programme.** Over recent years the Energy Saving Trust's work managing the Sustainable Energy Supply Chain Programme² on behalf of the Scottish Government has focussed a considerable amount of effort on supporting the supply chain in rural, remote and island areas. This has provided substantial insight into the challenges and opportunities around renewable energy faced by these communities. The findings of a piece of research³ undertaken by the programme in 2015 are particularly relevant here. This research looked at the supply chain in six remote rural and island areas of Scotland (Western Isles, Orkney, Shetland, Highland, Scottish Borders and Aberdeenshire) and aimed to identify the characteristics of these supply chains to assess what the barriers are for businesses in these areas. As well as interviews with businesses and other stakeholders it also included a small number (6) of qualitative telephone interviews with householders from these areas that had recent experience of installing, or seeking to install,

² See: <http://www.energysavingtrust.org.uk/scotland/businesses-organisations/supply-chain>

³ [Supply chain analysis of remote rural and island areas – March 2015](#)

energy efficiency and renewable technologies. It found that householders living in these areas found it difficult to access Green Deal (GD)/Microgeneration Certification Scheme (MCS) certified installers and assessors and that respondents preferred to use local businesses, both on the basis of trust and to support the local economy. As a result, some householders '*ended up using local, non-certified businesses to complete their installations*'. Where systems are not signed off as MCS compliant then it is not possible to claim the RHI or a Scottish Government loan and in such cases systems will have been installed without government support and without the same level of quality oversight and consumer protection.

- **Anecdotal evidence from the delivery of advice services.** The Energy Saving Trust also has anecdotal evidence of people installing low carbon heat technologies without government financial support. This evidence stems from the advice services that we currently deliver on behalf of the Scottish Government and the Welsh Assembly Government and that we have historically delivered on behalf of BEIS. The technologies in question tend to be low carbon heat technologies that would be ineligible for any government funding (for example, air to air heat pumps, solar thermal that heats anything other than water, etc.) or technologies that have been installed by the householder themselves and which are therefore ineligible for UK and Scottish Government funding because they are not MCS certified. We also have anecdotal evidence that suggests that some householders will choose to go with a non-MCS certified installer if that's the local and cheaper installer. This would make them ineligible for funding from both the UK and Scottish Government.

2. What other barriers may impede the uptake of low carbon heat in buildings not currently using mains gas?

The most relevant evidence that the Energy Saving Trust has on the barriers that impede the uptake of low carbon heat is from the 2017/2018 evaluation of the Scottish Government's specialist renewables advice service. The barriers that specialist advice service customers not currently using mains gas (who have indicated that they have an interest in installing renewables or solid wall insulation in their properties) cite about why they are not going to install the measures that have been recommended to them by one of the programme's specialist advisors are summarised in figure 3 below. It is worthwhile noting here that householders are only recommended a specific measure if they have shown some interest in the technology *and* it is suitable for their home.

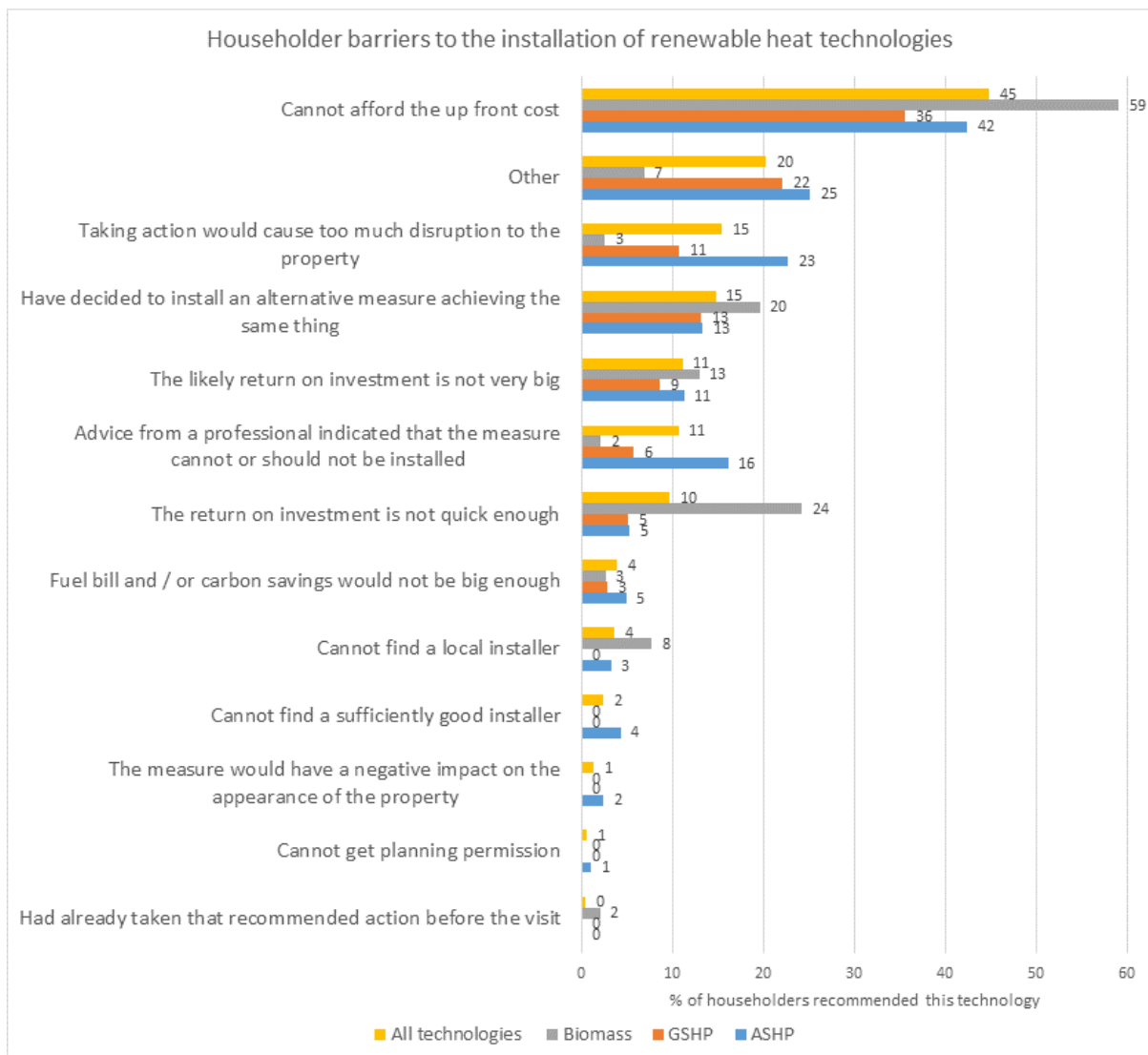


Figure 3: The barriers that specialist advice service customers not currently using mains gas (who have indicated that they have an interest in installing renewables or solid wall insulation in their properties) cite about why they are not going to install the measures that have been recommended to them.

The 'other' category in figure 3 above includes lifestyle logistics, noise (particularly for ASHPs), planning permission concerns and aesthetics.

A similar question was also asked to people who were still considering whether to proceed with an installation. 54% of those cited the reason for *'still considering whether to proceed'* as being the upfront costs – and this was particularly the case for people looking into heat pumps or biomass heating. More specifically 44% of those still considering whether to proceed with an ASHP installation cited upfront costs as the reason for this. The equivalent figures for those still considering whether to proceed with biomass and still considering to proceed with a GSHP installation were 55% and 36% respectively.

The barrier cited by the largest percentage of respondents was the upfront cost (45% of those who had decided not to install) and 54% of those deciding whether to install). Even with the RHI there is still a significant upfront cost to pay. It is important, when looking at the figure above, to take into account that householders have the option of taking out a HES loan which is up to £10,000 for renewable heat measures. Without this loan there would be an even greater barrier to meeting the

upfront costs of installing a renewable heating system. Most of those who were still considering whether to proceed with an installation had heard of the HES loan but had not yet applied for it (72%). Some mentioned that they may apply for it in the future whilst others had ruled out applying (often citing that they didn't want to take on additional debt).

It is also worthwhile noting here that the HES loan can cover 100% of the costs associated with installing a renewable heating system only up to £10,000. Costs of renewables systems in remote and rural (and therefore typically off-gas) areas are typically higher than an equivalent system in the central belt. This means that cost is arguably a bigger barrier in these areas.

Other barriers that we are aware of, and that are not covered in figure 3 above or in the consultation document are that:

- **Lack of availability of maintenance and repair professionals.** Householders, specifically those living more rurally, do not always have the confidence that they would be able to get people out quickly enough if their renewable heating system broke down due to a lack of qualified professionals in certain areas. This issue was recently raised by a number of MSPs (as a reason why they had not yet installed a heat pump) in a recent evidence session on the Climate Change Bill. In addition, informal feedback from some householders who have installed a renewable heating system suggests that a small minority have had problems getting maintenance contractors (particularly in remote areas) or problems where a certain system type is no longer in production and they can't find a qualified contractor.

3. What could we do to remove these barriers and support the uptake of low carbon heat? Can you give examples of successful low carbon heat implementation?

The support that is currently provided by the Scottish Government is successful when combined with other support to help cover the cost of the system (i.e. the RHI) and aims to overcome the main barriers to the uptake of low carbon heat. The specialist advice programme provides in-depth tailored and impartial support, the Green Homes Network provides inspiration and encouragement, HES loans remove the upfront costs barrier and the Renewables Installer Finder (RIF) tool provides access to consumer rated installers.

The programmes listed above provide some level of support (ranging from online information and self-help tools through to in-depth specialist in home advice). to not insignificant numbers of households every year (for example the renewables specialist advice service supports around 3,500 householders a year and the advice network gives advice on renewables to over 12,000 households a year). Given that there are 500,000 households in Scotland who do not use mains gas as their primary source of heat it will be important to continue to build on and further develop and expand the support available over the coming years.

As noted in our response to question 2 above one of the most significant barriers to the uptake of low carbon heat in buildings not currently using mains gas is upfront cost: our views on how this barrier can be removed and/or addressed are outlined below.

Removing and/or addressing the upfront cost barrier for the fuel poor

As we have noted in previous consultation responses, in order to help the fuel poor transition to renewable heating we believe that there will be an ongoing need for the Scottish Government to provide grants (together with loans for any required householder contributions) for households living in their own properties who cannot afford to pay for low carbon heating. We acknowledge that such grant support is already available through Warmer Homes Scotland for the installation of renewable

heating systems. However, low carbon heating systems currently make up only a minority of heating systems installed under Warmer Homes Scotland. This needs to change. Given the Scottish Government's fuel poverty and climate change targets there is a need for Warmer Homes Scotland (and indeed other publicly funded programmes that provide and/or subsidise the provision of heating systems) to transition from a programme that supports the installation of high(er) carbon heating systems to one that supports the installation of renewable heating systems. In practice this means removing support (from fuel poverty and other publicly funded programmes) for the installation of high carbon heating systems (coal, oil and LPG) in off-gas areas. We acknowledge that this will have implications for the public purse. However, as we have discussed in previous consultation responses we do not believe it is sensible to consider costs in the context of simple payback (i.e. in terms of fuel bill savings over the lifetime of any particular measure) because the benefits associated with the installation of such measures go significantly beyond simple fuel bill savings.

Removing and/or addressing the upfront cost barrier for the non - fuel poor (self-funders)

For the self-funded market we think there is a need to continue with the provision of loans.

The Home Energy Scotland renewables loan scheme has worked well in Scotland to date. Between its launch in May 2017 and March 2019, the HES loan scheme received applications for over 1,700 renewables measures. This loan scheme is an important part of the wider support package encouraging the uptake of home renewable technologies. Interest free loans increase affordability to all by removing some or all of the upfront financial cost barrier for households, complementing other financial support that is, or has historically been, available through the Feed-in Tariff (FIT), Renewable Heat Incentive (RHI) and Energy Company Obligation (ECO) schemes. The renewables loan scheme has been a key tool in ensuring that Scotland benefits from the maximum numbers of installations attracting FIT and RHI payments, driving income into Scotland from Great Britain-wide funds. It is also worthwhile noting that by far the most important motivation for applications to the renewables loan scheme has been that the loans are interest-free.

As noted in our response to question 1 above, the results of the evaluation of Home Energy Scotland domestic renewables loans show that 46% of loan recipients report that the loan was critical to them installing and 42% state that it had either made them install earlier than would otherwise have been the case and/or that it made them install something of higher quality than would otherwise have been the case. 28% of loan recipients also reported that the interest-free loan freed up funds for other energy efficiency improvements or additional renewables systems. It is also worthwhile noting that the majority of loan customers are customers of the Home Energy Scotland specialist advice programme – the scheme works hand in hand with advice and support.

The evidence provided in response to question 1 above highlighted the important role that the RHI plays in helping loan recipients pay back their loans. Given the need to incentivise people to choose renewable heating systems over fossil fuelled heating systems it is vital that consideration is given to how the funding gap will be plugged once the RHI ends in 2021. Potential options to consider could include Government grants, Government sponsored mass purchase schemes to bring down costs through bulk purchase, tax breaks for Scottish manufacture etc.

The role of regulation in overcoming barriers

It is widely accepted that funding for the improving the energy performance of Scotland's homes cannot come from the public sector alone and that it will be necessary to attract private sector finance. In the absence of significant public subsidy the only way to effectively unlock private finance is to use regulation to drive the market. If low-carbon heating is not economically competitive for the

consumer, then the only reason private finance will invest is if there is subsidy support to make it economically viable or if they are compelled to do so through regulation.

We therefore believe that a long term policy and regulatory framework for heat decarbonisation in off gas grid areas is needed to provide certainty to the market and encourage investment into low-carbon heating. This should include a firm end date for the installation of high carbon fossil fuel heating (coal, oil and LPG) of 2025 based on boiler lifetimes and Scotland's targets to become carbon neutral by 2040 and for net-zero emissions by 2045 at the latest. Setting clear targets as soon as possible will drive investment sooner and build the market quicker thus helping to drive prices down sooner through greater competition and economies of scale. This will mean low-carbon heating systems will become affordable more quickly for more homeowners than would otherwise be the case.

Tackling barrier - Lack of consumer knowledge

The Scottish Government needs to continue to lay the groundwork and build on existing initiatives (such as the Green Homes Network, specialist in-home advice service, etc.) to encourage consumers to shift away from fossil fuel based heating systems through advice and advertising to promote and normalise the concept of low carbon heating. For those directly responsible for decisions about the heating systems in their homes (i.e. owner occupiers), interest depends on a number of factors all being present:

- Clean heating technologies have to be an appropriate and realistic option for many consumers.
- Consumers have to be aware of the appropriate options, at the time when they are making decisions about heating systems.
- Consumers have to trust the information they are being given about less familiar technologies, including technical and economic performance, reliability and impact on lifestyle.

It is also important that consumers have a route to recourse when things go wrong.

We believe that, once other barriers have been mitigated, awareness of and interest in clean heating technologies can best be developed through a five-pronged approach:

- Build on existing impartial advice provision to ensure clean heating technologies are given at least equal prominence to like-for-like replacement options and information is provided on forthcoming minimum standards and carbon targets towards which low carbon heating systems will help contribute.
- Oblige heating installers to discuss all technically appropriate heating options when quoting to replace an existing system.
- Oblige high carbon fuel suppliers to promote low carbon heating solutions.
- A proactive awareness raising campaign, including national and local advertising, working with existing groups and networks, and working with the private sector including low carbon heating manufacturers and installers as well as fuel suppliers to encourage campaigns.

These activities in combination can work together to increase acceptance of clean heating technologies as modern but normal, and therefore low risk and worth considering.

Consumers need to be engaged at the point when they are considering a replacement heating system, whether as a planned upgrade or a distress purchase following a system failure. Clearly a key way of engaging with consumers at this point is through the installer, particularly for a distress purchase where there may be little time for the householder to research the subject more broadly. Modifications to building regulations will have a major impact in engaging consumers at this point, even if the regulations offer multiple options rather than a prescribed solution, as with the Boiler Plus requirements for England. Where choices on how to comply are available, installers should be required to signpost sources of independent and impartial advice, and this requirement should be written into the guidance for all relevant competent person schemes.

Energy Performance Certificates should also be reformatted to give renewable heating options higher prominence. Currently the EPC only provides insight on updating the currently installed system: that needs to change as householders' increasingly have wider options for low carbon heating systems. On behalf of the Scottish Government the Energy Saving Trust has developed an in-home assessment/advice tool linked to the Home Energy Scotland specialist advice service that provides more detailed options in this area and could inform a rethink of the EPC or the development of the Energy Efficiency Scotland Assessment in this area. It will be important to continue to link EPCs with impartial sources of information and advice for further guidance. This will increase engagement with home buyers at another key trigger point, especially if a fiscal incentive linked to land and buildings transaction tax is introduced.

Impartial advice services will also play a big part in raising public awareness and engaging with directly affected customers.

4. How can complementary systems, such as solar PV and heat pump systems be deployed to overcome such barriers?

Complementary systems, such as solar PV and heat pump systems can improve the economics of the running costs of renewable heating systems. However, this is limited by the fact that demand for heating is highest in winter when solar PV production is highest in summer. The lower running costs associated with such systems may appeal to some householders.

However, it is also worth pointing out that complementary systems could magnify as opposed to overcome barriers to the installation of low carbon heating systems. The upfront costs, for example, for two technologies would be higher than for just one. Disruption associated with the installation could be greater. Controls are likely to be more complicated, adding to the challenge for householders who have to learn how to use a new system.

We are aware that some service providers are working to break into the 'selling-heat' market by owning and maintaining heating equipment and selling heat. If their approaches are successful, then this could help to overcome many of the barriers outlined in the consultation document.

5. What do you consider to be the principal building-specific constraints on low carbon heat?

We think that consultation document captures the majority of the main building specific constraints on low carbon heat. However, one notable constraint is not covered:

- **The availability of space both inside and outside of the building** for specific technologies (for example space for a water tank inside the property for solar thermal, and outside space for a ground or air source heat pump).

6. What can be done to overcome these constraints?

There are a number of things that can be done to overcome the constraints identified in the consultation document including:

- The development and use of building level EPCs in multi-occupancy buildings (tenements, blocks of flats etc.). As Scotland moves towards planned increases in energy efficiency and renewable heat in buildings, more and more action is likely to be required at building scale in tenements, rather than at the level of individual flats: most obviously fitting insulation is most effectively and cost-effectively done at building level, and the heat transition will require much wider use of communal heating in buildings, whether or not connected to a wider district heating network. Having a building level EPC would ensure that residents could understand and act on building level energy efficiency solutions as well as dwelling level solutions. Available evidence⁴ suggests that a significant majority (74%) of European countries issue EPCs at the building level as opposed to the dwelling level.
- Further support for those living in flats to better enable owners to agree on and take forward building-level improvements.
- Review the guidance provided to planning departments in local authorities to ensure that national policy is not applied differently in different areas.
- Review the controls associated with conservation areas and listed buildings. We believe that, in the light of current climate science and of the declaration of a 'climate emergency' there is a need to review the controls associated with conservation areas and listed buildings which may prevent the installation of some low carbon heat solutions.

7. What evidence can you provide on the limitations of low carbon heat technologies (e.g. heat pumps) in buildings with poor energy efficiency?

While we do not have any specific evidence on the limitations of low carbon heat technologies in buildings with poor energy efficiency from the programmes that we manage on behalf of the Scottish Government and others we note that heat pumps perform more efficiently when providing low temperature heat, which becomes more viable in highly efficient homes. Where heat pumps need to provide higher temperature heat in buildings of lower energy efficiency then heat pumps will have a higher running cost due to them requiring a (relatively) greater use of electrical power however they are still expected to be significantly more efficient than boilers and electric storage heating.

8. What low carbon heat solutions are appropriate for hard-to-treat properties where there are limited opportunities to improve energy efficiency of the building fabric?

In older properties where it is not possible to insulate to a high enough standard for low temperature higher efficiency heat pumps to be fully effective then higher temperature heat pumps (which are still more efficient than traditional heating systems) could be used on their own or alternatively a traditional heating system could work alongside a standard heat pump (i.e. a hybrid heat pump or a bivalent set up). With these latter systems, most of the time the heat pump will provide all of a home's heating needs and the gas or oil boiler will be switched off. However, on occasions when the heat pump is not able to provide enough heat on its own, such as when outdoor temperatures are very low and heating demand is high the fossil fuel boiler turns on.

We believe that heat pumps may be able to drive transition in hard to treat properties. Hybrid heat pumps or bivalent systems could act as a bridging technology which can benefit from increased

⁴ See: <https://www.epbd-ca.eu/outcomes/2011-2015/CA3-BOOK-2016-A-web.pdf>

customer acceptance of heat pump technology where there is owner resistance to directly moving to a higher temperature heat pump. However, over time hybrid heat pumps will need to be replaced with renewable heating, or use carbon neutral fuels, such as biofuels or hydrogen. Therefore, the Scottish Government must take all necessary steps to ensure that if hybrid heat pumps are used they are only done so in the short term.

It will be important to ensure that any decisions made about the potential role of hybrids in the transition to low carbon heat in areas off the gas grid are taken in the context of both the potential benefits of this technology (i.e. that they may, in the short term, be appropriate for particularly hard to treat properties, and that such systems may benefit from increased acceptance of heat pump technology) and the potential disadvantages (they prolong the use of a high carbon fuel and mean that householders will potentially have to change the type of heating system they use more often than if they had moved directly to a higher temperature heat pump).

Biomass could also be appropriate for hard-to-treat properties where there are limited opportunities to improve the energy efficiency of the building fabric.

It will also be important to ensure that full consideration is given to how any limitations to improve the energy efficiency are dealt with. For example, the Scottish Government could provide some level of subsidy if opportunities to improve the energy efficiency of the building fabric were limited by the costs of the available solutions.

9. Regarding ground source, air source and water source heat pumps, what evidence can you provide on:

a) the cost of the technology, including installation, maintenance and running costs and alignment with costs related in the RHI data in tables 2 and 3?

We have evidence of costs associated with the installation of ground source heat pumps and air source heat pumps from the Scottish Government’s Home Energy Scotland Loan scheme. This is presented in table 1 below.

| Technology | Sample size | Minimum installation cost | Maximum installation cost | Average price | Average size (Kw) | Average price per Kw |
|-------------------------|-------------|---------------------------|---------------------------|---------------|-------------------|----------------------|
| Air source heat pump | 353 | £5,000.00 | £23,461.00 | £11,464.87 | 10 | £1,299.47 |
| Ground source heat pump | 57 | £8,193.91 | £28,739.55 | £17,024.24 | 11.64 | £1,601.15 |

Table 1: Data from Home Energy Scotland loans paid from August 17 to end May 19

The costs for air source and ground source heat pumps presented above are, broadly speaking, in the same ball park as those presented in Table 2 of the consultation document. It is worthwhile highlighting here that:

- The loans that this data is associated with were paid from August 2017 to the end of May 2019 and as such installations will have happened at a later point in time than the majority of installations associated with the data presented in the consultation document (2014-2017).
- No analysis has been undertaken of the % of customers in rural areas, which may affect costs.

- The HES loan covers the cost of eligible systems but can also cover some other elements e.g. pipework, upgrade to heating distribution etc.

We also have some data relating to maintenance costs for ground source and air source heat pumps. This comes from a recent survey of installers and manufacturers which aimed to gather data on the cost of maintenance and repairs for renewable heating systems. This work included desk research to collect equivalent data for gas and oil boilers. The reason that this research was undertaken was so that the data gathered could be used to improve the advice provided to Home Energy Scotland customers about the costs associated with different heating system options. We are still analysing the results and would be very happy to discuss this work in more detail with the Scottish Government if this would be useful.

The Scottish Government's Home Energy Loan scheme does not currently follow up on individual installations that it provides loan funding to and as such we do not have any data on actual running costs.

b) customer satisfaction with the system?

Customer satisfaction with the systems installed with the support of a HES loan is not something that has been captured in the evaluations of the loan programmes to date.

c) lifecycle and overall efficiency of the technology

The survey of installers and manufacturers discussed in response to part a) above which aimed to gather data on the costs of maintenance and repairs for renewable heating systems also gathered data on the expected lifetime of different heating systems. As noted above we would be happy to discuss the results with the Scottish Government.

10. What factors might inhibit the uptake of heat pumps?

See response to question 2 above.

11. What do you propose as solutions to overcome any barriers to uptake?

See response to question 3 above.

12. What innovations could reduce the operational cost of heat pumps, i.e. higher performing heat pumps, new refrigerants, 'time-of-use' tariffs coupled with thermal storage, and 'heat-as-a-service' business models?

All of the innovations covered in the consultation question *could* help to reduce the operational cost of heat pumps. We believe that ongoing provision and the further development of impartial advice about best use of technologies to maximise efficiencies, newer technological innovations or market offerings has a key role to play in reducing the operational cost of heat pumps. There have been a number of recent innovative developments in the advice space in Scotland (for example the development of services to allow the provision of more tailored advice based on a householder's smart meter data and work to encourage the appropriate use of heating controls). We believe there is significant scope for further innovation in this area.

13. Regarding hybrid heat pumps, what evidence can you provide on:

a) the cost of the technology, including installation, maintenance and running costs

Only a limited number of hybrid heat pumps have been installed in the UK (including Scotland). Those installations that we have data for are those that have been supported with a HES loan. In the period between from August 17 to end May 19 loans for 3 installations of hybrid air source heat pumps were paid. Given such small numbers the costs presented below should be treated with appropriate levels of caution. The data we have is as follows:

| Technology | Sample size | Minimum installation cost | Maximum installation cost | Average price | Average size (Kw) | Average price per Kw |
|-------------------------------|-------------|---------------------------|---------------------------|---------------|-------------------|----------------------|
| Air source heat pump (hybrid) | 3 | £8,820.00 | £11,099.00 | £9,872.97 | 10 | £1,060.90 |

Table 2: Data from Home Energy Scotland loans paid from August 17 to end May 19

The Scottish Government might find the data generated by the recent Freedom Project – a joint initiative from Western Power Distribution and Wales and Utilities - of use here. The project used an air source heat pump and high efficiency gas boiler hybrid system in 75 residential properties. The project’s final report can be found here: <https://www.wvutilities.co.uk/media/2829/freedom-project-final-report-october-2018.pdf>

b) customer satisfaction with the system

Customer satisfaction with the systems installed with the support of a HES loan is not something that has been captured in the evaluations of the loan programme to date.

c) lifecycle and overall efficiency of the technology

Lifecycle and overall efficiency of the technologies installed with the support of a HES loan is not something that has been captured in the evaluations of the loan programme to date. The survey of installers and manufacturers which aimed to gather data on the cost of maintenance and repairs for renewable heating systems did not cover hybrid heat pumps.

d) the ability of hybrid heat pumps to reduce peak demand for electricity whilst also reducing carbon emissions

We have no evidence from the programmes we manage on behalf of the Scottish Government and others on the ability of hybrid heat pumps to reduce peak demand for electricity whilst also reducing carbon emissions.

14. What factors might inhibit uptake of hybrid heat pumps?

See response to question 2 above.

15. What do you propose as solutions to overcome any barriers to uptake?

See response to question 3 above.

In the context of hybrid heat pumps we note that the Freedom Project is the only hybrid heat pump pilot work that has been undertaken (that we are aware of) to date in the UK. As noted above this pilot only involved 75 residential properties. We believe that larger scale hybrid heat pump pilots are required. We do not believe it is appropriate for any part of the Scottish Government’s (and indeed the UK government’s) decarbonisation policy to be based on the results of such a small pilot.

16. Can you share any evidence on the types of buildings where hybrid heat pumps may best be deployed?

As noted in our response to question 15 above. The evidence base for the use of hybrid heat pumps in homes is limited with only the one pilot (that we are aware of) covering 75 homes.

17. Regarding electric storage heating, what evidence can you provide on:

a) the cost of the technology, including installation, maintenance and running costs

The Scottish Government's Home Energy Scotland Loan scheme provides loans for high heat retention storage heaters. The data we have for the costs associated with the installation of these heaters is as follows:

| Technology | Sample size | Minimum installation cost | Maximum installation cost | Average price | Average size (Kw) | Average price per Kw |
|------------------------------------|-------------|---------------------------|---------------------------|---------------|-------------------|----------------------|
| High heat retention storage heater | 26 | £904.00 | £9,900.00 | £3,004.03 | 3.23 | £808.86 (per heater) |

Table 3: Data from Home Energy Scotland loans paid from August 17 to end May 19

As noted above the Scottish Government's Home Energy Loan scheme does not currently follow up on individual installations that it provides loan funding to and as such we do not have any data on actual running costs.

b) customer satisfaction with the system?

As noted above customer satisfaction with the systems installed with the support of a HES loan is not something that has been captured in the evaluations of the loan programme to date

c) Lifecycle and overall efficiency of the technology

We have no data from the programmes that we manage on behalf of the Scottish Government and others about the lifecycle high heat retention storage heaters.

18. What factors might inhibit the uptake of electric storage heating?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others about the factors that might inhibit the uptake of electric storage heating.

19. What do you propose as solutions to overcome any barriers to uptake?

See response to question 3.

20. Can you provide any evidence of electric heating technologies not already described that should be considered a potential future heating solution?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others of electric heating technologies not already described that should be considered a potential future heating solution.

21. Can you comment on the comparative installation, operating and maintenance costs of these technologies in relation to other electric heating sources? As well as their lifetime and efficiency?

As noted above, we have no evidence from the programmes we manage on behalf of the Scottish Government and others of electric heating technologies not already described.

22. Can you provide evidence on the performance of integrated systems such as heat pumps used in conjunction with battery storage and PV?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others of the performance of integrated systems such as heat pumps used in conjunction with battery storage and PV.

23. How could locally integrated systems, such as those mentioned above, help to overcome electrical grid constraints and what market mechanisms could be used to promote on site generation and use for low carbon heat?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others of the performance of integrated systems such as heat pumps used in conjunction with battery storage and PV.

24. Regarding Bioenergy technologies, what evidence can you provide on:

a) the running costs of the technology, including installation, maintenance, fuel and other running costs, and the extent to which costs of biomass boilers are in line with those in tables 2 and 3 above.

The Scottish Government’s Home Energy Scotland Loan scheme provides loans for pellet boilers. The data we have for the costs associated with the installation of these boilers is as follows:

| Technology | Sample size | Minimum installation cost | Maximum installation cost | Average price | Average size (Kw) | Average price per Kw |
|-------------------------|-------------|---------------------------|---------------------------|---------------|-------------------|----------------------|
| Biomass boiler or stove | 57 | £7,449.34 | £24,442.48 | £14,500.87 | 22.45 | £761.19 |

Table 4: Data from Home Energy Scotland loans paid from August 17 to end May 19

The costs for biomass boilers and stoves presented above are, broadly speaking, in the same ball park as those presented in Table 2 of the consultation document. It is worthwhile highlighting here that:

- The data that we present above is for both biomass boilers and stoves.
- The loans that this data is associated with were paid from August 2017 to the end of May 2019 and as such installations will have happened at a later point in time than the majority of installations associated with the data presented in the consultation document (2014-2017).
- No analysis has been undertaken of the % of customers in rural areas, which may affect costs.
- The HES loan covers the cost of eligible systems but can also cover some other elements e.g. pipework, upgrade to heating distribution etc.

We also have some data relating to maintenance costs for biomass heating systems which comes from the survey of installers and manufacturers referenced above and as noted above we are happy to discuss this further.

As noted above the Scottish Government's Home Energy Loan scheme does not currently follow up on individual installations that it provides loan funding to and as such we do not have any data on actual running costs.

b) customer satisfaction with the system

As noted above customer satisfaction with the systems installed with the support of a HES loan is not something that has been captured in the evaluations of the loan programme to date.

c) lifecycle and overall efficiency of the technology

The survey of installers and manufacturers discussed in response to part a) above which aimed to gather data on the costs of maintenance and repairs for renewable heating systems also gathered data on the expected lifetime of different heating systems. We are happy to discuss these results.

d) type of feedstock used, and whether this is grown in Scotland or imported?

We do not have any evidence from the programmes we manage on behalf of the Scottish Government and others about the type of feedstock used and whether this is grown in Scotland or imported.

25. What factors might inhibit the uptake of bioenergy technology?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others about the factors that might inhibit the uptake of bioenergy technology.

26. What do you propose as solutions to overcome any barriers to uptake?

See response to question 3.

27. What evidence can you provide to show whether there is a strong potential for growth of the biogas supply?

We have no relevant evidence.

28. Can you provide evidence on the relative cost of using Scottish produced bioenergy feedstocks compared with conventional fossil fuels?

We have no relevant evidence.

29. Can you provide any evidence on the potential to supply bioliquid fuels sustainably at reasonable cost? With reference to specific fuels such as bioLPG and different types of bio-diesel.

We have no relevant evidence.

Heat Networks

30. Regarding heat networks, what evidence can you provide on:

a) the cost of the technology, including installation, maintenance, fuel and other running costs.

The Energy Saving Trust manages, on behalf of the Scottish Government, the District Heating Loan Fund (DHLF) and as such maintains a record of the capital expenditure and loan amount for each district heating project that a loan is provided for. Data on the cost of the technology and the costs associated with its installation for each project is not requested from loan recipients although invoices for eligible expenditure are retained for audit purposes.

The DHLF is currently not resourced to follow up on individual projects that it provides loan funding to as a matter of course (unless interventions are required) and as such has very limited data on the actual ongoing maintenance, fuel and other running costs associated with each project.

Ofgem have detailed information on individual projects claiming non domestic RHI.

b) customer satisfaction with the system

The evidence that the Energy Saving Trust has about customer satisfaction with heat networks is from an evaluation of the DHLF undertaken in 2015. The full evaluation report can be found here: <https://www.energysavingtrust.org.uk/sites/default/files/reports/Heat%20-%20District%20Heating%20Loan%20Fund%20-%20Evaluation%20Final%20Report%20-%20EST-004-15%20%20%20.pdf>

The evidence on customer satisfaction in the evaluation report was generated from seven face-to-face interviews with customers of a particular large-scale biomass district heating project. The evaluation noted that overall customer satisfaction with the scheme – i.e. the costs, beneficial impacts and support provided – appeared to be high. Quotes from interview participants included:

- *“It has been brilliant. That’s the only thing I can say. It’s been the best heating we’ve ever had”.*
- *“They [Ignis] always notify you. And they won’t charge you if they are doing maintenance. They are good like that.”*
- *“I haven’t had many dealings with them [Ignis] because everything has run fine”.*
- *“It is good value for money; that is all I can say.”*

Conversations with both the customers and Ignis –the DH scheme operator – identified several activities and approaches that may have helped to ensure this high satisfaction. These are detailed in the evaluation report.

The evaluation report went on to note that *‘The one concern customers still had was the viability and so longevity of the scheme. This may be limiting appetite for joining such schemes across the country, though the same customers noted that many of their friends and relatives wanted to join’.*

c) lifecycle and overall efficiency of the technology

The Energy Saving Trust does not have any firm evidence relating to the lifecycle or the overall efficiency of the technology. As the oldest loans are just over 8 years old it is too soon for a technology replacement cycles to be measured (including generation plant and pipework).

31.What factors might inhibit uptake of the installation of heat networks?

There are a number of factors that might inhibit the installation of good quality heat networks, these include:

- **Large upfront capital and development costs** District heating networks are really only practicable if they are cheaper than the counterfactual (alternative heating solutions) for the consumer/end user. With current technology and fuel costs district heating projects can only deliver heat that is cheaper than the counterfactual if they are able to access low interest capital loans and in certain circumstances additional fiscal support such as grant funding and ongoing tariff payments (such as RHI). A lot of development support (including grant support) is required to get projects (especially larger more complex ones) to investment ready status.

For woodfuel biomass district heating it is worthwhile noting in the context of costs that the non-domestic RHI digression for woodfuel biomass has resulted in significant drop in the number of DHLF loan applications for this type of technology. When the DHLF fund was first launched in 2001 all 12 of the applications were for woodfuel biomass, whereas last year (2018/19) the DHLF received only one application for woodfuel biomass.

- **Lack of specialist knowledge on design and installation of district heating networks.** This is a sector that is still developing and one in which projects are complex and bespoke and involve a wide range of stakeholders, many still with relatively little experience of the technologies involved.
- **Lack of knowledge from practitioners on how to procure heat networks.**
- **Lack of confidence from potential customers being asked to connect to heat networks that the schemes will operate successfully and provide a good quality of service.**

32. What could be done to further encourage the development of heat networks?

There are a number of things that could be done to further encourage the development of heat networks. We believe that the most important are:

- **The development and dissemination of a common procurement framework.** As noted in our response to question 31 above the district heating sector is still developing and projects are complex and bespoke and usually involve a wide range of stakeholders, many with relatively little experience of the technologies involved. This includes importantly those commissioning and procuring projects and as such having a common procurement framework that housing associations, local authorities and others could use would help to ensure that good quality networks are procured to an acceptable standard.
- **Building customer confidence.** One of the key ways that the Scottish Government will be able to build customer confidence will be to introduce, as currently proposed, a legislative framework for district heating in Scotland. This will help to ensure that customers are treated fairly and that customer service standards are high (at a minimum, no worse than any other utility). The fact that district heating networks are currently operated as supply monopolies means that, if district heating does not become regulated, there is a considerable risk that a fragmented approach with no quality control could have potentially negative impacts for consumers. As such, we believe that a framework including licencing the provision of district heating has a key role to play in helping to build confidence and credibility in heat networks.
- **Ongoing provision of public subsidy.** We see a continued role for the District Heating Loan Fund. This successful scheme is run by the Energy Saving Trust on behalf of the Scottish Government. To date the scheme has funded 47 projects through provision of £11M of loan funds. As the loan fund is unsecured debt finance it can work alongside other lending to co-fund larger projects. At this stage of market transformation in Scotland when district heating isn't well known to mainstream lenders this type of support together with that of grant support for certain projects remains important. Grant funding (both development and capital) can help to significantly 'de-risk' projects at the outset. Ongoing fiscal support (such as non-domestic RHI) is also an important lever to help de-risk heat network projects which take a life cycle approach to financing. Heat networks require a degree of funding certainty as it can often take time to connect up potential customers and heat loads.

- **Ongoing provision of informed expert support** such as that currently provided by the DHLF programme team. This includes assessing applications, undertaking project appraisals, instructing technical and financial due diligence and ongoing risk monitoring of projects. Additional support and guidance is also provided by an expert advisory panel. This kind of support is essential because (as noted above) the district heating sector is still developing and projects are complex and bespoke and involving a wide range of stakeholders (many still with relatively little experience of the technologies involved).

33. Where and in which circumstances are heat networks the most appropriate low carbon solution in areas not using mains gas?

Heat networks are often the most appropriate low carbon solution in areas not using the gas network as long as there is sufficient building density and heat requirement. Smaller heat networks (micro grids) can also be appropriate in areas of lower heat/building density.

34. What examples can be provided to show how readily heat networks can be moved to renewables – especially those in buildings with high peak heat load?

As urban heat networks are built out it becomes easier to input renewable fuel sources into the network. Aberdeen Heat and Power (primarily a fossil fuelled gas CHP network) is starting to capture waste/residual heat from their energy centres as well as exploring potential from waste heat from sewage and water source heat pumps. It is technically possible to move to renewables for existing buildings with high peak heat loads but this will initially incur more cost for the network operator. These costs can be recouped over time through reduced heat losses in the network

35. What is your view on the continued extension of gas networks before low carbon alternatives to natural gas (e.g. hydrogen) are proven?

Beyond the near-medium term we do not think it will be sensible to continue to extend gas networks before low carbon alternatives to natural gas (e.g. hydrogen) are proven. There is little point investing in the expansion of the gas network unless there is certainty that it will be used over for many decades to come. Until low carbon alternatives to natural gas (e.g. hydrogen) are proven no such certainty will exist.

Investing in a network that may potentially have no role in the (relatively near) future is not in the best interests of consumers as they will ultimately be the ones paying for this.

We also note that high quality, low carbon alternatives to natural gas already exist, and are proven, in the form of heat pumps and biomass boilers. In the case of heat pumps they are significantly more efficient than boilers because they harness the use of heat energy in our surroundings rather than relying solely on the heat that can be derived from burning a fuel.

36. How should wider decarbonisation demands, including for industrial processes, be factored in when considering gas grid extension?

No response.

37. What evidence can you provide on the economic and technical viability of the existing gas grid if it was maintained and operated with low gas flows?

No response.

38. What evidence can you provide on the further developments needed for future market readiness and deployment of the low carbon technologies covered above?

The Energy Saving Trust has no specific evidence from the programmes we manage on behalf of the Scottish Government and others about the further developments needed for future market readiness and deployment of the low carbon technologies covered.

39. What evidence can you provide to show potential economies of scale and unit cost reductions that could be achieved through increases in annual levels of deployment of the low carbon heat technologies covered in this call for evidence?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others that shows potential economies of scale and unit cost reductions that could be achieved through increases in annual levels of deployment of the low carbon heat technologies covered in the call for evidence.

40. What examples can you provide of instances where installing a modern low carbon heating system has also lifted households out of fuel poverty?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others of instances where installing a modern low carbon heating system has also lifted households out of fuel poverty.

41. How should we phase in the policy framework in order to better support the decarbonisation of heat supply to off-gas buildings? Please reflect on whether or not a similar approach to that proposed for energy efficiency remains the best option.

When considering the phasing of the policy framework in order to better support the decarbonisation of heat supply to off-gas buildings it is important to consider that heating systems are systems that are *replaced* on a regular basis and as such it will be important for any phasing to tie into replacement cycles. Not doing so would risk householders having to replace their heating systems before the end of their lifetimes. This would not be in the best economic interests of the householder nor would it be popular.

In this context we think it will be important for the Scottish Government to set a date by which any replacement heating systems in off-gas homes are low-carbon replacements together with a (backstop) date by which all heating systems in off-gas homes are low-carbon.

A firm end date must consider industry investment cycles and take account of how much time must reasonably be allowed for a transition. It must also take account of boiler lifespan. A typical new oil boiler for example will last 12 years, depending on how well it is maintained and the Scottish Government has committed to a carbon neutral Scotland by 2040. This means that the very latest date for the installation of fossil fuel based boilers in areas off the gas grid would need to be 2028. Given the CCC's analysis that that '*strong progress*' will be required '*during the 2020s*' to establish heat pumps as a mass market solution, and the need to leave some leeway we believe that:

- All replacement heating systems in off-gas areas should be required to be low carbon from 2025 and the installation of high carbon fossil fuel heating (coal, oil and LPG) should no longer be permitted.
- There should be an expectation that all homes in off-gas areas will have a low carbon heating system by 2035.

We would expect that a firm end date of 2025 for the installation of high carbon fossil fuel heating (coal, oil and LPG) off the gas grid would give adequate time for industry to prepare and where possible

adapt their business models for the installation of low carbon heating systems while also allowing time for installed boilers to reach the end of their operational lifetime comfortably in advance of 2040.

42. How could Local Heat and Energy Efficiency Strategies (LHEES) help to prioritise early phasing of uptake of low carbon heat in areas not currently using mains gas?

No response.

43. How should the deployment of low carbon heat be funded? i.e. what relative contribution should come from central public funding, energy consumer's bills and private recipient funding?

Given that low carbon heating systems tend to be more expensive than higher carbon heating systems and the fact that their adoption will result in broader social benefits we think that there is a strong argument for a significant part of the funding for the deployment of low carbon heat to come from public funds (i.e. be funded through general taxation). However, given the substantial sums involved and the fact that low carbon heating systems are cheaper to run than higher carbon heating systems we believe it will be important for householders and landlords themselves to also contribute. Where overall costs to the consumer over the lifetime of the heating system are significantly larger than they would otherwise be (i.e. costs are larger overall than the heating system that is being replaced) regulation (to install a low carbon heating system) is likely to be unpopular and may cause many householders financial hardship and this must be taken into consideration when decisions are made about the relative contribution of the Scottish Government.

There will definitely be a need for the Scottish Government to continue to provide grant funds for those households who cannot afford to pay for low carbon heating systems and cannot access other grant support such as the domestic RHI. As such we believe that there is a need to ensure sufficient grant funding for the fuel poor who are living in their own properties.

For the self-funding market, we believe that in the shorter term – particularly for those 'hit' first by regulation in off-gas areas – there is likely to be a role for the provision of grant funding until the size of the market increases and the unit costs of low-carbon heating systems come down. In the medium-long term we believe that grant funding should be phased out for all those who are not fuel poor.

As well as grant funding, we think that there will also be a need for the ongoing provision of Scottish Government loan funding for all householders but particularly for the 'nearly fuel poor' who do not qualify for fuel poverty schemes but whose income level is such that energy costs are still a significant factor in household budgets – to help with the upfront costs of buying and installing a low carbon heating system.

When thinking about the balance between public and private funding for the decarbonisation of heat supply in off-gas grid areas it makes sense to consider the current financial climate as this presents an opportunity to attract more private sector finance that would otherwise be the case. As we have mentioned in earlier consultation responses borrowing costs are currently very low and therefore the costs to the Scottish Government of borrowing to provide finance to householders are also low. This represents a significant opportunity. However, there is also a flipside, when interest rates are so low generally, the incentive that the Scottish Government and/or local authorities would be able to provide, by in effect leveraging their ultimate credit-worthiness into very low (or zero) interest rates compared to the cost to an individual of borrowing directly, are much less. For the 'able to pay' with equity in their properties, it is currently possible to get very low-cost fixed interest deals from their mortgage provider. Rates of 2-3% are readily achievable and on this basis the difference in interest costs between a low or zero interest loan from the Scottish Government and a loan from a mortgage

provider is marginal. However, it is also important to note that interest free is still an energising and motivating something for nothing concept and so has leverage even in the present circumstances.

There is therefore an additional possible route for 'self-funding' householders with equity in their properties which is to simply go to their existing borrower. This would have the incentivising advantages of familiarity and of offering a very simple process, and get the necessary finance at little extra costs to them. Householders are likely to need to be 'incentivised' in some way to do this. We think there could be merit in exploring whether a small cash grant could be used for this purpose. The success of the 'cash-back' for HEEPS loans suggests that this could be a viable option. Clearly, this would only be an advantageous way forward if the cost (to the Scottish Government) of providing small cash grants was less than the cost (to the Scottish Government) of providing a loan, or if it drove higher uptake (i.e. market lending plus cashback drives higher uptake than a Scottish Government zero interest loan).

The consultation question also asks about the relative contribution that should come from energy consumer's bills. The funding for improvements to the energy performance of homes across GB that has come from consumers' bills to date has been via ECO and FITS. We believe that ECO, should it continue in its current form beyond 2022, should be one part of the funding mix for the deployment of low carbon heat. However, one of the challenges with the ECO programme, particularly as it supports more expensive measures in hard to heat homes, is the regressive nature of its funding. It imposes an additional burden on the poor across the country, for the benefit of only those that are in the worst performing homes. For this reason, we do not think that any additional supply obligation type obligation (where measures are funded from consumers' bills) is the correct one to take when it comes funding the deployment of low carbon heating. We understand that when the RHI was first introduced there was consideration of using an obligation approach to fund it but that was considered to be unworkable.

Finally, we understand that there are private organisations planning on providing heat as a service i.e. providing lower or zero cost heating systems combined with energy storage/batteries and charging the homeowner for the use of the heat whilst the organisation also secures income separately through the use of the battery. We also understand that some companies have secured investment to provide zero or low cost low carbon heating systems in exchange for claiming the RHI payments. There may be other financial and commercial models that help to reduce the cost of low carbon heating and the Scottish Government should encourage the piloting of these arrangements to gather further evidence of effectiveness.

44. What is needed to encourage private investment in low carbon heat?

As noted in our response to question 3 above in the absence of significant public subsidy the best way to effectively unlock private finance is to use regulation and clear targets to drive the market. If low-carbon heating is not economically competitive for the consumer, then the only reason private finance will invest is if there is subsidy support to make it economically viable or if householders are compelled to do so through regulation.

Regulation also serves another important purpose in that it provides a clear and definitive signal to the market and as such provides confidence to investors to invest. It also provides a clear signal to the supply chain providing them with confidence to invest in the development of their staff, to recruit more staff and grow their businesses.

45. Of the current sources of finance which are currently available for low carbon heat, which are working well and which are not? Are there successful examples of attracting private sector finance to support low carbon heat deployment that should be explored?

The relevant evidence that we have about the sources of finance available for low carbon heat that are working well relates to the Home Energy Scotland Loan scheme. The evidence that we have suggests that the Home Energy Scotland loans scheme has worked well in Scotland to date. Between its launch in May 2017 and March 2019, the HES loan scheme received applications for over 1,700 renewables measures. This loan scheme is an important part of the wider support package encouraging the uptake of home renewable technologies and energy efficiency upgrades. Interest free loans increase affordability to all by removing some or all of the upfront financial cost barrier for households, complementing other financial support available through the Renewable Heat Incentive (RHI). The renewables loan scheme is a key tool in ensuring that Scotland benefits from the maximum numbers of installations attracting RHI payments, driving income into Scotland from Great Britain-wide funds. It is also worthwhile noting that by far the most important motivation for applications to the renewables loan scheme has been that the loans are interest-free. We believe that consideration should be given to whether, with greater levels of promotion, there is the potential to increase demand for HES loans in Scotland.

The results of the evaluation of Home Energy Scotland domestic renewables loans show that there are only 11% of loan recipients who are free riders with 46% reporting that the loan was critical to them installing and the remaining 42% stating that it had either made them install earlier than would otherwise have been the case and/or that it made them install something of higher quality than would otherwise have been the case. 28% of loan recipients also reported that the interest free loan freed up funds for other energy efficiency improvements or additional renewables systems. It is also worthwhile noting that the majority of loan customers are customers of the Home Energy Scotland specialist advice programme – the scheme works hand in hand with advice and support.

There are a variety of different models that could be used to mobilise private investment and while Scotland has already started to show some innovation in this space with the introduction of equity loans we think there is scope for innovation in this space in Scotland. In particular, we think that there could be a future role for on-bill financing. This approach is already being used in other parts of Europe. Within the social housing sector in Holland for example the Energiesprong model works by replacing the bill that the residents would have paid to the energy companies with an Energy Plan (that costs the householder no more than the bill that was previously paid to the utility) that is paid to the housing provider.

Finally, and as noted in our response to question 43 above we believe there is scope for the Scottish Government to consider ways to encourage 'self-funding' householder with equity in their properties to borrow from their existing borrower in order to cover the costs of purchasing and installing a low-carbon heating system. We also believe that the Scottish Government should support the piloting of more innovative financial and commercial models to test what works most effectively.

46. How should off gas buildings be assessed for their suitability for low carbon heat technologies?

Off gas buildings should be assessed for their suitability for low carbon heat technologies by a suitably trained professional. While the proposed Energy Efficient Scotland assessment is likely to indicate which type of heating systems are potentially suitable for a property it will not include bespoke consideration of the suitability of a particular property for a particular type of heating system. So, for example while the EES assessment may suggest that a number of different heating system types are

options for a particular property, it will be up to the householder to decide which system type they are most interested in and feel would be most appropriate for them and to commission a more bespoke assessment from an individual with expertise relating to that particular heating type. It will also be important to ensure that assessment includes analysis of potential costs and benefits

It will be important that householders are able to access information about potential options online. This could be followed up with more detailed support through Home Energy Scotland to look at specific options in more detail and ultimately a trained professional installer of the systems will need to provide advice to the homeowner so they can make a final decision about what is most appropriate for them and their property. In this context it is worthwhile noting that there is a basic suitability tool on the Energy Saving Trust's website. This tool is being updated this year as part of our work on behalf of the Scottish Government.

47. To what extent should the assessment of suitability of low carbon heat relate to the proposed Energy Efficient Scotland assessment?

As noted in our response to question 46 above, the Energy Efficient Scotland assessment is likely to indicate which type heating systems are potentially suitable for a property. However, ultimately any assessment of the suitability of a particular property for a particular type of heating system will need to be more bespoke and carried out by an individual with expertise relating that particular heating system type.

48. What wider information and advice should be supplied to inform consumers seeking to install low carbon heat supply in buildings that are off gas?

We believe that Scotland and the Scottish Government are ahead of the rest of the UK in having an integrated, significantly resourced and very high quality advice service. In 2016/2017 Home Energy Scotland helped 92,500 households achieve significant carbon savings with a customer satisfaction rating of 96.9 per cent.

The need for effective advice will become even more significant in the coming years. Encouraging householders to install low carbon heating systems will mean persuading them to engage with systems that involve more complex choices and significant investment. Our evidence shows that where Home Energy Scotland provides specialist in-home advice on more complex measures such as small-scale renewables and solid wall insulation around 85 per cent of customers who received this support and took action attributed that action, at least in part, to the support they received. Our evidence also shows that the aspects of the specialist in-home advice service that customers found most important are: that advice is tailored to their property, that it covers all potential actions they can take, that it is delivered 1-2-1 and that it is written into a report.

Against this background we believe that, in order to ensure that householders and owners are well advised and supported in making decisions installing a lower carbon heating system it will be essential that the Home Energy Scotland advice function is not only retained but also enhanced.

As detailed above Home Energy Scotland is successful and works well in the current policy and delivery landscape. Enhancements will be necessary to ensure it is fit for purpose for the evolving Energy Efficient Scotland landscape. In this context, and in terms of the information and advice that should be supplied to inform consumers seeking to install low carbon heat supply in their homes that are off-gas we believe that Home Energy Scotland should:

- **Benefit from increased resource to provide advice and support.** Increased activity and the increasing need to install more complex and expensive measures together with a more

complex landscape (in terms of for example smart meters, tariffs, local systems) imply a need for increased resource to provide advice and support. The targets envisaged by the Scottish Government and the need to install more complex and expensive measures also imply a need for more in depth/in-home advice. In addition, in a regulatory environment, which will likely be a reality under EES, it will be more important than ever that people (owner occupiers, private sector landlords and tenants) have access to free, impartial advice to ensure that they are aware of and, where appropriate, able to meet the new regulatory standards in that way that is most cost effective, and appropriate to them.

- **Provide advice on using low carbon heating systems.** Low carbon heating systems will in the majority of cases need to be used differently than the systems that they are replacing and it is important that householders have access to the advice and information necessary to ensure that they are able to use them effectively and efficiently.

Finally, we believe that further consideration should be given to whether and how the wider benefits of installing renewable heating systems are communicated to customers. The evaluation results of the renewables programmes that the Energy Saving Trust manages on behalf of the Scottish Government indicate that installing renewables has a number of wider benefits, for example 79% of customers said measures they had installed (renewables and energy efficiency) had improved their living conditions and comfort levels in the house, 52% said they had reduced stress levels related to energy costs and household finances and 28% said they had reduced or eliminated health conditions

Please also see our response to Q3 above.

49. What evidence can you provide on the role that regulation could play in helping to support uptake of low carbon heat in existing buildings (domestic and non-domestic)? What form should this regulation take?

We have no evidence from the programmes we manage on behalf of the Scottish Government and others on the role that regulation could play in helping to support uptake of low carbon heat in existing buildings. However, we note that the Scottish Government has in the past used regulation to effectively drive change in the domestic heating market, with building regulations being used to mandate that all replacement and newly installed boilers are energy efficient. We believe that a similar approach could be taken here to help to support the uptake of low carbon heat in existing buildings i.e. building regulations could be used to ensure that high carbon fossil fuel heating systems (coal, oil and LPG) replaced by low carbon heating systems.

As noted in our response to question 41 above we believe that:

- All replacement heating systems in off-gas areas should be required to be low carbon from 2025 and the installation of high carbon fossil fuel heating (coal, oil and LPG) should no longer be permitted.
- There should be an expectation that all homes in off-gas areas will have a low carbon heating system by 2035.

50. To what extent could any regulation to support uptake of low carbon heat in existing buildings link to the already-proposed Energy Efficient Scotland energy performance standards? How could a link be made?

No response.

51. How should the Scottish Government respond to the CCC's advice and the UK Government announcement in the Spring Statement that new buildings constructed should "accommodate low carbon heating from the start"?

The Scottish Government should respond positively to the CCC's advice and the UK Government announcement in the Spring Statement that new buildings constructed should "accommodate low carbon heating from the start" and should make an equivalent commitment for new buildings constructed in Scotland and set a date from which this requirement would take effect.

The Scottish Government's response should, however go further than that, it should also: commit to a date by which all new buildings would be heated by low carbon sources

52. Have you encountered any specific examples of barriers to the installation of low carbon heating systems in new buildings?

The main focus of the programmes that the Energy Saving Trust delivers on behalf of the Scottish Government and others is on the existing housing stock and as such we have not encountered any specific examples of barriers to the installation of low carbon heating systems in new buildings.

53. Can you provide evidence on the comparative cost of installing low carbon heat solutions in new buildings rather than high carbon systems?

As noted above the main focus of the programmes that the Energy Saving Trust delivers on behalf of the Scottish Government and others is on the existing housing stock and as such we do not have any evidence on the comparative cost of installing low carbon heat solutions in new buildings rather than high carbon systems.

However, it is important note that the comparative cost of installing low carbon systems rather than high carbon systems should be considered in the context of the avoided costs that would otherwise have to be paid for the retrofit of a low carbon system between now and 2040.

54. Can you provide evidence on the comparative cost of installing low carbon heat solutions in new buildings compared to retrofitting to install low carbon heat at a later date?

We cannot provide any specific evidence on the comparative cost of installing low carbon heat solutions in new buildings compared to retrofitting to install low carbon heat at a later date.

However, we believe that the Scottish Government should seek to avoid retrofitting to install low carbon heat at a later date and ensure that low carbon heat solutions are installed in the first instance.

55. Are there particular actions that you would identify for consideration as part of any action to 'future proof' new buildings for low carbon heat retrofit.

As noted above the main focus of the programmes that the Energy Saving Trust delivers on behalf of the Scottish Government and others is on the existing housing stock and as such we do not have specific expertise on the actions necessary to 'future proof' new buildings for low carbon heat retrofit.

56. In light of the reservation of consumer protection powers, how else could the Scottish Government ensure consumer protection on a robust basis? For example, through commercial agreements.

Consumer protection needs to be at the heart of efforts to build consumer confidence in Energy Efficient Scotland. Ultimately consumers need to know that work has been carried out to a high standard and that if it is not there is a system in place to rectify any problems quickly (ideally a single

point of contact for redress). Given that significant Scottish Government funds are likely to be invested in the deployment of low carbon heating systems in areas off the gas grid, that the private sector is likely to be *required* to install measures and that, low carbon heating systems require significant skills to install, it will be important to get this right! In this context we support the consumer protection recommendations outlined in the Quality Assurance Short Life Working Group's recently published recommendations report.

We note the importance of ensuring that robust standards exist and that they are **monitored and enforced** and that the consumer is aware that they are monitored and enforced. For low carbon heat this applies to performance estimates, the prevention of mis-selling, design, installation and handover. Without the monitoring and enforcement of such standards there is a serious risk that trust in low carbon heating systems will be eroded. It will also be important to ensure that mechanisms are in place to allow the provision of feedback to suppliers to help them improve their practices.

As the Working Group's recommendations are built upon there will need to be specific consideration given to low carbon heating systems and how the benefits of the Microgeneration Certification Scheme can be best integrated into any Scottish specific quality assurance developments.

Finally it is worthwhile highlighting that with funding from the Scottish Government and the MCS the Energy Saving Trust has developed a best practice heat pump guide⁵. Such guidance is important as it goes some way to helping protect customers through clear technical and contractual guidance for heat pump installers.

57. What actions should we undertake to ensure the Scottish supply chain has the skills and capacity to capitalise on the future increase in demand for the installation of low carbon heat?

The Energy Saving Trust is currently managing a contract with the Energy Skills Partnership (ESP) to develop a skills matrix outlining minimum competency requirements for all energy efficiency measures including low carbon heat. This includes the setting up of a Qualifications and Skills Working Group with key members of industry represented. This group has been positively received and is about to provide recommendations to the Scottish Government on skill requirements for Energy Efficient Scotland. Consequently, we would recommend building upon the work of this group to ensure Scotland's supply chain has the necessary skills to capitalise on the future increase in demand for the installation of low carbon heating systems.

⁵ See: <https://www.microgenerationcertification.org/consultation-announcement-mcs-heat-pump-guide/>