



Reaching Rural Properties

OFF-GRID HEATING IN THE TRANSITION TO NET ZERO

By Zayn Qureshi

About Localis

Who we are

We are a leading, independent think tank that was established in 2001. Our work promotes neo-localist ideas through research, events and commentary, covering a range of local and national domestic policy issues.

Neo-localism

Our research and policy programme is guided by the concept of neo-localism. Neo-localism is about giving places and people more control over the effects of globalisation. It is positive about promoting economic prosperity, but also enhancing other aspects of people's lives such as family and culture. It is not anti-globalisation, but wants to bend the mainstream of social and economic policy so that place is put at the centre of political thinking.

In particular our work is focused on four areas:

- **Decentralising political economy.** Developing and differentiating regional economies and an accompanying devolution of democratic leadership.
- **Empowering local leadership.** Elevating the role and responsibilities of local leaders in shaping and directing their place.
- **Extending local civil capacity.** The mission of the strategic authority as a convener of civil society; from private to charity sector, household to community.
- **Reforming public services.** Ideas to help save the public services and institutions upon which many in society depend.

What we do

We publish research throughout the year, from extensive reports to shorter pamphlets, on a diverse range of policy areas. We run a broad events programme, including roundtable discussions, panel events and an extensive party conference programme. We also run a membership network of local authorities and corporate fellows.

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Zayn Qureshi

Policy workshop sessions

This research project was supported by two policy workshops, whose members are listed below. Workshop members provided comments on an agenda based off the interim findings of this research project. They may not necessarily agree with every analysis and recommendation made in the report.

Monday 23 May 2022:

- Bentley Strafford-Stephenson, Advocacy, Offer and Insights Manager, Avanti Gas
- Jeff House, Head of External Affairs, Baxi
- Duncan Carter, Corporate Affairs Manager, Calor
- Nicholas Parkinson, Greener Homes and Consumer Protection, Department of Levelling Up, Housing and Communities
- Madaliso Zgambo, Policy Advisor – Climate Change, HM Treasury
- Loic Rich, Deputy Chair, LGA Environment, Economy, Housing & Transport Board
- Jo Lugg, Project Manager – Central Buildings Team, National Trust
- Gavin Dick, Policy Officer, National Residential Landlords Association
- Malcolm Farrow, Head of Policy, OFTEC
- Paul Clarke, Policy & Markets Director, Passiv Systems
- Martyn Bridges, Director of Marketing & Technical Support, Worcester Bosch

Thursday 26 May 2022:

- Paul Williams, Technician, Albert Williams Ltd
- James Higgins, Partner, Gemserv
- Daniel McNaughton, Senior Building Services Engineer, Historic England
- Morwenna Slade, Head Of Historic Building Climate Change Adaptation, Historic England
- Ben Cowell, Director General, Historic Houses
- Sarah Roller, Policy Officer, Historic Houses
- Jack Valentine, Parliamentary Researcher, Office of Helen Morgan MP
- Chris Goggin, Director, Rinnai Ltd
- Graham Biggs, Chief Executive, SPARSE Rural Services Network
- Kerry Booth, Deputy Chief Executive, SPARSE Rural Services Network
- Girvin Gill, Policy Advisor, Sustainable Energy Association

Executive Summary

Since the UK became the first country in the world to set a legally-binding target to reach net zero emissions by 2050, policy focus has been geared toward how best to achieve and support a sustainable and just transition. Nowhere is this truer than with the decarbonisation of the nation's housing stock. Given that 80 percent of the houses people will be living in in 2050 have already been built, a focus on decarbonising the existing stock naturally forms a major priority. This is recognised by government through their Clean Growth Strategy, the Ten Point Plan for a Green Industrial Revolution and the Heat and Buildings Strategy.

Off-grid energy in the UK

The task of decarbonising the nation's off-grid building stock warrants particular consideration. In the UK, around four million households are off the gas grid, which is approximately 15 percent of all households. In England, the 1.1 million off-grid homes on fossil fuel heat sources breaks down to 78 percent using heating oil, 13 percent using liquified petroleum gas, or LPG, and nine percent using coal. In addition to fossil-based sources, there are also number of low carbon technologies and systems that can heat buildings off the gas grid. These include Air Source Heat Pumps (ASHP), Ground Source Heat Pumps, Solid biomass fuelled heating systems (including wood pellets), and biofuels.

Geography is the principal reason why many domestic and commercial properties will be off the gas grid. A higher percentage of households in rural areas will be off the grid owing to their distance from the wider gas network. In the current political and economic context, those heating their homes and businesses off-grid face a myriad of unique place, property and personal challenges that need to be addressed in order to bring all households along on the journey of heat decarbonisation. On the one hand, there are factors which exacerbate the cost-of-living issue for those living off-grid whilst on the other, challenges around decarbonisation are currently not well reflected in policy.

The costs of living off the gas grid will depend on the fuel source. While low carbon options are cheaper in the long run, they have high up-front costs that many rural households are unable to afford. Many off-grid properties are not uniform in design and idiosyncratic in character. They are often a lot older and tend to be poorly insulated. These issues are exacerbated in the current cost-of-living crisis and the associated rise in energy prices. In a letter sent to the Business Secretary, a number of rural MPs argued that it is indefensible how their constituents are facing significantly steeper energy bills on top of the additional

day-to-day costs without government support.

Certain challenges in decarbonising off-grid properties arise from geographic location, since many are in rural areas, as well as older buildings, which impacts energy efficiency and places in focus the need for effective fabric first retrofitting. Despite the eagerness of many off-grid households to play their part in reaching net zero and decarbonising their heating, installing renewable sources of heating is therefore not always an immediate or straightforward option for them. In an attempt to help address this and support the uptake of renewable heating, the government has rolled out certain incentive schemes. The Boiler Upgrade Scheme came into effect on 01 April 2022. The technologies covered and the funding available include ASHP with £5,000 available for installation and GSHP with £6,000 available for installation. Biomass boilers are also covered with £5,000 available, but only in rural locations and properties off the gas grid. However, biofuels are currently excluded from this support mechanism.

The funding and incentive support currently available, including the Boiler Upgrade Scheme, will contribute to the transition to low carbon heating and the uptake of heat pumps, where appropriate. However, it is also true that it is most beneficial for properties already suitable for heat pump technology – and especially in terms of maximising energy efficiency. For this reason, industry groups have argued that more thought needs to be given to what role future cost reductions in fuels and technologies might play for those whose properties are not currently suitable for heat pump installation.

The policy landscape

Following the publication of the Clean Growth Strategy, government launched the Future Framework for Heat in Buildings call for evidence in March 2018. A key realisation from the call for evidence in 2018 was the need for a consistent, long-term policy framework, backed by regulation where needed, to help industry support the decarbonisation of heat. In October 2021 the government launched the Heat and Buildings Strategy to outline the transition to net zero heating. Of particular relevance for some off-grid households, the strategy sets a 'clear ambition for industry to reduce the cost of installing a heat pump by 50 percent by 2025 and to ensure heat pumps are no more expensive to buy and run than gas boilers by 2030'.

Alongside the Heat and Building Strategy, government also put out a new call for evidence 'Phasing Out the Installation of Fossil Fuel Heating in Homes Off the Gas Grid', including an end to the installation of all fossil fuel heating by 2026 and a 'heat pump first' approach to replacements. For those houses that require major upgrades including external wall insulation ahead of boiler replacement to ASHPs,

government have pledged to consult on alternative low carbon heating solutions consistent with the objectives of net zero.

The results of the consultation on alternative heating solutions are of great importance to many rural off grid households. As it stands, placed against the unique challenges facing those off the grid, including rising fuel prices bills amidst the cost-of-living crisis, the proposed approach risks failing to adequately help households decarbonise. Furthermore, what is missing from the proposed regulations is any indication of how the current electricity network in rural areas could cope with the demand to electrify all heating alongside a transition to electric vehicles and other decarbonisation policies.

Elsewhere, aside from the heating technology itself, government needs to place greater emphasis on 'fabric first' energy efficiency improvements, where repairs, insulation and draft-proofing are prioritised ahead of add-ons and holistic system changes. Especially in supporting the proper insulation of low efficiency off-grid properties. However, the Heat and Buildings Strategy has been largely silent on fabric first improvements, while the package of support currently available has not been effective enough in supporting off-grid households decarbonise. Rather, there appears to be a 'baked in assumption' within the Heat and Building Strategy that the price of heat pumps will drastically reduce by 2030 - an assumption which critics of the policy argue the government is overly reliant on. Furthermore, many older rural houses off the gas grid, are technically unsuitable for the energy efficiency measures which are required in order to heat pumps to work.

Heat, buildings and energy security

The British Energy Security Strategy, launched in the aftermath of the invasion of Ukraine, is aimed at accelerating the generation of homegrown power in order to make the UK more energy independent. In accordance with the proposed 'heat pump first' approach, government will be running a Heat Pump Investment Accelerator Competition in 2022, worth up to £30m, to speed up the manufacturing of heat pumps. A major focus in the strategy has been on what role domestic oil and gas should play in the transition to low-carbon energy. On this, government has acknowledged that as international imports are reduced, there will be a continued need for 'gas to heat our homes and oil to fill up our tanks' as they both remain the glue that holds the British electricity system together and as such are a vital transition fuel.

However, there is no indication of what role biofuels can play. This is despite government committing to a Biomass Strategy by the end of 2022. In light of recent policies aimed at getting more domestic gas supplying the grid, the lack

of concrete support for off-grid homes in the energy security strategy appears all the more concerning. It means that while extra leeway is being given to the 86 percent of the population on the grid, who have a further decade to replace their high carbon boilers, no practical support is being provided to those off the grid who have a much more imminent deadline.

Policy support for off-grid properties

The fact that a regulatory and policy framework is currently in development by government means there is no coherent approach through which to adequately support them through difficulties they face. In general, the support mechanisms available for off-grid homes in the cost-of-living crisis are the same as for those on the grid. However, in the long term, what off-grid homes need is tailored support around fabric first energy efficiency measures including loft insulation, bringing down bills and paving the way for low-carbon heating systems.

Although the government have looked at this, there remain several outstanding issues with its current approach, particularly pertaining to the Homes Upgrade Grant, aimed at upgrading all households to an Energy Performance Certificate (EPC) band C. So far, 51 local authorities have been successful in receiving grant funding for a total of 78 projects. The grant is a step in the right direction in providing targeted support to vulnerable off-grid households, after the policy failings of the Green Homes Grant, yet there are potential problems with the use of the EPC system as a gauge for the energy efficiency of a domestic property that may unfairly target those using off-grid heating.

Off-grid properties face particular challenges in using the EPC methodology to measure energy efficiency. This is because the energy efficiency metric will take into account both the fabric efficiency of the building and also the higher costs of heating oil compared to natural gas. The methodology essentially is based around energy cost square metre of property, rather than true energy efficiency, as such off-grid households with more expensive heating systems – be they renewable or fossil-fuel based – end up with a worse EPC rating.

The need for consistency

On the whole, it is important for government to show consistency in its approach to decarbonising heat in off-grid properties. Policy support for off-grid properties needs to set out long-term certainty to allow those households ready for low carbon heating systems to transition at pace. Additionally, for it to be truly effective, support must be reflective of the circumstances which those living rurally and off the grid face.

When it comes to the proposed regulations, concern has been expressed over rural communities not being adequately communicated to or engaged with - meaning they risk not understanding either what they are or what their implications could be. This may lead to unintended consequences and a panic-driven rush for low carbon heating installation as the proposed deadline nears. To forestall this, therefore, a concerted effort from lead departments and a sustained government communications campaign aimed at rural householders will be necessary.

Alternatives to the current approach

In order to fully understand the challenges to the current approach, it is important to first contextualise the impact of being off the gas grid on energy efficiency, fuel use, and the costs involved. One-in-five homes in rural areas are in the very energy inefficient F and G categories. For such properties, many of the low carbon alternatives come at a significant cost. Either through the upfront installation costs or those associated with the required retrofitting needed before installation.

Beyond an all-or-nothing approach

Data from Liquid Gas UK¹ has shown that the capital costs for installing an Air Source Heat Pump in a detached off-grid family home in England, including the need for retrofitting, are around £30,000. This figure helps illustrate the extent of the financial barriers facing rural off-grid properties in switching to low carbon fuel alternatives. And unfortunately, proposed government regulation will increase the burden on off-grid households further. This is counterproductive to accelerating the transition to low-carbon alternatives, as all it does is add increasing financial pressure on already cash-strapped households.

While an eventual transition to heat pumps is the desired outcome, the current all-or-nothing approach of the government, through the 2026 end date for the installation of fossil fuel heating as well as the 'heat pump first' approach, places an unfair and disproportionate burden on off-grid properties. A leading problem with the approach being proposed is that the incentive schemes attached to it do not give a variety of cost-effective choices to consumers as to what heating technology they can choose. At the same time, in their fuel poverty strategy² government have signalled their intent to remove support for new LPG and oil heating systems from 2022. Although they have not clarified how this will happen.

1 Liquid Gas UK – Decarbonising a detached family home in rural England

2 BEIS (2021) – Sustainable Warmth: Protecting Vulnerable Households in England

Nevertheless, this gives little scope to working with these systems to understand how biofuels can play a role.

The government, in its latest call for evidence, has recognised the potential benefits of net zero consistent biofuels and signalled their awareness of the LPG industry's commitment to transitioning to 100 percent renewable gas by 2040. In the Heat and Buildings Strategy, government has acknowledged the potential of bioLPG as part of a hybrid heating system along with an air source heat pump. A mixed technology approach, where low carbon technologies along with feasible 'drop in' fuels such as bioLPG, play equal parts in reaching the net zero goals in a cost-effective and popular manner should be adopted. Overall, this would allow more choice for off-grid consumers, which would increase the likelihood of meeting net zero transition targets.

Towards greater flexibility

Many rural tenants are older and face different living circumstances to their urban counterparts. Therefore, a mixed technology and flexible approach has the added benefit of adapting to the needs of households, whilst also embedding an understanding of the need to decarbonise heating and its wider significance. Such an attitude to heating decarbonisation will lead to increased consumer buy in, as efforts will be made alongside households rather than imposing from above a certain pre-determined solution that may not suit everyone's circumstances.

Off-grid households and businesses need to be offered a range of choices in their decarbonisation journey. Through creating a range of choices, a market incentive is provided for suppliers to start producing more low carbon fuels and to bring them to market. Additionally, it instils a sense of individual agency for meeting the varied needs of unique properties, as opposed to imposing limited 'one size fits all' solutions in what might be felt as a high-handed, top-down manner.

Role of government going forward

In order to effectively support off-grid households, government needs to adapt their proposed framework to reflect the reality of transition for many. At the same time, it is imperative that households are made aware of the support and different options available to them on their decarbonisation journey. Here, the local state has a strong role in leading locally tailored engagement campaigns that raise awareness and help empower off-grid consumers.

Central government

The roll out of government support schemes has faced increasing criticism.

Leading reasons for this are unachievable deadlines set by BEIS and insufficient financial support. For example, the amount of funding available for the Boiler Upgrade Scheme will only fund 30,000 installations of heat pumps a year, which is approximately the size of the current market. The problem is that contrary to government aims and ambition, this will do little to encourage new installer businesses to enter the market, which will create problems further down the line in 2026 when there will need for a far larger numbers of installers than are being trained currently.

While the development of a regulatory framework and the associated incentive measures to support off-grid households and businesses is an encouraging step from government, flexibility, and adaptability to the local circumstances of off-grid consumers is critical, government must give due consideration to each varying factor of the decarbonisation of off-grid properties. Specifically, in defining what role each different low carbon alternative can take. Setting this out from the beginning will be vital to creating a truly responsive and flexible framework.

Local government

Local government can play a leading facilitatory role in engaging with off-grid communities and to raise consumer awareness and buy-in. Polling has consistently shown that local government is more trusted than national government. Research shows that over the pandemic trust in local government³ remained higher than at national level. They are perfectly placed to lead locally-tailored engagement campaigns that speak to the unique circumstances of the housing stock in their locality. Awareness-raising in this manner is extremely important if government wants to reach goals set out in their proposed regulations on off-grid buildings and wider net zero objectives. Particularly when considering how, according to statistics from the BEIS Committee report, 77 percent of people polled in December 2020 showed little awareness or willingness to install an air source heat pump.

Without this understanding, off-grid households may feel penalised for being targeted first, which will risk eroding support for the heat decarbonisation agenda before it has had a change to effectively start in the first place. A sense of unfairness could be embedded in off-grid households given that on-grid households will not have to replace their existing gas boiler until 2035, while they only have four years within which their boilers can be replaced.

3 LSE Covid-19 blog (2021) – Trust in local government is still high, and policy makers should take advantage of it

Recommendations

The table below displays key facets of the current approach to decarbonisation of off-grid homes, alongside policy recommendations based on the research for this report that might make net zero more achievable for the four million homes currently using off-grid heating.

Government policy	Localis recommendation
<p>An end to the installation of fossil fuel heating in homes off the gas grid from 2026.</p> <ul style="list-style-type: none"> Part of this policy will rely on working with industry to reduce upfront cost of heat pump installation by 50 percent by 2025 and achieve cost parity between them and gas boilers by 2030. Government support to enable an end to installation of fossil fuel heating includes £450m Boiler Upgrade Scheme and £2.5bn Heat Upgrade Grant Government believes these steps will enable them to end the installation of fossil fuel heating in off-grid homes from 2026. They believe this is enough time to allow their funding support and the market mechanism time to improve heat pump market condition 	<p>Bring the 2026 ban on fossil fuel boilers for off-grid homes into line with the 2035 deadline for on-grid homes.</p> <ul style="list-style-type: none"> Set out evidence for how government will work with industry to reduce costs of installation and what steps are being taken already. Increase the amount available within the Boiler Upgrade Scheme to match the entire cost of a heat pump. Broaden the Boiler Upgrade Scheme to include liquid biofuels. Four years is not enough time to improve the current heat pump market condition. Government needs to improve the incentive schemes available to households as well as embark on a communication campaign to engage with off-grid households over the proposed regulations. This will help increase uptake and help grow the market.

Government policy	Localis recommendation
<p data-bbox="353 314 746 413">A 'heat pump first' approach to replacement heating systems from 2026.</p> <ul data-bbox="353 444 773 1177" style="list-style-type: none"> <li data-bbox="353 444 773 644">• This entails setting a high standard governing the choice of replacement heating system, with air source heat pumps being the lead replacement technology in most cases. <li data-bbox="353 661 773 895">• Ahead of the regulation coming into force, government will issue guidance on how households and installers should determine whether it is reasonably practicable to install a heat pump in their home. <li data-bbox="353 913 773 1177">• Government also proposes to extend this 'heat pump first' approach to replacement heating systems in off-grid fossil fuel heated homes that can be made suitable through minor energy efficiency upgrades that can be done quickly including insulation. 	<p data-bbox="810 314 1218 447">Government should not be proscriptive over technology at this stage in the decarbonisation process.</p> <ul data-bbox="810 479 1230 1246" style="list-style-type: none"> <li data-bbox="810 479 1230 713">• With an eventual transition to heat pumps in mind, at this stage government must encourage a variety of low carbon heating technologies that accord with the place circumstances of each rural off-grid community. <li data-bbox="810 730 1230 930">• Government must work with industry to immediately set out guidance on the different low carbon options available for households that are not ready for heat pump installation. <li data-bbox="810 947 1230 1246">• With focus currently on costly major transformations to homes and their heating systems, more achievable improvements to efficiency risk being overlooked. The government should provide funding for 'fabric first' improvements to rural homes via local councils.

Government policy	Localis recommendation
<p data-bbox="128 314 518 479">Requiring high performing replacement heating systems where heat pumps cannot reasonably practicably be installed</p> <ul data-bbox="128 513 546 1211" style="list-style-type: none"> <li data-bbox="128 513 546 748">• Government intends to consult on the criteria governing the choice of replacement heating systems available to households not ready for heat pumps ahead of the 2026 implementation of the heat pump first approach. <li data-bbox="128 765 546 1034">• Government have proposed that any alternate choice of technology for households not ready for heat pumps must reflect the high standards of performance of high temperature heat pumps and solid biomass systems. <li data-bbox="128 1052 546 1211">• It is believed that this proposal will create space for industry to innovate and bring forward new low carbon heating solutions that are not currently available. 	<p data-bbox="584 314 996 548">Embed a mixed technology approach in the regulatory framework and work with industry stakeholders to determine what role biofuels will play in the decarbonisation of off grid homes.</p> <ul data-bbox="584 583 996 1567" style="list-style-type: none"> <li data-bbox="584 583 996 887">• Government needs to work with industry stakeholders operating in alternative low carbon heating sectors to set out the role and capacity of each replacement heating system. This communication needs to be underpinned by clarity and consistency. <li data-bbox="584 904 996 1104">• Work with same industry stakeholders to clarify what ‘high standards of performance’ means and how alternative low carbon heating technologies can achieve this. <li data-bbox="584 1121 996 1355">• Providing certainty over the role that biofuels will play in the decarbonisation of off-grid homes will allow the sector to make the appropriate investment decisions to build required infrastructure and stimulate the market. <li data-bbox="584 1373 996 1567">• Government must ensure that the mixed technology approach in the regulatory framework is localised and flexible depending on the place circumstances of off-grid homes.

In addition to this:

- The electricity infrastructure in rural areas is in many places not prepared for a widespread switch to electricity as a primary heating source. Therefore, it is important that government **build a programme of electricity infrastructure upgrade in rural areas into the roadmap to net zero**.
- The current Energy Performance Certificate (EPC) methodology is not well-suited to application in off-grid homes. The government should **review the EPC methodology** with the aim of redressing the unequal impact on off-grid homes.

At a local level:

- **Regional Heat Decarbonisation Hubs should be developed** that bring together local state stakeholders including energy providers, neighbouring local authorities and installers. These should be collaborative efforts aimed at engaging with off-grid communities and raising awareness of the need for and importance of heat decarbonisation.
- They should act to illuminate a path to achieving sustainable rural heating through providing consumers knowledge over a variety of low carbon choices best suited to the local housing stock context.
- These hubs should communicate clearly what the regulatory framework is, and what it means for the local housing stock as well as off grid households.
- They should provide all relevant information on key aspects of the decarbonisation process including signposting details of the government's fiscal support scheme, most suitable low carbon heating for the local building stock, support regarding the planning process where relevant, and information on local SMEs and installers available to do the required work.
- These regional hubs should also have a model home to showcase and demonstrate to households what a fully decarbonised off grid property could look like.
- These hubs should also facilitate best practice sharing between and amongst households wanting to decarbonise.

Introduction

A great change to how we go about the fundamental aspects of day-to-day life is in train. Commercial and domestic heating is in the frontline of this epochal shift in the everyday which will have profound implications for millions of households. To take the decarbonisation drive, national attention is rooted on energy policy and prices. Like many national top-down agendas, the policy corridor for this remains stubbornly urban.

However, in trialling the transition to clean heat methods, the pioneering areas are those which lie off the mains gas grid - and in consequence rely on alternative sources, frequently expensive to heat their homes. This is no small concern. In England there are 1.1 million homes off the gas grid that rely on fossil fuel heating, a figure which stretches to four million households – 15 percent of the total, across the UK.

Localis was commissioned by Liquid Gas UK to undertake a rigorous place-based analysis to investigate energy provision and decarbonisation in hard-to-reach and off-grid properties in rural areas.

The intention in our report has been to devise a suite of localist policy recommendations that take in the entire ambit of the challenge of meeting Net Zero energy efficiency targets in hard-to reach, off-grid rural areas and properties in ways that align with:

- the decarbonisation promise of ‘clean growth’ and;
- the beneficial social impact of ‘good growth’ for local economic health and overall place prosperity and wellbeing.

In making the case for place, Localis has sought to first identify the scale of the issue and define which technologies are most appropriate for different areas and properties in the short, medium and long term.

In exploring the policy landscape, Localis has also sought to identify those policy levers at national, local and industry level that could facilitate the work being undertaken in the most cost-effective manner.

For example, how can local government’s strategic planning and placemaking role be set in motion to create a plan for heating and energy rural areas based on local knowledge of area, property types and in line with future spatial strategies?

The history of policy is littered with experimental guinea pigs that turned out to have vicious consequences on their originators. While the transition to clean heat in off-grid gas areas does not seem on the surface to mimic in any way the

disastrous adoption of the poll tax – to name the most contentious ‘guinea pig’ policy in recent domestic history - its success will depend on the deft handling of individual and social sensitivities as well as local economic nuances.

Success will also depend on strongly co-ordinated messaging and communication allied with persuasive bottom-up community engagement strategies. In as vital a domestic policy area as this, a policy which literally affects the hearths of countless homes, there is limited scope to backtrack and reheat policy. It serves all our interests to work together and get this right first time.

CHAPTER ONE

Off grid energy in the UK

With the current national focus on energy policy and prices, a small but nonetheless significant proportion of homes risk being overlooked regarding how best to support a transition to clean heat. Currently, approximately four million, or 15 percent of, households across the UK⁴ are off the mains gas grid and reliant on often expensive alternatives to heat their homes. In England, there are 1.1 million homes off the gas grid using fossil fuel heating⁵.

1.1 The scope and scale of off-grid power

The 1.1 million off-grid homes in England on fossil fuel heat sources breaks down to 78 percent using heating oil, 13 percent using liquified petroleum gas and nine percent using coal. There are 280,000 non-domestic off-gas grid buildings in England⁶ with 100,000 using carbon intensive means such as heating oil, LPG, or coal to fuel their heating system.

In addition to fossil-based sources, there are also number of low carbon technologies and systems that can be used to heat buildings off the gas grid. These include Air Source Heat Pumps, Ground Source Heat Pumps, Solid biomass fuelled heating systems (including wood pellets), and liquid biofuels.

4 Energy Saving Trust (2019) – Why outside the grid does not mean outside of help

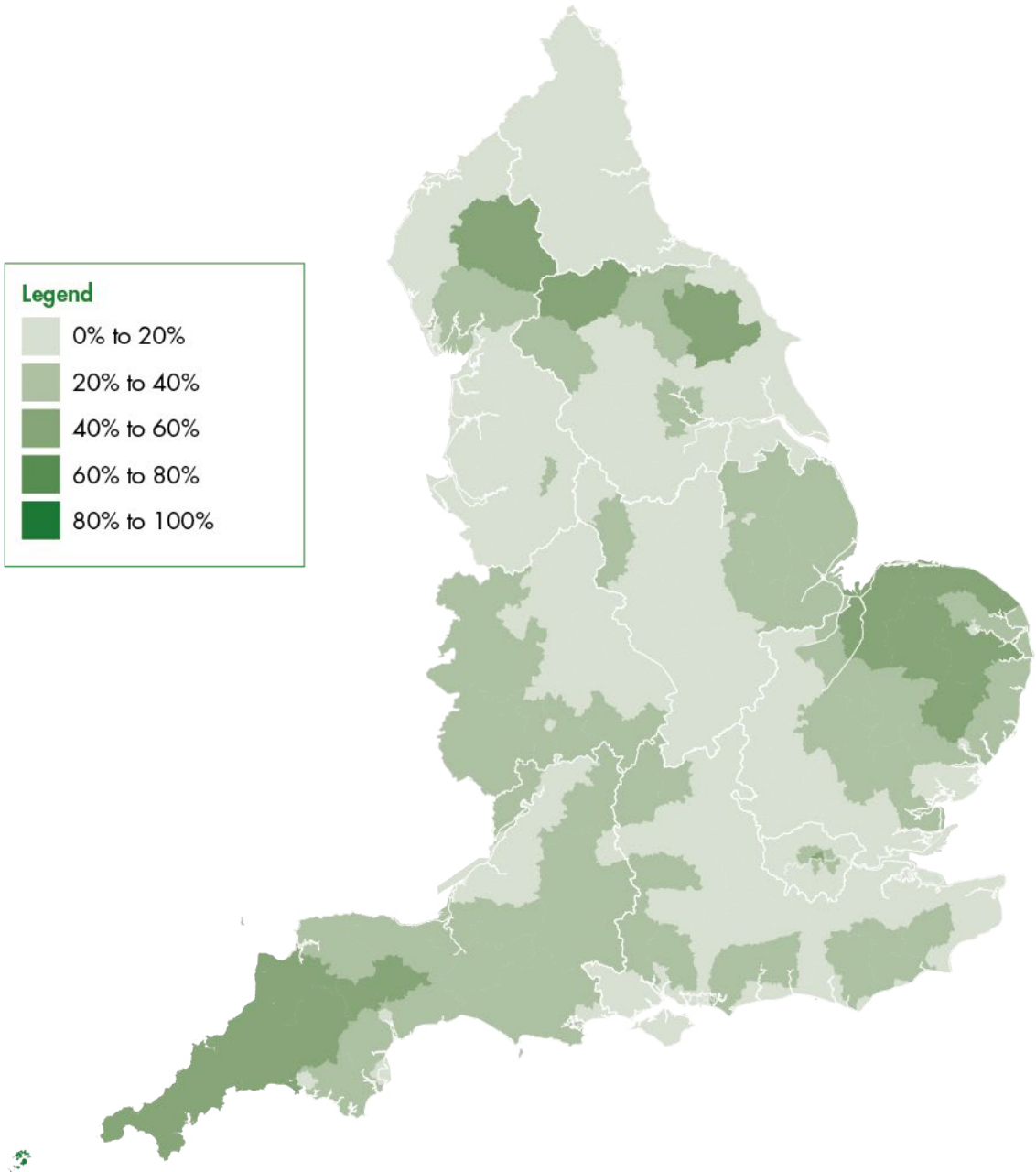
5 BEIS (2021) – Phasing out the installation of fossil fuel heating in homes off the gas grid

6 BEIS (2021) – Phasing out the installation of fossil fuel heating systems in businesses and public buildings off the gas grid

Off-grid heating options

LPG/ BioLPG boilers	LPG is widely available, and the service infrastructure is well established. It is cleaner than heating oil, producing 15 percent less carbon dioxide than oil. A new LPG boiler can cost between £1,500-£3,000. An LPG powered system has an efficiency of over 90 percent. BioLPG is produced from renewable and biological sources. It is chemically indistinct from LPG and is seen as a 'drop in' fuel ready to be used in existing equipment and infrastructure. Recently, the industry has committed to deliver 100 percent bioLPG by 2040.
Oil boilers	Oil boilers have been a popular option for use in off-grid properties. The price of a new one will be similar to an LPG boiler, with the estimated efficiency being 93 percent. It is also a widely available fuel source. However, the costs involved in buying in bulk, as well as the price of purchasing a tank, have been seen as a downside of this option.
Biomass boilers	Using natural and renewable sources means that this option is better for the environment. However, the high upfront costs and need for large storage space makes it difficult for a number of households to adopt. The installation costs can range from £5,000 - £20,000. The efficiency is similar to a conventional system.
Air source and ground source heat pumps	Heat pumps are seen as the best off-grid option with the highest efficiency. However, GSHP require a lot of outdoor space and ASHP need a clear area on an external wall for the fan unit. The costs to install an ASHP range from £9,000 - £15,000 and £12,000 - £20,000 for a GSHP. Heat pumps provide an efficiency of between 300-500 percent since they do not generate heat. Often accompanying energy efficiency improvements to building fabric are required in addition to the new heating system.
Solar panels	Solar panels are best suited for hot water, but less so for space heating. Given this, they must be considered as one part of a wider range of options for water and space heating. The fact they struggle to provide the right level of heating all year round is a challenge. They cost between £3,000 - £6,000 to install and have an efficiency of between 70-90 percent.

Figure 1: Percentage of homes off-grid in English local authorities



Source: BEIS

Geography is the principal reason⁷ why many domestic and commercial properties will be off the gas grid. A higher percentage of households in rural areas will be off the grid owing to their distance from the wider gas network. Other reasons cited for households opting to live off-grid include the desire for sustainable living, environmentalism and renewable energy being cheaper than conventional forms of fuel – although the Energy Saving Trust has pointed⁸ out that it is often harder and more expensive to heat homes off-grid.

The costs of living off the gas grid will depend on the fuel source. While low carbon options are cheaper in the long run, they have high up-front costs that many rural households cannot afford. Another challenge is with the difficulty of retrofitting these properties with low carbon renewable heating solutions. Many off-grid properties are not uniform in design and idiosyncratic in character. They are often a lot older and tend to be poorly insulated. For example, three percent of rural properties are EPC band C or above, and 65 percent of off-grid homes in England using heating oil as their main source of fuel are in EPC band E, F or G⁹.

Off-grid businesses face the same challenges, compounded by the fact that the off-grid locations of such commercial enterprises are often intrinsic¹⁰ to their type of business and operational model. Access to high grade heat is critical for these businesses to operate effectively – particularly for industry sectors such as hospitality and leisure, manufacturing and agriculture.

1.2 Off-grid homes and businesses in 2022

1.2.1 Affordability, fairness and cost of living

Households and businesses off the gas grid in rural parts of the country have unique energy needs and are facing significant challenges as a result of the cost-of-living crisis.

Tabling the Energy Pricing (Off Gas Grid Households) Private Members Bill¹¹, Drew Hendry MP has brought attention to the fact that households off the grid are having to pay about four times more for their energy bills than an average household. In September 2021¹², households using heating oil were paying £250 for a 500-litre delivery of domestic heating oil – by March 2022, prices

7 Roberts, D (2015) – Fuel poverty in the UK: Is there a difference between rural and urban areas?

8 Energy Saving Trust (2019) – Why outside the grid does not mean outside of help

9 Evidence Session

10 Flogas – The use of LPG in off-grid domestic properties

11 UK Parliament Hansard (2022) – Energy Pricing (Off Gas Grid Households)

12 The Guardian (2022) – Britons in rural areas face crisis as heating oil prices more than triple

had risen to between £600 - £875. Helen Morgan, MP for North Shropshire, has highlighted¹³ how the country is facing an 'off-grid fuel crisis', also pointing to how those rural households reliant on domestic heating oil saw prices triple in two weeks over early March 2022.

In a letter sent to the Business Secretary, a number of rural MPs argued that it is indefensible how their constituents are facing significantly steeper energy bills on top of the additional day-to-day costs without government support. And in its response to the letter, government indicated the desire to stimulate competition in the off-grid fuel market. However, from a consumer perspective the market is not big enough for them to drive this desired competition.

The Energy Saving Trust has also drawn attention to these problems facing off-grid households, highlighting how 12.5 percent of rural families are in fuel poverty¹⁴. Furthermore, it noted that the 'fuel poverty gap'¹⁵, which is the extra annual income that is needed to lift a household out of fuel poverty, stood at £585 in rural areas compared to a £216 national average.

Research¹⁶ looking into the difference in fuel poverty between urban and rural parts of the UK found that while urban fuel poverty is more persistent, the rural fuel poor are more vulnerable to energy price shocks. Factors contributing to this include a limited choice of fuel suppliers, energy-inefficient housing stock and lower incomes. Of particular interest, the same research showed that the fuel poor in rural areas can also include those on above average incomes paying high fuel prices and living in poorly insulated homes.

On the whole, the impact of more expensive fuel sources is made worse in rural parts of the country. This is especially the case when considering rural realities such as an older demographic, lower wages, poor transport infrastructure and an energy-inefficient housing stock. Despite this, off-grid households want to act on climate change and reaching net zero. However, they are concerned about how to do this in the most effective, fair, and financially efficient manner possible. In this regard, the lack of consistent support from government on facilitating a transition to low carbon heating has caused worry and frustration.

1.2.2 Off-grid decarbonisation options

Despite the eagerness of many off-grid households to play their part in reaching

13 Border Counties Advertiser (2022) – Fuel crisis warning as MPs call on price cap for oil

14 Energy Saving Trust (2019) – Why outside the grid does not mean outside of help

15 Countryside Alliance (2022) – Call to tackle off-grid fuel poverty

16 Roberts, D (2015) – Fuel poverty in the UK: Is there a difference between rural and urban areas?

net zero and decarbonising their heating, installing renewable sources of heating is not always an immediate option¹⁷ for them. This is largely down to the high upfront costs involved in the process.

In an attempt to help address this and support the uptake of renewable heating, government has rolled out certain incentive schemes. The most notable has been the Renewable Heat Incentive scheme, which closed on 31 March 2022. There were two versions of the scheme, a domestic and non-domestic one. The former launched in April 2014 and was open to all households on and off the grid. Those who joined received quarterly payments for the clean heat that their systems were expected to produce.

The Boiler Upgrade Scheme is the successor of the RHI and came into effect on 01 April 2022. The scheme will run from 2022 to 2025. In order to apply for the scheme, you will need to own your property, have an installation capacity of 45kWth and have a valid EPC certificate. The technologies covered and the funding available include ASHP with £5,000 available for installation and GSHP with £6,000 available for installation. Biomass boilers are also covered with £5,000 available, but only in rural locations and properties off the gas grid. Liquid biofuels are currently excluded from the scheme.

The funding and incentive support currently available, including the Boiler Upgrade Scheme, will definitely contribute to the transition to low carbon heating. However, it is also true that it is most beneficial for properties already suitable for heat pump technology – and especially in terms of maximising energy efficiency. For this reason, industry groups have argued that more thought needs to be given to what role future cost reductions in fuels and technologies might play for those whose properties are not currently ready for heat pump installation.

17 Energy Saving Trust (2019) – Why outside the grid does not mean outside of help

CHAPTER TWO

The policy landscape

UK government action in the energy sector has in recent decades been geared toward supporting households transition to low carbon energy sources. The regulatory and policy framework around off-grid heating is rooted in the Clean Growth Strategy¹⁸ - where a leading commitment was to phase out the installation of high carbon fossil fuel heating in off the gas grid buildings during the 2020s.

2.1 The emerging policy framework

This commitment to phase out high carbon heating has guided the direction of policy over the last few years and has been central to the emerging policy framework. Following the publication of the Clean Growth Strategy, government launched the Future Framework for Heat in Buildings¹⁹ call for evidence in March 2018. Government intention here was to create a policy framework that initially focused on enabling the market to drive the transition. After this, focus would be on helping consumers and industry comply with regulation in the longer term.

A leading realisation from the call for evidence in 2018 was the need for a consistent, long-term policy framework, backed by regulation where needed, to help industry support the decarbonisation of heat.

18 BEIS (2018) – The Clean Growth Strategy

19 BEIS (2018) – A Future Framework for Heat in Buildings

2.1.1 The Heat and Buildings Strategy

In October 2021 the government launched the Heat and Buildings Strategy²⁰. In its own words, it 'outlines a transition [to low carbon heating] that focuses on reducing bills and improving comfort through energy efficiency, and building the markets required [for the transition]'. Of particular relevance for off-grid households, the government has set a 'clear ambition for industry to reduce the cost of installing a heat pump by 50 percent by 2025 and to ensure heat pumps are no more expensive to buy and run than gas boilers by 2030'. This touches on the issue that for many living off the gas grid, the costs involved are proving too high for them to realistically make the switch. Regarding off-grid businesses, there appears to be little recognition of the significant challenges that the hospitality and leisure sector will face when replacing their heat infrastructure in the strategy itself.

Alongside the Heat and Building Strategy, government also put out a new call for evidence 'Phasing Out the Installation of Fossil Fuel Heating in Homes Off the Gas Grid'²¹. This serves as a continuation of the development of the longer-term policy framework started in 2018. Significantly, this is where government has laid out its regulatory proposals for a long-term framework to decarbonising homes off the gas grid. These include:

- **An end to the installation of fossil fuel heating in homes off the gas grid from 2026.** This targeted regulation is designed to give funded measures and market mechanisms already underway time to improve the heat pump market conditions, while also allowing enough time for issues in the supply chain, affordability, and skills to be addressed.
- **A 'heat pump first' approach to replacement heating systems from 2026.** The government is proposing to set a very high standard over the choice of replacement heat systems for households off the gas grid. This approach will see air source heat pumps as the lead replacement technology.
- **Requiring high performing replacement heating systems where heat pumps cannot reasonably practicably be installed.** For those houses that require major upgrades including external wall insulation ahead of boiler replacement to ASHPs, government will enable the use of alternative low carbon heating solutions consistent with the objectives of net zero. They intend to consult on how best to do this. Here, they have signalled their openness to liquid biofuels that are 100 percent bio-derived.

20 BEIS (2021) – Heat and Buildings Strategy

21 BEIS (2022) – Phasing out the installation of fossil fuel heating in homes off the gas grid

It is believed that these proposals will deliver a policy framework through driving an increase in demand for low-carbon heating and heat pumps in particular, giving the sector certainty and time to prepare, boost innovation, and lower costs. In explaining the logic behind these proposals, the government has pointed to certain submissions received during the 2018 call for evidence, which 'reaffirmed [the] view that electrification of heat is the only pathway to net zero proven to work at scale for homes off the gas grid'.

2.1.1 Reinforcing rural electricity infrastructure

With the proposed 'heat pump first' approach, a key government priority will have to be the reinforcement of rural electricity infrastructure. However, what is missing from the proposed regulations is any indication of how the current electricity network in rural areas could cope with the demand to electrify all heating.

Additionally, industry stakeholders have highlighted concerns with the pace of change for rural off-grid communities and the deadlines within the governments proposed regulatory framework. In particular, how support measures such as the Boiler Upgrade Scheme are not enough to facilitate households to make the transition to low carbon heating in a cost-effective manner. Compounding this concern is the high upfront costs of many low carbon heating technologies, as well as how their projected cost reduction will still not be enough to make new heating affordable for many off-grid households in rural communities.

Elsewhere, aside from the heating technology itself, government needs to place greater emphasis on fabric first energy efficiency improvements. Especially in supporting the proper insulation of low efficiency off grid properties. This will need to be prioritised in order to maximise the efficiency of any low carbon heating technology. As well as to allow households to fully benefit from support schemes such as the Boiler Upgrade Scheme, which as highlighted is most beneficial for properties already suitable for technologies such as heat pumps.

However, the Heat and Buildings Strategy has been largely silent on fabric first improvements, while the package of support currently available has not been effective enough in supporting off-grid households decarbonise. Rather, there appears to be a 'baked in assumption' within the Heat and Building Strategy that the price of heat pumps will drastically reduce by 2030 - an assumption which critics of the policy argue the government is overly reliant on. Furthermore, there is little guidance for those homes which may be unsuitable for heat pumps.

2.2 Policy support for off-grid properties

As previously highlighted, there are a number of factors presenting challenges for off-grid properties in the current political-economic landscape. The fact that a regulatory and policy framework is currently in development by government means there is no coherent approach through which to adequately support them through difficulties they face.

2.2.1 Support and grants

In general, the support mechanisms available for off-grid homes in the cost-of-living crisis are the same as for those on the grid, including the Warm Home Discount²² and Winter Fuel Payment²³. However, in the long term, what off-grid homes need is tailored support around fabric first energy efficiency measures including loft insulation. This would bring down energy bills for households and pave the way for the deployment of low-carbon heating systems.

Although the government have looked at this, there remain a number of outstanding issues with its current approach. In an attempt to deal with the costs and technical challenges of retrofit, the government introduced the Homes Upgrade Grant (HUG)²⁴, with the stated aim that “EPC band F-G homes should be upgraded to D or above and band D-E homes to C or above to meet statutory fuel poverty targets of EPC band C by 2030”. So far, 51 local authorities have been successful in receiving grant funding for a total of 78 projects. The project timeline is from early 2022 to March 2023. While it is too early to comment on the success of the HUG so far, it is a step in the right direction in providing targeted support to vulnerable off-grid households. Going forward it is vital that the scheme doesn’t suffer the same fate as the Green Homes Grant²⁵. At the same time, it is important to note the concerns raised with regards to the use of the EPC system as a gauge for the energy efficiency of a domestic property.

2.2.2 Energy Performance Certificate methodology

The current EPC methodology serves as a measure of energy cost per m² through the inclusion and weighting of fuel costs leading to these factors taking a disproportionate focus over the building fabric of the property. This results in EPC rating in homes becoming distorted when comparing various fuel types, especially when all alternatives are more expensive than natural gas within SAP. And

22 GOV.UK – Warm Home Discount Scheme

23 GOV.UK – Winter Fuel Payment

24 Environmental Audit Committee (2021) – Energy Efficiency of Existing Homes

25 The Guardian (2021) – Audit office blames UK government for botched £1.5bn green homes scheme

ultimately identical properties built to the same standard will receive different EPC ratings, with the one off-grid receiving a lower rating.

There are a few unintended consequences that result from these policy choices. Of significance to government efforts to improve energy efficiency through the HUG, in order for off-grid homeowners to achieve a higher EPC rating, and meet the Minimum Energy Efficiency Standard, they are incentivised to take up high carbon fuel sources. This is counterproductive to the overall strategy to decarbonise the nation's homes and undermines efforts in upgrading energy efficiency in properties.

Off-grid properties face particular challenges in using the EPC methodology to measure energy efficiency. This is because the energy efficiency metric will take into account both the fabric efficiency of the building and also the higher costs of heating oil compared to natural gas. Government has acknowledged that it is hard to disaggregate these two from one another to see what the actual efficiency of the stock is, and that more needs to be done to improve the system.

These issues found within the EPC methodology will also have implications for rural landlords. Stakeholders have noted²⁶ that owing to the way the system is currently set up, even if a landlord of an off-grid property wished to install a heat pump, there is no guarantee that doing so would meet the minimum standards required of them to let out their property. This could result in many opting to leave the Private Rented Sector and move to the holiday let and Airbnb market, which are less regulated. It could equally risk compounding the housing crisis in areas such as Cornwall that are already facing housing shortages.

Therefore, while efforts to increase the energy efficiency through the Homes Upgrade Grant are welcome, government must re-evaluate the feasibility of assessing efficiency through the current EPC methodology.

2.2.3 The need for consistency

On the whole, it is important for government to show consistency in its approach to decarbonising heat in off-grid properties. For the sake of consistency, this approach needs to be underpinned by clear communication on government objectives and how each affected stakeholder should fit into these plans. Doing this would increase buy in from households. But for this to properly happen, policy makers need to engage more substantively with rural off-grid communities.

Policy support for off-grid properties needs to set out long-term certainty to allow those households ready for low carbon heating systems to transition at pace. Additionally, for it to be truly effective, support must be reflective of the circumstances which those living rurally and off the grid face. Specifically, it must take into account challenges such as a lack of public transport and reliable broadband connections - both of which increase fuel consumption and make accessing information on decarbonisation support more difficult.

When it comes to the proposed regulations, concern has been expressed over rural communities not being adequately communicated to or engaged with - meaning they risk not understanding either what they are or what their implications could be. This may lead to unintended consequences and a panic-driven rush for low carbon heating installation as the proposed deadline nears. To forestall this, therefore, a concerted effort from lead departments and a sustained government communications campaign aimed at rural householders will be necessary.

2.3 Biofuels and energy security

The British energy security strategy²⁷, launched in the aftermath of the invasion of Ukraine, is aimed at accelerating the generation of homegrown power in order to make the UK more energy independent. A key focus of the plan²⁸ includes expanding nuclear power as well as offshore wind, solar and hydrogen as part of the government's target of having 95 percent of electricity being low carbon by 2030.

2.3.1 Current approach to energy security

In accordance with the proposed 'heat pump first' approach, government will be running a Heat Pump Investment Accelerator Competition in 2022, worth up to £30m, to speed up the manufacturing of heat pumps. A major focus in the strategy has been on what role domestic oil and gas should play in the transition to low-carbon energy. On this, government has acknowledged that as international imports are reduced, there will be a continued need for 'gas to heat our homes and oil to fill up our tanks' as they both remain the glue that holds the British electricity system together and as such are a vital transition fuel.

Here, an emphasis is placed on the cleanest and most secure way to source this domestically through the North Sea. Policies to this end include the North Sea

27 HM Government (2022) – British Energy Security Strategy

28 Sky News (2022) – What is in the government's energy security strategy?

Transition Authority launching another licensing round in the autumn of 2022, which the government state will mean more domestic gas on the grid.

While certain aspects of the strategy have been lauded, other aspects including plans around further gas exploration have drawn significant criticism. With regards to the plans for the expansion of North Sea oil and gas exploration, the Climate Change Committee advised against²⁹ it, while acknowledging they had little power to stop it. While Greenpeace UK pointed out³⁰ how new licences would potentially take decades to get going and wouldn't be useful in tackling the immediate challenges posed by Russia or the cost-of-living crisis.

Elsewhere, it is important to note the overall lack of direction on the potential role of biofuels, not only in the decarbonisation of heat, but also to our national energy security. The Net Zero Strategy confirmed that government will set out a Biomass Strategy that will look into its role in supporting decarbonisation, creating new jobs, and tackling climate change. However, this is not scheduled for release until Autumn 2022, and the energy security strategy was a missed opportunity to indicate government thinking in this area.

This is a particular shame given the potential of biofuels in strengthening domestic energy security given the unfolding geo-political events. Analysis done by bioeconomy consultants NNFCC³¹ has shown the significant potential and possibility to grow domestic supply of biofuels through sustained investment in indigenous production facilities across the UK.

2.3.2 Implications for off-grid households

A number of the policies and overall direction of the energy security strategy have certain implications for households living off-grid. Policies aimed at investing in renewable and low carbon sources of energy can have a positive impact for off-grid households in the long term.

While it is evident in the strategy that government are pursuing their heat pump first approach, any indication of how they plan to tackle issues facing off-grid homes, including up-front costs of installation and energy efficiency of housing stock is missing. This is significant to note particularly given that we are four years away from the 2026 boiler ban for off-grid homes, and there appears to be no indication that government are acting to address obstacles in the way.

29 The Guardian (2022) – North Sea oil exploration should not proceed but can, says UK's climate committee

30 The Guardian (2022) – UK to defy net zero targets with more oil and gas drilling

31 NNFCC (2020) – A business case for an indigenous BioLPG supply chain in the UK

In light of recent policies aimed at getting more domestic gas supplying the grid, the lack of concrete support for off-grid homes in the energy security strategy appears all the more concerning. It means that while extra leeway is being given to the 86 percent of the population on the grid, who have a further decade to replace their high carbon boilers, no practical support is being provided to those off the grid who have a much more imminent deadline. This makes the need for government to incorporate transitional fuels, including bioLPG, on their own or as part of hybrid heat pumps all the more important.

CHAPTER THREE

Alternatives to the current approach

The policy framework currently being developed, as laid out in the most recent call for evidence, has sparked concern. Critics of the proposed regulation, particularly the ‘heat pump first’ approach, have pointed to the high costs involved as well as the high rates of fuel poverty experienced by many rural off-grid households as reasons why it is not feasible. In addition, the age and build of many rural homes means they are less energy efficient, and in some instances it is technically difficult to improve this.

3.1 Calls for a mixed approach

In order to fully understand these challenges to the current approach, it is important to first contextualise the impact of being off the gas grid on energy efficiency, fuel use, and the costs involved. One-in-five homes in rural areas are in the very energy inefficient F and G categories. And given that properties in these areas do not have access to the cheaper option of using a gas boiler connected to the grid to heat their homes, they rely on the more expensive options - including electricity, heating oil and LPG.

3.1.1 Switching heating systems and the financial barriers

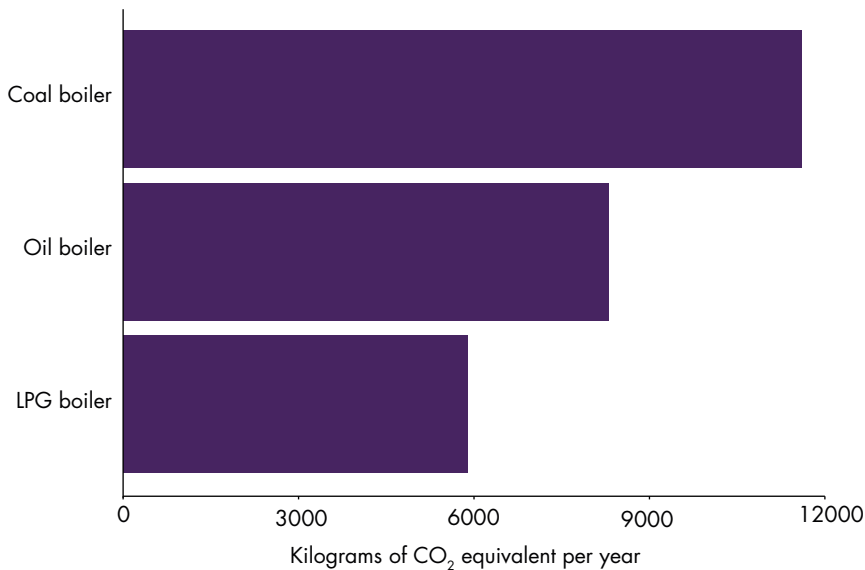
Analysis produced for Liquid Gas UK³² has shown the different heating systems available for off-grid rural properties, the carbon emissions they produce as well as the capital and operational costs involved.

On the whole, the most common heating system for off-grid detached properties in rural England include an oil boiler, coal boiler, and LPG boiler. For the first, the capital and operational costs are £4,150 and £1,658 respectively with the carbon emissions being 8,299 kgCO₂e/yr. For the second, the capital and operational costs are £5,077 and £1,478 respectively with the carbon emissions being 11,599 kgCO₂e/yr. For the third, the capital and operational costs are £1,900 and £2,208 respectively with the carbon emissions being 5,883 kgCO₂e/yr.

For such properties, many of the low carbon alternatives come at a significant cost. Either through the upfront installation costs or those associated with the required retrofitting needed before installation. The capital costs for installing an Air Source Heat Pump, including the need for retrofitting, are £29,690 with the carbon emissions being 818 kgCO₂e/yr. For a hybrid heat pump that includes a backup source of oil or LPG the cost is £30,470 the carbon emissions being 825 kgCO₂e/yr.

These figures help illustrate the extent of the financial barriers facing rural off-grid properties in switching to low carbon fuel alternatives. And unfortunately, proposed government regulation will increase the burden on off-grid households. This is counterproductive to accelerating the transition to low-carbon alternatives, as all it does is add increasing financial pressure on already cash-strapped households.

Figure 2. Emissions from off-grid energy sources



Source: Ecuity Consulting

3.1.2 Moving past an all-or-nothing approach

While an eventual transition to heat pumps is the desired outcome, the current all-or-nothing approach of the government, through the 2026 end date for the installation of fossil fuel heating as well as the 'heat pump first' approach, places an unfair and disproportionate burden on off-grid properties. As Liquid Gas UK has highlighted in their response to the call for evidence³³, forcing off-grid homes down a singular path guided by a 'one size fits all' approach will only lead to adverse impacts facing those the policy is designed to help the most.

A leading problem with the approach being proposed is that the incentive schemes attached to it do not give a variety of cost-effective choices to consumers as to what heating technology they can choose. At the same time, in their fuel poverty strategy³⁴ government have signalled their intent to remove support for

33 Liquid Gas UK (2022) – Liquid Gas UK: Written Evidence (ESI0013) UK Energy Supply and Investment Inquiry

34 BEIS (2021) – Sustainable Warmth: Protecting Vulnerable Households in England

new LPG and oil heating systems from 2022. Although they have not clarified how this will happen. Nevertheless, this gives little scope to working with these systems to understand how biofuels can play a role. The consequence of this will see off-grid households being put in a compromised position and having to install a heat pump at great personal expense.

Relatedly, the task of retrofitting electrified technology in old, poorly-insulated, detached homes off the grid should not be underestimated. It poses practical challenges for achieving government's desired 'heat pump first' approach from 2026 onwards. As discussed, capital costs for heat pumps, both air source and hybrid, can run up to £30,000+ - making a switch to them largely unaffordable for most rural households.

Instead, a mixed technology approach, where low carbon technologies along with feasible 'drop in' fuels such as bioLPG, play equal parts in reaching the net zero goals in a cost-effective and popular manner should be adopted. Using this approach will allow for the diversity of the off-grid housing stock in different localities to be properly considered. Such an approach would mean households being able to move forward with decarbonising their heating using a low carbon heating technology that is suitable for their property and fiscal circumstances.

Overall, this would allow more choice for off-grid consumers, which would increase the likelihood of meeting net zero transition targets. Ecuity has produced research³⁵ showing a mixed technology switch can achieve emission reductions aligned with wider net zero targets, with 90 percent reductions achieved by 2050.

3.1.3 Increasing consumer buy in and establishing the role of biofuels

A mixed technology approach also touches on the importance of addressing the user journey in the transition to low carbon heating. Many rural tenants are older and face different living circumstances to their urban counterparts. Therefore, a mixed technology and flexible approach has the added benefit of adapting to the needs of households, whilst also embedding an understanding of the need to decarbonise heating and its wider significance.

Such an attitude to heating decarbonisation will lead to increased consumer buy in, as efforts will be made alongside households rather than imposing from above a certain pre-determined solution that may not suit everyone's circumstances. For rural households, the best solution will be the one that causes least friction and

imposes the least cost, disruption or inconvenience. For those houses that use oil, in many cases it is easier to change the fuel which is a quicker and simpler process than completely swapping the heating system.

For a mixed technology approach to be successful, there will need to be a focus on readily available, established, and affordable decarbonising technologies. In those properties where heat pump technology is not a realistic option, bioLPG can act as a leading transitional fuel on the path to a fully decarbonised housing stock. This will be particularly important for government to consider as stakeholders have highlighted how many off-grid properties are still not ready to install heat pump technology³⁶.

In light of this, the mixed technology approach needs to be locally-flexible in order to properly consider the most appropriate low carbon heating technology based on factors including building type and climate risk. This will allow for effective planning on how to achieve full decarbonisation in different off-grid building types.

Adding to all of this, the government, in its latest call for evidence, has recognised the potential benefits of net zero-consistent liquid biofuels and signalled their awareness of the sectors commitment to transitioning to 100 percent biofuels by 2040. In the Heat and Buildings Strategy, government has acknowledged the potential of bioLPG as part of a hybrid heating system along with an air source heat pump.

There needs to be further support from the Department for Business, Energy and Industrial Strategy on the role biofuels could play in the future decarbonisation of off grid properties. Overall, off-grid households and businesses need to be offered a range of choices in their decarbonisation journey. Mandating specific technologies for their properties will not be helpful. At the same time, it is important that the range of choices are net zero compliant. Through creating a range of choices, a market incentive is provided for suppliers to start producing more low carbon fuels and to bring them to market. Additionally, it instils a sense of individual agency for meeting the varied needs of unique properties, as opposed to imposing limited 'one size fits all' solutions in what might be felt as a high-handed, top-down manner.

3.2 The retrofit challenge

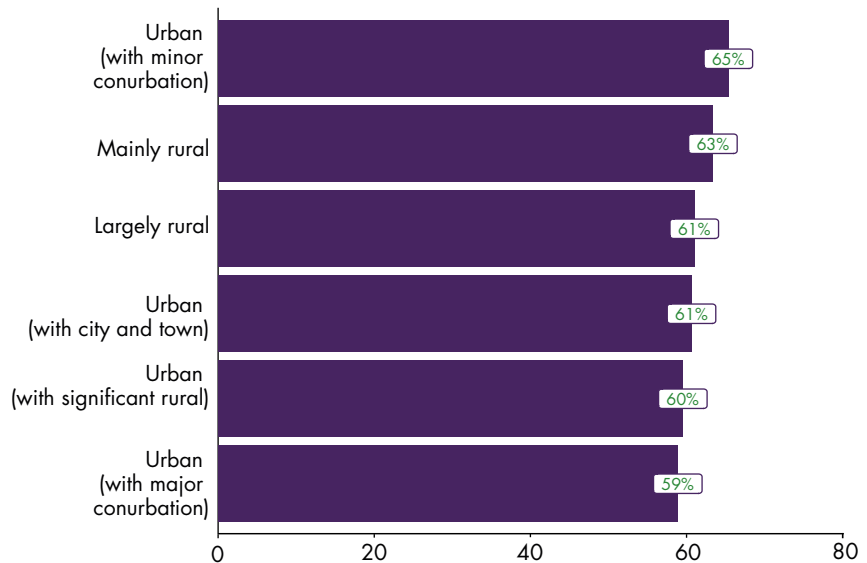
Given that in 2050 people will still be living in 80 percent of the homes that exist

36 Politics Home (2022) – Where is the 'fairness' in using off-grid homes as the testing ground for heat policies?

today, retrofitting and improving their energy efficiency will play a central part in the decarbonisation process. In this context, government set out their initial aspiration for homes in England and Wales to achieve EPC Band C by 2035 in the Clean Growth Strategy.

Figure 3. Retrofit demand by degree of rurality

Average percentage EPC certificates rated C and below (2011-2021) across local authorities by ONS urban-rural classifier group



Source: DLUHC/ONS

3.2.1 Retrofitting off-grid properties

The task of retrofitting the domestic building stock has been labelled 'one of the toughest infrastructure challenges the UK has ever seen'³⁷. Some 25 million homes need to be decarbonised by 2050 at an estimated cost of between £400bn - £1,000bn. In the more immediate term, this translates to 270,000 each year³⁸ by 2035.

Retrofitting off-grid properties warrants specific consideration owing to the unique circumstances they face from energy demands as well as government targets. The retrofitting of energy efficiency measures is a difficult task already because the UK

³⁷ Local Government Chronicle (2021) – Domestic retrofit: our toughest infrastructure challenge?

³⁸ pbctoday (2021) – Start your retrofit journey here

has one of the oldest and least efficient housing stocks³⁹ in Europe. And out of this stock, off-grid properties tend to be the oldest and least efficient when compared to the average on-grid property.

A recent Environmental Audit Committee⁴⁰ report highlighted how the most challenging properties to retrofit are those built before 1919, owing to the fact that they are constructed with solid walls that are less energy efficient and cost more to insulate. According to the English Housing Survey⁴¹ estimates, around 22 percent of homes in the UK were built before 1919 and there are currently eight million solid wall properties in the UK. Furthermore, these solid wall properties tend to be found in more rural areas and are therefore less likely to be connected to the gas grid. And as a result, are reliant on alternative fuels including heating oil and LPG.

Another challenge with retrofitting these properties goes back to the reliance on the EPCs as a measure for energy efficiency. As pointed out, the problem with using EPCs in this manner is that because they are based on the cost of the fuel used for heating, a property off the grid using more expensive alternatives will inevitably score lower.

Owing to the fact that off grid homes tend to be more rural, older or heritage buildings, and as a result less energy-efficient, with higher heating demand, the task of retrofitting these properties becomes extremely expensive and even unviable in certain instances. Challenges confronting the retrofitting of heritage homes will include homeowners wanting to maintain their aesthetic and character, as well as more stringent planning restrictions in conservation areas.

Relatedly, the planning system is not seen as being geared toward helping deliver what is required for the decarbonisation of buildings. The planning restrictions on older and heritage buildings impede on the ability to deliver their required decarbonisation in the expected timescale. A degree of Permitted Development Rights for low-impact energy-efficiency technology would be a policy support option that would help such off-grid properties decarbonise fairly.

Having said this, a balance must be struck between addressing obstacles our off-grid heritage buildings face in decarbonising as well as respecting their inherent historic and social value. In this light, the commitment for a review in the Energy

39 UKGBC (2018) – Energy efficient Mortgage Action Plan: Creating an energy efficiency mortgage for Europe

40 House of Commons Environmental Audit Committee (2021) – Energy Efficiency of Existing Homes: Fourth Report of Session 2019-2021

41 MHCLG (2020) – English Housing Survey: Headline Report, 2018-19

Security Strategy to assess the barriers in the planning system for energy efficiency improvements for heritage buildings should be seen as a welcome first step towards a sustainable solution.

3.2.2 Retrofitting and green skills

Looking at the retrofit challenge from an installers' perspective, a central plank of concern is that the correct training is not being provided to adequately retrofit and install the low carbon heating technology which government is championing. Given the four-year cycle of an apprenticeship scheme, the most recent apprenticeship cohorts will soon have to go back and retrain to get the required qualifications and skills for these new technologies, including heat pumps.

The government have claimed they are working with the heating industry to ensure installers are available to meet this challenge and that upskilling can happen within a single week of training. While it is technically possible, there is a strong sense from industry and community stakeholders that the reliance on a one-week training course to plug the gap is overly optimistic.

This brings to light a wider issue regarding the correct skills requirements for retrofitting. A strong sentiment coming from sector stakeholders is that installers do not have the consistency of support or training required in how to tackle the decarbonisation challenge in rural areas. Therefore, along with delivering consistent support to households and businesses looking to retrofit and decarbonise, government need to also develop a framework of support for installers with an emphasis on key areas such as skills provision and training on retrofitting rural and off-grid building stock.

CHAPTER FOUR

Role of government going forward

Government as a whole has a crucial part to play in supporting the decarbonisation of off-grid households and businesses. Central and local government will have different roles in helping guide consumers along the decarbonisation process.

Central government will have to lead in developing a coherent and workable regulatory framework that sets out realistic targets, support mechanisms and low-carbon choices for off-grid consumers to help them transition. While local government, along with other local state stakeholders, will play a leading role in awareness raising of the importance of decarbonisation as well as providing locally tailored guidance and support that is reflective of place circumstance.

4.1 Central government

4.1.1 Current ambition

As has been highlighted throughout this report, central government is in the process of developing a framework based on three aspects:

- To end the installation of fossil fuel heating in homes off the gas grid from 2026;
- moving forward with a ‘heat pump first’ approach to replacement heating systems from 2026;
- and requiring high performing replacement heating systems where heat pumps cannot be viably installed.

Government proposals for commercial and public buildings also follow a ‘heat pump first’ approach to the replacement of fossil fuel systems introducing the policy from 2024 onwards. In addition to this, government are proposing to use the natural replacement cycle to phase out oil, LPG and coal systems in commercial and public buildings off the gas grid.

There are a number of policies and incentive schemes in place aimed at supporting households and businesses transition to low-carbon heating. A few include the aforementioned Boiler Upgrade Scheme⁴², Domestic⁴³ and non-Domestic⁴⁴ Renewable Heat Incentive, and the Public Sector Decarbonisation Scheme⁴⁵.

4.1.2 Practical implications of current approach

The government has pointed to these policies as key in growing heat pump deployment and in enabling the entirety of the off-grid building stock to take them up. While these measures offer welcome support for consumers, the challenge lies in the limited variety of choice they present with regards to the low-carbon technologies they support. Additionally, what support is provided is not sufficient. For example, the maximum £5,000 provided for Air Source Heat Pump installation from the Boiler Upgrade Scheme will cover only 38 percent of the £13,060 needed. This figure significantly increases when considering the need for retrofitting energy efficiency measures as well.

42 BEIS (2022) – Future support for low carbon heat

43 GOV.UK – Domestic Renewable Heat Incentive

44 GOV.UK – Non-domestic Renewable Heat Incentive

45 BEIS (2021) – Public Sector Decarbonisation Scheme

Furthermore, the amount of funding available for the Boiler Upgrade Scheme will only fund 30,000 installations of heat pumps a year, which is approximately the size of the current market. The problem is that contrary to government aims and ambition, this will do little to encourage new installer businesses to enter the market, which will create problems further down the line in 2026 when there will need for a far larger numbers of installers than are being trained currently. In addition, liquid biofuels are explicitly excluded from the support mechanism, reducing options available to home-owners, severely impacting the speed and size of rural decarbonization.

Given how things stand at the moment with support schemes and other incentives, it does not seem as if things will change fundamentally to address this imminent problem around consumer demand and installer capacity. As matters currently stand, installers are not putting in the required investment to train for the extra skills that will be needed in a few years.

The roll out of government support schemes has faced increasing criticism. It has been reported⁴⁶ that out of the 17 councils that initially received funding as part of the Social Housing Decarbonisation Fund pilot, nine stated they did not retrofit a single property. A leading reason for this being unachievable deadlines set by BEIS. This comes shortly after the government's mishandling of the Green Homes Grant roll out, which resulted in the Public Accounts Committee issuing a report⁴⁷ critical of the government's handling of schemes devised on too short timescales and for their overly complex nature.

4.1.3 Moving forward and embedding flexibility

A key problem with the government's wider approach to developing policy frameworks is that regulatory deadlines and compliance is often set ahead of clear guidance or specifications on how to go about achieving these deadlines. The danger with this approach is in the risk of increased maladaptation and people going down pathways that are counterproductive in the long term.

While the development of a regulatory framework and the associated incentive measures to support off-grid households and businesses is an encouraging step from government, flexibility, and adaptability to the local circumstances of off-grid consumers is critical. Government must give due consideration to each varying

46 Inside Housing (2022) – Social Housing Decarbonisation Fund: majority of councils failed to retrofit single home by deadline

47 House of Commons Public Affairs Committee (2021) – PAC report: Green Homes Grant scheme “underperforming badly”

factor of the decarbonisation of off-grid properties when setting out the final regulatory framework. Specifically, in defining what role each different low carbon alternative can take. Setting this out from the beginning will be vital to creating a truly responsive and flexible framework.

Especially with regards to the approach and low carbon technologies available for off-grid households to transition their energy sources. An 'all or nothing' approach towards the decarbonisation of buildings with specific technologies, such as heat pumps, in mind will not work. It is unfair, especially when such an approach does not consider the socio-economic circumstances of individual households. And it risks holding the country back on the road to net zero and placing the burden and onus for action disproportionately on consumers without adequate support.

The best policy the government can pursue in providing support to those living off-grid is to allow for this flexibility through providing a range of options for different low carbon heating technologies. As well as better utilising the potential of transitional low carbon biofuels in decarbonising the building stock that could be 'dropped in' to existing heating systems.

4.2 Local government

4.2.1 Awareness raising and behavioural change

Another area where vital support for off-grid households is needed is in awareness raising over the importance of decarbonising their homes and the viable options available. In the 'Decarbonising Heat in Homes'⁴⁸ BEIS Committee report, the UK District Energy Association identified decarbonising domestic heating as an area where the general public will face the reality of reaching Net Zero. Furthermore, the process of retrofitting and installing low carbon heating technology will test public willingness to make lifestyle changes to reach the 2050 target.

This is where local government can play a leading facilitatory role in engaging with off-grid communities and to raise consumer awareness and buy-in. Polling has consistently shown that local government is more trusted than national government. Research shows that over the pandemic trust in local government⁴⁹ remained higher than at national level.

Coupled with the fact that local government is the custodian of place and

48 Business, Energy and Industrial Strategy Committee (2022) – Decarbonising heat in homes

49 LSE Covid-19 blog (2021) – Trust in local government is still high, and policy makers should take advantage of it

intimately knows the dynamics and demographics of local communities they are perfectly placed to lead locally-tailored engagement campaigns that speak to the unique circumstances of the housing stock in their locality.

Awareness-raising in this manner is extremely important if government wants to reach goals set out in their proposed regulations on off-grid buildings and wider Net Zero objectives. Particularly when considering how, according to statistics from the BEIS Committee report, 77 percent of people polled in December 2020 showed little awareness or willingness to install an air source heat pump. For ground source heat pumps, the number was 71 percent. In light of the government's heat pump first approach to decarbonisation, these statistics are a major cause for concern.

Community engagement and awareness raising will have to address the larger aspects of behavioural and lifestyle changes. Especially with rural off grid households, there needs to be a wider conversation regarding the need for and importance of transitioning to low carbon heating. This conversation will need to highlight what role each household will have to play in the transition.

Without this understanding, off-grid households may feel penalised for being targeted first, which will risk eroding support for the heat decarbonisation agenda before it has had a change to effectively start in the first place. A sense of unfairness could be embedded in off-grid households given that on-grid households will not have to replace their existing gas boiler until 2035, while they only have four years to act.

4.2.2 Guiding households through their decarbonisation journey

The scale of behavioural change needed will require a fundamental shift in mentality of households and forward planning regarding the different low carbon technology options available to them. Yet this is easier said than done. There are a lot of variables that households will need guidance on to successfully make this transition. And a leading challenge is that there is no easily accessible and localised service that can provide this guidance. At the moment it is difficult for households to get advice on an overall plan for retrofitting their property including changing the heating system and what the best options for this would be.

However, having regional knowledge sharing networks, facilitated by local state stakeholders including local authorities, could help address this. There already are examples of such sharing networks. For example, in Scotland the Green

Homes Network⁵⁰ puts interested homeowners in touch with households that have already gone through the process of installing renewables and low carbon heating technologies. From here, people can gain a practical understanding of the advantages, challenges, costs and other factors central to the journey.

Localis has previously called for neighbouring local authorities to set up 'one stop shops' as a way to tackle the retrofit and building decarbonisation challenge⁵¹. By working with housing data on an amassed scale, partnering authorities can design bespoke solutions and tailor engagement to address place specific challenges.

'One stop shops' can help raise awareness and buy-in from off-grid households. They could act as hubs where place-specific information is available and distributed on every important aspect of decarbonising heat in homes. This could include information signposting details of the government's fiscal support schemes, the most suitable low carbon heat technology for the local building stock, the impact of planning regulations on carrying out work, and information on the best local SME's available to do the work. In light of the cost-of-living crisis, this is all the more necessary.

50 Energy Saving Trust – Green Homes Network

51 Localis (2021) – Lagging Behind: Energy efficiency in low-viability properties

Recommendations

The table below displays key facets of the current approach to decarbonisation of off-grid homes, alongside policy recommendations based on the research for this report that might make net zero more achievable for the four million homes currently using off-grid heating.

Government policy	Localis recommendation
<p>An end to the installation of fossil fuel heating in homes off the gas grid from 2026.</p> <ul style="list-style-type: none"> Part of this policy will rely on working with industry to reduce upfront cost of heat pump installation by 50 percent by 2025 and achieve cost parity between them and gas boilers by 2030. Government support to enable an end to installation of fossil fuel heating includes £450m Boiler Upgrade Scheme and £2.5bn Heat Upgrade Grant Government believes these steps will enable them to end the installation of fossil fuel heating in off-grid homes from 2026. They believe this is enough time to allow their funding support and the market mechanism time to improve heat pump market condition 	<p>Bring the 2026 ban on fossil fuel boilers for off-grid homes into line with the 2035 deadline for on-grid homes.</p> <ul style="list-style-type: none"> Set out evidence for how government will work with industry to reduce costs of installation and what steps are being taken already. Increase the amount available within the Boiler Upgrade Scheme to match the entire cost of a heat pump. Broaden the Boiler Upgrade Scheme to include liquid biofuels. Four years is not enough time to improve the current heat pump market condition. Government needs to improve the incentive schemes available to households as well as embark on a communication campaign to engage with off-grid households over the proposed regulations. This will help increase uptake and help grow the market.

Government policy

A 'heat pump first' approach to replacement heating systems from 2026.

- This entails setting a high standard governing the choice of replacement heating system, with air source heat pumps being the lead replacement technology in most cases.
- Ahead of the regulation coming into force, government will issue guidance on how households and installers should determine whether it is reasonably practicable to install a heat pump in their home.
- Government also proposes to extend this 'heat pump first' approach to replacement heating systems in off-grid fossil fuel heated homes that can be made suitable through minor energy efficiency upgrades that can be done quickly including insulation.

Localis recommendation

Government should not be proscriptive over technology at this stage in the decarbonisation process.

- With an eventual transition to heat pumps in mind, at this stage government must encourage a variety of low carbon heating technologies that accord with the place circumstances of each rural off-grid community.
- Government must work with industry to immediately set out guidance on the different low carbon options available for households that are not ready for heat pump installation.
- With focus currently on costly major transformations to homes and their heating systems, more achievable improvements to efficiency risk being overlooked. The government should provide funding for 'fabric first' improvements to rural homes via local councils.

Government policy

Requiring high performing replacement heating systems where heat pumps cannot reasonably practicably be installed

- Government intends to consult on the criteria governing the choice of replacement heating systems available to households not ready for heat pumps ahead of the 2026 implementation of the heat pump first approach.
- Government have proposed that any alternate choice of technology for households not ready for heat pumps must reflect the high standards of performance of high temperature heat pumps and solid biomass systems.
- It is believed that this proposal will create space for industry to innovate and bring forward new low carbon heating solutions that are not currently available.

Localis recommendation

Embed a mixed technology approach in the regulatory framework and work with industry stakeholders to determine what role biofuels will play in the decarbonisation of off grid homes.

- Government needs to work with industry stakeholders operating in alternative low carbon heating sectors to set out the role and capacity of each replacement heating system. This communication needs to be underpinned by clarity and consistency.
- Work with same industry stakeholders to clarify what 'high standards of performance' means and how alternative low carbon heating technologies can achieve this.
- Providing certainty over the role that biofuels will play in the decarbonisation of off-grid homes will allow the sector to make the appropriate investment decisions to build required infrastructure and stimulate the market.
- Government must ensure that the mixed technology approach in the regulatory framework is localised and flexible depending on the place circumstances of off-grid homes.

In addition to this:

- The electricity infrastructure in rural areas is in many places not prepared for a widespread switch to electricity as a primary heating source. Therefore, it is important that government **build a programme of electricity infrastructure upgrade in rural areas into the roadmap to net zero**.
- The current Energy Performance Certificate methodology is not well-suited to application in off-grid homes. The government should **review the EPC methodology** with the aim of redressing the unequal impact on off-grid homes.

At a local level:

- **Regional Heat Decarbonisation Hubs should be developed** that bring together local state stakeholders including energy providers, neighbouring local authorities and installers. These should be collaborative efforts aimed at engaging with off-grid communities and raising awareness of the need for and importance of heat decarbonisation.
- They should act to illuminate a path to achieving sustainable rural heating through providing consumers with knowledge over a variety of low carbon choices best suited to the local housing stock context.
- These hubs should communicate clearly what the regulatory framework is, and what it means for the local housing stock as well as off grid households.
- They should provide all relevant information on key aspects of the decarbonisation process including signposting details of the government's discal support scheme, most suitable low carbon heating for the local building stock, support regarding the planning process where relevant, and information on local SMEs and installers available to do the required work.
- These regional hubs should also have a model home to showcase and demonstrate to households what a fully decarbonised off grid property could look like.
- These hubs should also facilitate best practice sharing between and amongst households wanting to decarbonise.



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