REA Response to BEIS Select Committee Inquiry – Decarbonising Heat in Homes

The Association for Renewable Energy & Clean Technologies (REA) is pleased to submit this response to the above inquiry. The REA represents a wide variety of organisations, including generators, project developers, fuel and power suppliers, investors, equipment producers and service providers. Members range in size from major multinationals to sole traders. There are over 550 corporate members of the REA, making it the largest renewable energy trade association in the UK. Of particular relevance to this inquiry are the REA Wood Heat Members Forum, who advocate for the modern wood biomass heating industry and its supply chains, as well as the REA Biogas Forum, who include biomethane producers who are helping to decarbonise the gas grid. The REA also have members involved in the deployment of heat pumps, biofuels for heating, deep geothermal, thermal battery storage technologies, gasification and pyrolysis, renewable and clean hydrogen

Given the range of the technologies represented by the REA, and the evidence provided below, we would welcome the opportunity for our Chief Executive, Dr Nina Skorupska CBE, to also provide oral evidence to the committee as part of this inquiry.

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1. Summary of Response

1.1 The REA emphasise that there is no one solution to heat decarbonisation within homes, however, by taking a multi-technology approach, including energy efficiency measures, it is possible to see domestic heat almost totally decarbonised in line with the Climate Change Committees projections, and the UK's legally binding net-zero ambitions.

1.2 Heat policy going forward must focus on ensuring the right technology is used in the right situation. This must consider a wide variety of factors including the level of energy efficiency within the property, the infrastructure availability for that heat source (including power/gas grid or feedstock availability), and the level of savings provided in terms of carbon abatement and cost.

1.3 The starting point for considering where heat policy should focus next must be with reviewing the current renewable heat sectors, understanding what has been achieved by the Renewable Heat Incentive (RHI) and how the UK must build on this foundation to continue to deploy decarbonised heat today. The largest contribution to heat decarbonisation across all buildings within the UK comes from established heat markets including biogas and biomethane, biomass heat and heat pumps which can already be deployed affordably at scale, to realise immediate carbon reductions. These sectors have established knowledge, skilled workforces and supply chains which must be grown and maintained if the level of deployment required to effectively decarbonise is to be delivered.

1.4 Further technologies such as deep geothermal, biomethane from gasification and pyrolysis, , thermal storage batteries and heat networks are also of high strategic importance and, while nascent, are ready for significant deployment to contribute to the decarbonisation of both homes and businesses in the short to medium term. In the longer-term further strategic technologies such as hydrogen will also play a role, helping to decarbonise the gas grid, and it is correct that there is a focus on exploring sustainable production pathways to see the technology delivered. However, support for such innovation must complement, rather than replace, policies that deliver no-regret solutions, providing immediate carbon reduction, today. Delivery of such future strategic technologies will be dependent on their being a strong renewable heat sector already in place, rather than seeing existing markets contract in favour of future solutions.

1.5 The UK needs a step-change in heat decarbonisation policy. The RHI was successful in establishing a renewable heat sector in the UK across multiple technology solutions and at multiple scales, however, the proposed policy replacements for domestic heat (the Green Homes Grant and Clean Heat Grant) have so far been narrowly focused and will prove inadequate for the scale of deployment required. These policies also leave a serious policy gap opening around the decarbonisation of businesses and industrial-scale heat, which so far has seen no significant announcements on what will replace the non-domestic RHI. For many renewable heat sectors, there is now little growth opportunity for larger scale installation, which in turn will harm the options for domestic renewable heat installations. With polices narrowly focused on small scale domestic (predominantly heat pump) deployment, contraction of renewable heat sectors like biomass, geothermal, larger-scale heat pumps are expected just as the UK needs to be more than doubling its deployment rate for renewable heat technologies.

1.6 The Governments Heat and Buildings Strategy need to set out a real deliverable strategy that both ensures the continued growth of all renewable heat sectors, across both domestic and non-domestic scales, in operation today and the delivery of strategically important technologies in the future. Within this response, we review what the RHI has achieved and the industries response to the proposed replacements. We also provide an overview of the range of renewable heat technologies that must now be delivered and the current barriers to their deployment that must be addressed if full decarbonisation of homes is to be realised.

2. The impact of The RHI and lessons learnt

2.1. The Renewable Heat Incentive has been a success story for the establishment of the renewable heat industry in the UK. The tariff-based mechanism has provided a bankable solution for long-term investments in renewable heating systems across the domestic and non-domestic scale. As of September 2020, the RHI, since its introduction in 2011, has achieved:

- 81,706 domestic accredited renewable heat installations and a further 20,483 non-domestic accredited installations [1].
- This has delivered a total installed capacity of over 6000 MW of heat (985 MW of which is in the domestic sector) and delivered over 57 TWh of heat since the scheme began [1].
- Established crucial renewable heat supply chains and maintenance sectors. The REA REview 2020 identified over 32,000 direct jobs in the heat pump, solar thermal, biomass boiler, biomass CHP and AD sectors combined in 2018. This grows to well over 44,000 jobs when you also include those employed in ancillary services such as the production of biomass for fuel [2].

2. 2 It is worth noting that across the whole RHI, bioenergy heat application, such as biomass boilers and anaerobic digestion have accounted for about 90% of renewable heat produced, making the largest contribution to heat decarbonisation in the UK to date. Within the Domestic RHI total renewable heat production is relatively evenly split between heat pumps and biomass, although 76% of installations within the domestic RHI have been air or heat pump installations [1]

2. 3 The RHI has been subject to frequent reform by both DECC and then BEIS, to improve overall scheme performance. This has been an interactive learning process, for both Government and Industry as issues are highlighted and resolved. This has included revising tariffs, amending sustainability requirements, reconsidering eligible heat uses and the introduction of assignment of rights. While this amendment process has not always been smooth, causing disruptions to deployment, they have

resulted in important lessons being learned and the quality of installations improved as the scheme has evolved. There are significant concerns that these lessons are not being carried forward into new support schemes for heat.

2. 4 These lessons include:

- Strong installations, maintenance and fuel standards should be designed into the scheme early on so that quality projects are delivered.
- If a tariff degression system is required to ensure tariffs are reflective of market costs, then degression mechanisms must be carefully designed so that they are not triggered before the industry can respond, which leads to cliff edges in deployment.
- Providing options for the 'Assignment of Rights' for investors has overcome the challenge of tariff-based mechanisms requiring upfront capital.
- Consumer protection, through the adoption of Consumer Codes, is essential to enable recourse should installations go wrong.
- Consumers must be educated and provided evidence on all the options available to them, and proper heat requirement surveys done to ensure the right technology is being installed in the right property.
- The ongoing running costs of renewable heat system must also be considered in comparison to a fossil fuel comparator. This is an issue well addressed by a tariff-based mechanism.

3. Schemes replacing the Domestic RHI are narrowly focused, without the breadth of the RHI

- *3.1 The Clean Heat Grant Scheme (CHG)*

3.1.1 The proposed replacement for the Domestic RHI is the Clean Heat Grant (CHG), due to start in 2022, following the end of the domestic RHI in the same year. It only has £100mn to spend over two years and is proposed to provide a limited grant of £4000 for systems below a capacity cap of 45 kW. Unlike the RHI, that supported projects across a range of sizes, this is a grant level focused on small, predominantly air source heat pump installations with a limited role for biomass. Installation costs for different technologies, provided in the Annual RHI statistics, demonstrate a grant of £4000 is likely to only incentivise projects up to about 10kW. Above this, the proportion of installation cost falling on the consumer is more than £7000, identified by BEIS in their recent Future of heat consultation as a 'psychological threshold' for deployment (See Table 1) [3]. The average installation size, across all technologies in the Domestic RHI, is currently 13.5 kW [1].

Table 1: A flat grant of £4000 will not incentivise deployment much above 10 kW. Data from BEIS 2019 Annual RHI Statistics.

Technology	**Installation Capacity (kW)**	**Median recorded cost of installation under the Domestic RHI April 2014 – Dec 2019 [4]**	**Cost per Kilowatt of Capacity (£/kW)[2] [4]**	**Percentage (%) of project cost covered by £4000 grant**	**Expected capital cost still needed to be met by the consumer**	**Is the cost to consumer below £7000 - the "psychological threshold" for deployment**
Air Source Heat Pump	Less than 5	£7,290	£1,480	55 %	£3,290	Yes
	6 - 10	£8,220	£1,080	49 %	£4,220	Yes

	11 - 15	£11,500	£920	35 %	£7,500	No
	16 - 20	£13,000	£810	31 %	£9,000	No
	21 - 25	£17,970	£770	22 %	£13,970	No
	26 - 30	£20,000	£710	20 %	£16,000	No
	31 - 35	£20,000	£630	20 %	£16,000	No
	36 - 40	-	-	-	-	-
	41 - 45	£22,500	£530	18 %	£18,500	No
	Average across the range	**£11,274**	**£866**	**35 %**	**£7,274**	**No**
Biomass	Less than 5	-	-	-		
	6 - 10	£13,000	£1,360	31	9,000	No
	11 - 15	£11,760	£820	34	7,760	No
	16 - 20	£13,000	£690	31	9,000	No
	21 - 25	£14,750	£610	27	10,750	No
	26 - 30	£16,500	£600	24	12,500	No
	31 - 35	£18,000	£510	22	14,000	No
	36 - 40	£19,390	£500	21	15,390	No
	41 - 45	£25,000	£570	16	21,000	No
	Average across the range	**£16,425**	**£708**	**24**	**12,425**	**No**

3.1.2 The £4000 level also means that if a project is deployed above 10 kW, they are likely to be of low quality, or could be undersized to a level that does not meet the consumer's heat needs. Applicants are effectively disincentivised from considering better-designed projects where the grant will cover less of the total project cost.

3.1.3 The committee should also be aware that as of 2019, VAT on energy-saving materials, which includes domestic renewable heat technologies like heat pumps and biomass installations, increased from 5% to 20% (unless certain relief criteria apply) [5]. In the case of installations at the upper end of the capacity range, where the grant level covers 20% or less of the total project cost, the grant may only be paying the VAT on the project.

- *3.2 Green Homes Grant (GHG)*

3.2.1 Announced in July and then speedily opened for applicants at the end of September, the Green Homes Grant is a welcome policy providing homes owners with a £5000 voucher to install energy efficiency measures and low carbon heating technologies. However, this should also be recognised as a short sharp impetuous, currently only expected to last six months. It is a helpful, but limited, sticking plaster which will allow some of the heat sector to weather the disruptions of Covid-19 while hopefully seeing increased uptake in domestic decarbonisation measures in the short term.

3.2.2 As a Grant we fear that the scheme will be subject to many of the same weaknesses as the Clean Heat Grant, described above, although note the more generous £5000 grant will help some slightly larger heat systems to be installed. The speed at which the scheme has been delivered also raises concerns that many of the lessons of the RHI have not been carried forward, especially around ensuring quality standards. We also note that the scope of the scheme is limited, excluding technologies like biofuels or thermal energy storage and unjustifiably restricting biomass deployment to only being deployed in rural areas [6].

3.2.3 We also note the discrepancy in funding announced between the Green Home Grant and The Clean Heat Grant. The Green Homes Grant has a budget of £3 bn to spend in six months, while the Clean Heat Grant has only £100mn over two years. The committee should note the significant lack of ambition Government have put forward for the CHG, which their impact assessment suggests will deliver 24,300 heat pumps and only 700 biomass boilers, deployment figures that will fail to maintain a sustainable renewable heat industry [7].

- *3.3 Grant based schemes suffer from not addressing operational costs*

3.3.1 The REA note that both the GHG and CHG currently do not address the operational costs of renewable energy heat systems. The RHI tariff ensured applicants use their low carbon heating systems, as paid for the heat produced, rather than being incentivised to install a system which was left idle due to lower fossil system running costs. For example, the grant will support the deployment of heat pumps in on-gas grid properties. In 2019 the average domestic unit cost for electricity was 16.6 p/kWh compared to an average unit cost for gas of 3.79 p/kWh [8]. A consumer switching from a gas boiler to a heat pump is likely to see a significant increase in running costs which is not addressed by a one-off capital expenditure focused grant support mechanism. Very similar comparisons can be made to the ongoing costs of biomass feedstocks compared to continuing to burn oil. Any saving the consumer makes in upfront costs could be quickly negated by ongoing operational expenditure. If not properly considered at the point of assessment and installation it may put people off using their renewable heating systems in the medium to long term, reverting to fossil fuel heating systems. Examples of this were seen on the grant scheme that came before the RHI, the Renewable Heat Premium Payment, and was a major reason for the switch to a tariff-based mechanism.

- *3.4 Policy Gap around Business and Industrial Heat Decarbonisation.*

3.4.1 While we recognise that the terms of reference for this inquiry are around domestic heat decarbonisation, it is worth highlighting that the end of the ND RHI is in March 2021 leaving a significant heat policy gap around business and industrial heat use. As it stands there is no announced support for medium or large-scale heat decarbonisation projects, for any technology, following the closure of the existing scheme. Given that many domestic installers will also install business heat systems, this gap means many are seeing market opportunities shrink. This is especially true from technologies well suited to higher heat loads, such as biomass and ground source heat pumps, where previous reforms to the RHI had encouraged them to focus on larger-scale projects [15]. In considering the sustainability of the heat sector, the committee should also consider what further support is available beyond the domestic sector.

- *3.5 Green Gas Support Scheme (GGSS)*

3.5.1 It is welcome that BEIS has proposed bringing forward a support mechanism aimed at increasing the proportion of biomethane in the grid as well as avoiding a hiatus in biomethane development. We anticipate the proposed change in the interaction between the RHI and the Renewable Transport Fuel Obligation will result in significant additional biomethane injection from existing biomethane injection facilities, as well as enabling any new projects joining the scheme to optimise their output.

3.5.2 However, the Green Gas Support Scheme should include support for plant expansions of existing assets as well as new build. Making existing plants eligible for the Green Gas Support Scheme would maximise value for money delivered through the scheme, whilst stimulating further biomethane generation.

3.5.3 In addition, the GGSS proposals set out earlier this year by BEIS to deliver an additional 2.8 TWh per annum of biomethane in the grid by 2030 under the scheme, do not go far enough. From a standing start in 2010, the UK has developed one of the most dynamic biomethane to grid industries in the world with over 100 plants now operational, injecting approximately 6 TWh per annum of green gas into the network. The Government's proposals for the coming decade, as set out in the GGSS and GGL consultations, is to support less than half of this level in terms of new green gas production over the coming decade. The potential for green gas production and injection in the grid is considered to be much greater, as estimated by a number of sources including the REA (52 TWh/annum by 2032) and the Climate Change Committee (20 TWh/annum by 2030).

3.5.4 The REA also consider that the Green Gas Support Scheme should be technology-neutral and include, currently excluded, biomethane from thermal gasification, in line with support provided under the Renewable Heat Incentive.

3.5.5 In the longer-term industry want to move to a situation where real market 'pull' signals play an increasing role rather than straight producer subsidies, to encourage a 'real' market to develop in supply and use of biomethane. The REA's preferred mechanism would be a green gas obligation on gas suppliers to meet a gradually increasing GHG reduction target over a period of time, which would reward technologies and renewable gases that deliver the largest carbon savings, whilst driving best practice and innovation.

4. Technologies required to deliver the decarbonisation of heating, and current barriers to deployment

4.0 As described in the introduction, a complete range of renewable heat technologies will be required to successfully decarbonise heat across all UK homes. The focus should be on ensuring the right technology is used for the right situation. This will require building on the existing heat sector established by the RHI, delivering immediate decarbonisation, while further heat technologies are developed. Maintaining the existing skills, supply chains and jobs will be crucial for delivering all the technologies required for the UK to meet its decarbonisation targets. Policies are therefore required to both continue deployment of affordable no regret renewable heat options, as well as strategies that see the delivery of further innovative and strategic technologies

- *4.1 Heat Pumps*

4.1.1 As identified by the Climate Change Committee, heat pumps are of high strategic importance to the decarbonisation of homes. They are a versatile technology and will have a crucial role to play in both on gas grid and off-gas heat decarbonisation. Air source heat pumps are particularly effective in buildings with high energy efficiency measures, typically in urban areas and new builds, while ground source heat pumps are also able to provide higher heat loads. Heat pumps are a convenient solution for many consumers providing a strong option for replacing gas or oil boilers.

4.1.2 Barriers:
Heat pumps, like all renewable heat technologies, should not be expected to be the solution for all properties. The widespread use of heat pumps is dependent on a fully decarbonised and updated power grid. It also relies on energy efficiency measures to be widely rolled out. The electrification of heat, combined with the electrification of transport, will need to be done in coordination with upgrades to the electricity grid to ensure increased power demand from individual households is met.

While the power to heat conversion is an efficient process, most domestic properties typically only have a single-phase electricity supply, the upgrading of this infrastructure to three-phase supply, could well be required if transport and heat are to be effectively electrified.

4.1.3 Currently heat pump deployment is supported by the Green Homes Grant and Clean Heat Grant. However, these mechanisms are focused on small scale systems. The deployment of Ground Source Heat pumps is expected to be restricted, while there also remains a policy gap around deployment for business or industrial-scale systems.

- *4.2 Biomass Heat*

4.2.1 Biomass boilers provide the largest contribution under the RHI to heat decarbonisation in the UK today. They are effective in replacing oil boilers in existing buildings and are a crucial technology for powering heat networks. In Sweden over 40% of heat is met via biomass [9]. Biomass is a versatile alternative where electrification may not be possible, they are particularly suited to contexts where a high heat load is required and/or where levels of energy efficiency are low, typically in off-gas grid rural areas and certain on-grid urban areas (e.g. district heating). There is also potential in urban areas with larger residential or commercial sites, such as schools and hospitals or in new developments combined with heat networks.

4.2.2 Barriers

Despite having been crucial in achieving the levels of heat decarbonisation to date, the sector is currently facing an uncertain future as government policy aims to restrict it to a poorly defined 'niche role'. The Clean Heat Grant currently only aims to deliver 700 biomass boilers over 2022 – 2024, which will not support a sustainable industry. This, in turn, is expected to see existing users impacted as the feedstock and maintenance supply chains also contract This could see existing users revert to fossil fuel heating systems.

4.2.3 Much of BEIS's analysis for off-gas grid homes decarbonisation is based on the findings of the Delta-EE report *"Electric Heating in Rural Off-Gas Grid Dwellings: technical Feasibility"* [10]. This highlights the strong potential for heat pumps to be used for decarbonisation. We support the findings of this report but urge the committee to take note of the full implications of their modelling. We particularly highlight this paragraph within the Executive Summary:

> "*The results from the network modelling show that based on average peak winter day temperatures, around 84% of homes can be electrified at their current level of insulation. This increases to around 93% of all suitable homes have loft & wall insulation installed. However, based on a 1-in-20 winter peak scenario, the proportion of homes that the current low voltage network can support drops to around 64% if ground-source heat pumps are the preferred technology for households, or to 41% if air-source heat pumps are the preferred technology (assuming that air source heat pumps require a direct electric heating back-up in a 1-in-20 winter scenario). For both merit order scenarios, adding loft and wall insulation results in only a marginal improvement in electrification rates." [Emphasis added]*

4.2.4 Delta EE make clear that when considering harsher winters, which are widely predicted to become more common, policymakers need to be considering the role of higher heat load technologies. There is no doubt that heat pumps are of high strategic importance and have a primary role to play in the decarbonisation of such properties, however, policymakers cannot afford to

underestimate how big the 'niche-role' actually left for biomass. Delta-EE identifies over 1.3mn off-gas grid properties in the UK, as such the above suggests there could still be over 468,000 off-gas grid locations [11] where heat pumps may not be appropriate and where biomass, or other bioenergy options, are likely to be the best-suited heating option. This leaves a potential biomass market 17 times the size of what has already been deployed by the RHI and requires a strong and established sector to be in place [12].

4.2.5 The Delta-EE report also does not consider costs. BEIS data demonstrates that using wood fuels in hard to treat areas provides one of the lowest cost heat decarbonisation options, with an average of £463/kW across the three biomass ND RHI tariffs [4]. Furthermore, analysis by the consultancy In Perpetuum, concerning off gas grid decarbonisation, demonstrates that bioenergy applications provides the cheapest annualised carbon saving cost, with Biomass costing about £271/tonne of carbon saved [20]. Biomass heat has provided some of the best value for money projects under the RHI.

4.2.6 In addition, we are seeing increasing evidence of Government intention to restrict the deployment of biomass to rural areas. As has been demonstrated to BEIS during the last urban biomass consultation [13], emissions from biomass boilers are not an issue where Best Available Techniques (BAT) is used and where flue gas filters are fitted. These are mature technologies which are readily available. Tight emission and maintenance standards for urban biomass projects should be used rather than ban them from deploying in on-gas grid locations. Such a restriction adopts an approach seen nowhere else in the world and sets a dangerous and difficult-to-reverse precedent which will further obstruct the deployment of renewable heat, particularly in larger buildings. (For further information on why Biomass Boilers, properly installed, do not cause a threat to urban air quality see [14])

- 4.3 Anaerobic Digestion

4.3.1 Given that the majority of homes in the UK continue to use gas for heating, biomethane injection offers a low-regrets, cost-effective way of helping to decarbonise the gas grid. BEIS has previously identified that biogas (including biomethane) has an important role to play both now and in the longer term, reducing greenhouse gas emissions and supporting jobs in rural areas [15].

4.3.2 Biomethane from AD is an established and commercially ready technology. This means it is one of the few technologies that can help in the short and medium term to make progress towards decarbonising the gas grid, whilst other technologies become technically and commercially ready to be deployed.

4.3.3 In addition, biomethane is an enabler for other technologies for decarbonising the grid such as the production of biohydrogen production from Steam Methane Reforming (SMR) of biomethane. Encouraging increased biomethane production would stimulate the development of new technologies, such as Methanation (power to methane), where waste CO_2 is reacted with hydrogen to create methane, effectively reducing emissions whilst also producing renewable fuel.

- 4.4 Solar thermal

4.4.1 Solar Thermal provides baseload water heating which may be most suited to domestic or commercial settings with high energy efficiency levels, or low heating requirements.

- 4.5 BioLPG

4.5.1 As identified, a mixed technology approach is required to decarbonise off-gas grid properties, notably the 'hard to treat' sector where electrification may not be cost effective or technically feasible. When the cost of transition is taken into account, an independent economic analysis commissioned by an REA member found that bioLPG, both in standalone boilers and in a hybrid system, would be one of the most cost effective routes to decarbonising 44% of rural homes currently heated by oil. As identified with biomass, it appears BEIS may be underestimating the scale of the hard to treat sector where "modelled analysis suggests that around 20% of off gas grid fossil fuel homes are not currently suitable for low temperature heat pumps and are better suited to high temperature heating" [p27, 3]

4.5.2 Biopropane (sold as bioLPG) is already available in the GB market. Biopropane is chemically identical to conventional propane (LPG) so can be blended in any ratio with conventional LPG, allowing a smooth transition to 100% renewable product. An existing LPG boiler is also a biopropane boiler: no infrastructure change is required for existing LPG consumers or the LPG industry when using biopropane in any blend with conventional LPG. This makes it a particularly affordable option in terms of upfront costs for the consumer, and low disruption because there is no need to upgrade radiator, or even change boilers in homes currently heat by conventional LPG. The UK's liquid gas industry has committed to a 2040 100% renewable target.

4.5.3 Whilst an initial step may be to use high-efficiency LPG/bioLPG boilers in homes instead of higher carbon alternatives such as heating oil – and this may be an enduring policy particularly in hard to treat homes - these boilers can be readily integrated with heat pumps to create smart hybrid systems, potentially offering demand-side response services. Indeed, modelling done for the CCC suggests hybrid heat pumps, combined with boilers burning biofuels, could play a significant role [21].

4.5.4 Biofuels however are not yet supported by the RHI, or the Clean Heat and Green Homes Grants. A separate line items for bioLPG (100% bioLPG and 60/40 conventional/bioLPG blend) must be included in the Standard Assessment Procedure (see further details below) to both encourage increased supply to market and consumer uptake. A zero rating of VAT for bioLPG and biomass, would largely offset the slight cost premium for bioenergy feedstocks, minimising impacts on consumer bills.

- 4.6 Deep Geothermal

4.6.1 Deep Geothermal provides baseload dispatchable green heat perfectly suited to powering renewable heat networks, as is the case elsewhere in Europe where it is seen as a key technology for decarbonising large conurbation of domestic buildings. For example, the Paris basin region has over 40 geothermal plants feeding district heating networks across the city [19]. While the Non-Domestic Renewable Heat Incentive (ND RHI) has brought geothermal projects close to successful deployment in the UK, Covid-19 related delays and the nature of these infrastructure schemes means there is now a group of projects that are unlikely to meet the RHI March 2021 application deadlines. Support is needed to see these projects commission and establish the sector in the UK.

4.6.2 Geothermal Engineering and Eden Geothermal have raised circa £30 million of public funds with £15 million private-sector match funding for two projects set to commission in 2021 and 2023, respectively. Similarly, GT Energy which has recently been acquired by IGas Energy Plc has secured

£20mn in private capital and is working with Stoke on Trent Council to deliver £50mn investment in a geothermal district heating network across the City of Stoke on Trent. Uncertainty over the RHI and a lack of any mention of support for geothermal in the Future Heat Consultation has greatly unsettled financiers, despite huge obstacles having been overcome in the last few years to bring these projects to fruition. Given the potential for Geothermal, especially for powering green heat networks, a proportion of funding within the Green Heat Network Grant should be ring-fenced to support the delivery of up to 10 geothermal heat projects in the UK, thereby establishing the market. Following on from recent announcements on job losses in the oil and gas sector this would also be an opportunity for BEIS to support an industry which can offer opportunities and employment to people with the same skillset.

4.6.3 This is of strategic importance to the UK, once the first few successful geothermal projects are commissioned it will help release further private investment, helping drive heat decarbonisation and heat network deployment. Failure to support the existing projects will likely see this nascent sector contract and be a lost opportunity for the UK to decarbonise heat.

- 4.7 Thermal Heat Storage Batteries

4.7.1 The Committee should also consider the role of thermal battery energy storage which can be used to efficiently store heat within residential properties. They can be charged by electricity, air-source heat pumps, ground-source heat pumps, biomass boilers and photovoltaics. At the domestic scale, up to ~12kWh, they can be used to make heating domestic properties more efficient, replacing hot water storage tanks, and providing new opportunities to save energy and costs. With the transition to a greater decentralised energy system and a need to spread out heat demand, especially on the electricity grid, thermal storage is likely to play a crucial role in enabling household heat decarbonisation.

- 4.8 Biomethane from thermal gasification and pyrolysis

4.8.1 Gasification and pyrolysis extend the range of feedstocks that can be converted into biomethane because they can process lignocellulosic material that is not suitable for anaerobic digestion. Work by Cadent suggests that gasification has the potential to produce three times the amount of renewable gas that can be produced by anaerobic digestion.

4.8.2 In Europe, there have been two major projects that produce biomethane using gasification:

- The GoBiGas [22] project ran from 2005 to 2018 in Sweden and produced 20MW of grid quality biomethane from wood residues for more than 12,000 hours, achieved efficiencies of more than 70% and greenhouse gas savings of 80% compared to fossil gas. The data generated by the project showed that a large-scale plant could produce gas with a cost of £50/MWh.
- The Gaya project in France is being developed by Engie and produces grid quality gas from waste wood. It produced gas in 2019 [23] and is ramping up to full time operation.

4.8.3 In the UK, National Grid has worked with Advanced Plasma Power and Progressive Energy to demonstrate the production of biomethane from the gasification of household waste. This led to the construction of a plant in 2016 that demonstrated the commercial, technical and environmental feasibility of the process.[24]

4.8.4 Advanced Biofuel Solutions Ltd is currently commissioning a plant, based in Swindon, that will produce 3MW of biomethane from household waste using gasification. This plant is due to commence operations in 2021 and will operate on a full-time basis in a commercial environment.

4.8.5 In total, more than £200m has been invested in the production of biomethane using gasification. The technical viability of the process has been established and commercial projects are under development. For example, Progress Energy is working with Peel Environmental on a commercial scale facility in Cheshire [25].

4.8.6 Barriers

A significant barrier to the success of these projects is the availability of Government incentives to allow the technology to compete with fossil fuels. Generally, gasification projects operate at a larger scale than anaerobic digestion which means that the tiering within the RHI has a major impact. Recent changes to the Renewable Transport Fuel Obligation (RTFO) have improved the support available to biomethane. It is likely that a combination of the RTFO and GGSS will allow gasification biomethane projects to progress to financial close, however the proposed restriction of the GGSS to anaerobic digestion will halt the development of projects using other technologies for several years until a new green gas support scheme is developed.

- 4.9 Grid delivery of biomethane

4.9.1 Currently most biomethane is sourced from the gas grid (referred to as "grid delivery of biomethane") and used to fuel gas boilers, gas-fired combined heat and power systems – whether in homes, commercial buildings or within communal heat networks or district heat networks.

4.9.2 The REA and the Green Gas Certification Scheme (GGCS) believe that, provided the chain of custody between producer and consumer is tracked through a robust methodology like Guarantees of Origin[26] for Renewable Gas, grid delivery of biomethane should be recognised by policy makers as a route for decarbonising gas consumption in both the voluntary and regulated sectors, especially where other options are not viable.

4.9.3 As an example, carbon savings from biomethane used in district heating schemes are not recognised by Building Regulations (i.e. there are no biomethane 'factors' in SAP/SBEM or clarity on the use of Guarantees of Origin or Mass balancing to evidence grid delivery of biomethane). This issue should be addressed.

4.9.4 As the Government further develops its Future Homes Standard policy to move from near- zero to zero carbon homes, and extend Net Zero planning requirements to all new development, linking new district heating schemes to grid delivered biomethane could provide an additional route to decarbonise for sites where other low carbon heat technologies are unviable. The principle of grid delivery of biomethane should also be recognised in the planning regulations. This would encourage developers to enter into long-term Renewable Gas Purchase Agreements with biomethane producers, supporting new unsubsidised plant development, to secure the carbon savings required to comply with the regulations for their own developments.

- 4.10 Hydrogen

4.10.1 Several projects are looking at the role that hydrogen can play in decarbonising the UK gas grid. The REA believe hydrogen will have a strong part to play in energy decarbonisation in the future, but that it remains to be seen whether this is primarily in connection to power, heat or transport. It is worth noting that the CCC sees a limited role for hydrogen in supplying buildings heat. They

recommend that hydrogen is best used selectively, where it adds more value alongside widespread electrification. A recent report published by Frontier Economics [16] and procured by BEIS also highlights that hydrogen may have the greatest decarbonisation value in industrial heat applications, at least in the near term, as industrial users are likely to have fewer alternative practical and cost-effective options than other end-user groups.

4.10.2 The REA believe hydrogen should only be supported if the production pathway is sustainable. Primarily this means green hydrogen, produced from electrolysis powered by renewables sources. We also recognise Blue Hydrogen may have a role but only where carbon capture and storage is used and all carbon tracked, monitored and captured or used – as a transitionary measure in the move toward a net-zero carbon economy.

5 Key heat policies for domestic decarbonisation to deliver net-zero

5.0 The Heat and Buildings Strategy must step up the Government's ambition for heat decarbonisation. This means both increasing the deployment of ready to deploy technologies today across both domestic and non-domestic sectors while looking to the delivery of further innovative technologies in the future. There is significant concern that as we approach the end of the Renewable Heat Incentive there will be a contraction of important renewable heat sectors, just at a time when the UK needs to be significantly stepping up its heat decarbonisation ambitions. A lack of future growth opportunity provided by the Clean Heat Grant, which as described above is narrowly focused on small scale installations, will likely damage the viability of these sectors in the future. Possible policy interventions include:

- 5.1 Amending the Clean Heat Grant (CHG)

5.1.1 In response to the CHG proposals, the REA called for the proposals to be adapted to a variable grant based on the capacity required to sufficiently heat the building. This is best achieved by providing a flexible grant that pays out based on £/kW deployed, with a proportion of each kW covered by the grant. REA analysis suggests a figure of about £280/ kW. As such the remaining expenditure for the consumer remains below 'phycological threshold' identified by BEIS.

- 5.2 Amending the Green Homes Grant

5.2.1 The Green Homes Grant should be extended beyond March 2021, up to at least when the Clean Heat Grant starts, to avoid a cliff edge in deployment. The scheme should also be expanded to include further technologies that will help decarbonise homes include biofuels, thermal battery storage, power storage and solar PV.

- 5.3 Low-interest Loans to further drive the deployment

5.3.1 To further enable larger projects to deploy, a low-interest loan should also be offered in conjunction with the scheme to help cover the remaining cost of the project. This will also help mitigate low quality or undersized projects by enabling consumers to consider more expensive installations. Such a loan is likely easiest supplied by Government and can be modelled on the successful Home Energy Scotland Loan Scheme, which provides 0% interest loans up to £17,500 for renewable energy systems. At this level, the remaining capital expenditure following receipt of the grant is easily met and will make the Clean Heat Grant Scheme far more attractive to consumers. This would be a case of extending the scheme to the rest of the UK.

- 5.4 Building Regulations and Future Homes Standard

5.4.1 In October 2019 Government consulted on the development of a Future Homes Standard for inclusion in Part L (conservation of fuel and power) and Part F (ventilation) of the building regulations for new dwellings [17]. The government response to this consultation is still outstanding. The REA called for the Future Home Standard to mandate the use of high energy efficiency materials and ensure all homes utilise suitable low carbon heating systems. As explained above, the standard will need to be flexible enough to ensure the right technology is used in each situation. Renewable heat should be mandated in all new builds as soon as possible.

See also the point above about the need to recognise grid delivery of biomethane.

- 5.6 Tax Breaks

5.6.1 Tax breaks could also be considered to incentivise households to install renewable heating systems. For example, rebates on income tax, spread over 3-5 years, would further support investments. Such schemes are used to good effect in other European countries. In Italy, people with renewable heat measures installed can take advantage of a 65% reduction in income tax due to an 'eco bonus', with a maximum deductible limit of €60,000 a year.

5.6.2 The rebate could be time-limited to when high-carbon fossil fuel systems have been phased out. If combined with a carbon tax the scheme could be revenue neutral. Households making energy efficiency improvements would supply evidence (potentially in the form of an updated Energy Performance Certificate or a Green Buildings Passport) to demonstrate the change, and to apply for a reduction in their tax bill going forward.

- 5.7 Variable stamp duties and encouraging more green mortgage products

5.7.1 It is recognised that a significant proportion of home renovations take place at the point of sale, so while not addressing all properties, it is appropriate that polices are in place to encourage the decarbonisation of heat during the process of selling a house. Discounts to house buyers could be provided if a property is above a given energy efficiency standard or has renewable heating installed. The scheme would incentivise the retrofitting of heating systems and strengthen the link between energy efficiency and house prices, at the point of sale - a time when a significant level of home renovations takes place.

5.7.2 The incentive can be designed so that properties in the 0 per cent Stamp Duty Land Tax band were not penalised for poor performance, but given a benefit if they chose to move into better-performing properties or if they chose to undertake improvements after moving into a new home.

5.7.3 At the same time Government should continue to work with banks to see more green mortgage products become available in the market. These products recognise a link between those using renewable energy systems in higher energy efficient homes and lower levels of debt defaults, as such being able to offer more attractive interest rates. Such products, based purely on private finance, again will drive demand for properties going onto the market to retrofit renewable heating systems allowing potential owners to benefit from better interest rates.

- 5.8 A clear trajectory for escalating fuel duty or a carbon tax on fossil fuels for heat

5.8.1 A major barrier to the installation of renewable heating systems continues to be the low cost of using fossil fuels for heating, in particular gas prices. BEIS statistics on quarterly energy prices (see chart below [17]) demonstrate that the UK has one of the cheapest domestic gas prices in Europe, compared to one of the highest electricity prices. As a result, it is very difficult to provide an ongoing

economic case for consumers to switch to a renewable heat system if their operational heating costs can be expected to significantly increase, switching from gas to electricity, or oil to biofuels.

Figure 1 Industrial and Domestic Gas Prices (the UK and EU15) July-December 2019 [17]

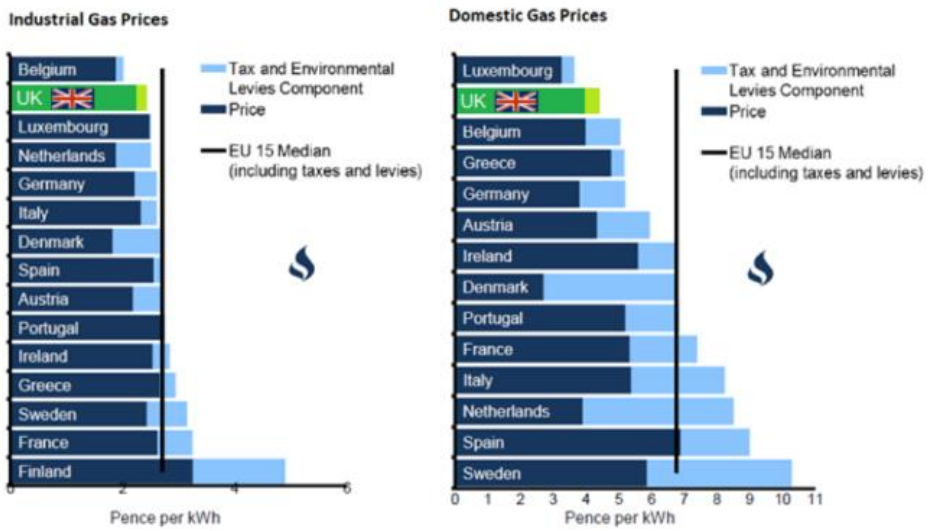
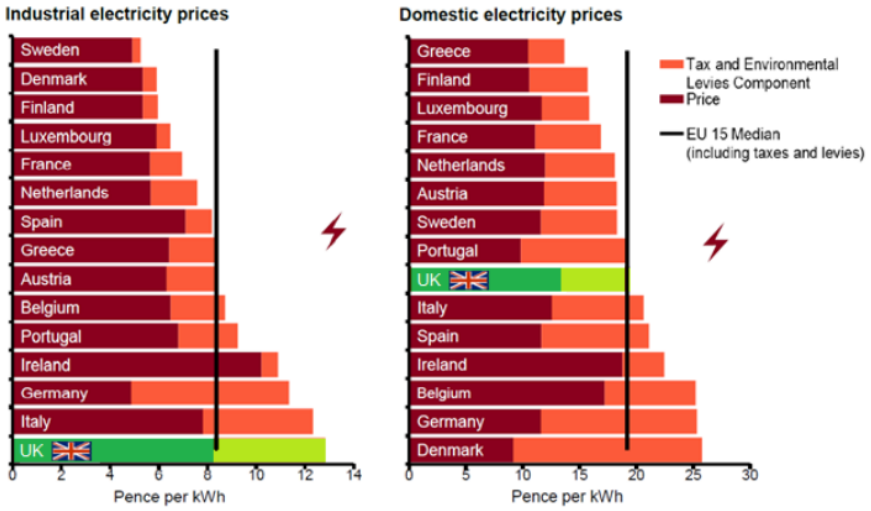


Figure 1 Industrial and Domestic Electricity Prices (UK and EU15), July-December 2019 [17]



5.8.2 A trajectory for gradually increasing the cost of using fossil fuel heating systems needs to be introduced. This could be through a carbon tax or an increase in the fuel duty levy. This would send an appropriate and strong price signal to the market for the use of renewable alternatives including biomass, heat pumps and biofuels. Having a clear trajectory in place, would in itself make users consider the future costs of using fossil-based heating options when replacing heating systems and drive demand for renewable options in the early 2020s, even if the additional cost was minimal to start with.

5.8.3 It is recognised that such a policy could negatively affect the fuel poor if introduced without appropriate protections. Such households could be provided a rebate on such a tax and tax revenue

raised should be directly spent on enabling fuel poor households to make the switch to renewable systems and increase energy efficiencies of off-gas grid properties.

5.8.4 Germany next year is set to introduce a new carbon tax across power, heat and transport fossil fuels. The carbon tax on heat will start at €25/mt in 2021, rising each year to €55/mt by 2025. The tax is expected to lift heating fuel oil prices for consumers by €0.08/litre and natural gas by €5/MWh for end-consumers. The UK should assess the impact of this policy decision and consider similar implementation in the UK [18].

- 5.9 Updating Energy Performance Certificates and the Standard Assessment Procedure

5.9.1 Energy Performance Certificate's (EPCs) are a tool which offers an A-G rating based on energy efficiency technologies and immoveable features in a building, such as insulation and boilers. They are used by a range of stakeholders, including consumers (to understand their expected energy bills and gain recommendations into how to upgrade their home), tenants (when choosing properties to rent), landlords/investors (when undertaking due diligence on acquisitions), policymakers (for a holistic view of the quality of the UK's building stock), policy measures such as the minimum energy efficiency standards (MEES – which ban the letting of extremely energy inefficient properties), financial institutions (who are developing innovations in finance such as "green mortgages" rewarding those who choose to purchase more energy-efficient buildings) and more.

5.9.2 However a major barrier to heat decarbonisation comes from the fact that Standard Assessment Procedure (SAP), which is used to calculate the EPC, does not use up to date figures on cost, efficiency, and carbon intensity. Out of date efficiency calculations for renewable heat technologies within the SAP regularly produces results that favour fossil fuel heating systems and fail to reward flexibility.

5.9.3 SAP 2012 continue to be used for official assessments such as EPC's using out of date assumption about renewables. Methodologies should be updated as soon as possible so that renewable energy is the primary focus within the SAP calculation while taking into consideration the loss of that generated heat. This should create a more robust method which can keep up with technological advances and fairly reflect the benefits of renewable energy and low carbon technologies and should be updated more frequently. Once complete, this should also be implemented with the introduction of this review of building regulations.

6. Where should responsibility lie for delivery of heat decarbonisation?

6.1 The REA believe heat decarbonisation should continue to lie with BEIS, although stronger cross Whitehall coordination is required to ensure polices do not contradict on another. A dedicated heat decarbonisation team should also be established in Treasury, to ensure the issue is prioritised within public spending consideration.

6.2 Also, we would like to see the Regulator Ofgem, along with the gas and power grid Code Administrators have clear decarbonisation objectives built into their operational terms of reference. Currently, regulatory decisions do not always take into consideration decarbonisation. This needs to be rectified to ensure both policy and regulatory decisions do not undermine each other.

November 2020

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Although not officially recognised by the UK Government yet, the Green Gas Certification Scheme (GGCS) owned and operated by REAL is well established and runs and robust and trusted scheme for awarding and tracking Renewable Gas Guarantees of Origins throughout the supply chain.