REA Response to BEIS Review of Evidence on options for long-term heat decarbonisation ('Clean Growth – Transforming heat')

1. Introduction & Context

In its December 2018 publication entitled 'Clean Growth – Transforming heating', the Government stated it will develop a new roadmap for policy on heat decarbonisation, taking into account the views received in response to the report, and the outcomes of the next Spending Review.

This publication mainly focuses on the options available for the long-term decarbonisation of heat on the gas grid. However, a different stream of work within BEIS is looking at developing targeted, nearer-term policy to phase out installation of high carbon fossil fuel heating systems in off-gas grid properties throughout the 2020s, as set out in the *Future Framework for Heat in Buildings* Call for evidence also published at the end of 2018.

In this response we highlight that these two work streams need to be considered in parallel. Last year the UN's IPCC reported that we have just 12 years to limit climate change catastrophe. Failing to cut emissions now by utilising established technologies and markets, in favour of relying on future technologies is no longer an option. The UK needs to make both deep cuts in emissions today, while further innovative technologies mature so that they too can be added to the mix.

While the Review of Evidence is useful for setting out a future vision, it does little to consider the current status of the renewable heat industry, which must be the definitive starting point if we are to make a successful transition to the medium- and long-term, as highlighted within the review. Established markets like Biogas, Biomass heat and Biofuels for heating are ready to be deployed at scale today, delivering carbon savings now, meanwhile further innovative technologies like gasification, BECCS, hydrogen and power-to-gas establish themselves, making deep inroads into greenhouse gas emissions as the market transitions.

We therefore urge BEIS to consider how their Strategic Inferences, which we broadly agree with, are to be delivered from a starting point that secures today's renewable heat market. Below we provide a selection of ideas as to how this might be done within the boundaries set by the Review, namely the need to move away from direct fiscal subsidies and to look at how the identified transition might be delivered.

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In keeping with the spirit of the Review of Evidence itself, the ideas presented below are meant as a starting point, recognising that further discussion between industry and Government will be required to deliver a range of policies suited to the long-term decarbonisation of the heat sector.

The first section below specifically refers to the views of the REA and its members regarding the support needed from Government after March 2021 for the long-term decarbonisation of the gas grid. The second section is focused on the views of the REA and its members on the policies needed to decarbonise the off gas grid market.

Data behind the review should be made public.

Before going onto explore possible mechanisms for encouraging renewable heat decarbonisation, we would encourage BEIS to make the data and models which sit behind some of the charts used within the Review publicly available. This would provide further clarity around the assumptions being used and reasoning for future policy proposals.

For Example, Figure 2.1 entitled "*Estimated UK Emissions Attributed to Heating, 2016*" shows that heat is responsible for **37%** of **468 MtCO2e** - of which 17% is space heating. 14% is industrial processes and 4% is hot water for buildings. However, if you take BEIS's data for Energy Consumption in the UK for 2017 and apply Greenhouse Gas Conversion Factors for the same year, total heat emissions are about **140 MtCO2e**, which is lower than the figure forwarded by the review. We suspect that this may be due to an overestimation of industrial heat emissions, however, this is difficult to check without BEIS making the data behind the review publicly available. The broader point here is that such discrepancies could greatly effect assumption around feedstock availability and future policy proposals for decarbonising heat across the economy, and are therefore crucially important to clarify.

2. Long-term decarbonisation of the gas grid: biomethane and other green gases

The REA welcome the inferences from the review that Biomethane can achieve high GHG savings and that there is strong potential for further emission savings with technologies such as Bio-CCUS, especially when utilising waste feedstocks.

Biomethane from anaerobic digestion has been regarded by Government as a 'no or low-regrets' low carbon heating option. In the Government consultation on the RHI reforms in March 2016, BEIS stated that 'biogas (including biomethane) has an important role to play both now and in the longer term, in decarbonising heat and the gas grid, reducing greenhouse gas emissions and supporting jobs in rural areas.'

Between 2016 and 2018 the RHI scheme was reformed by Government to focus towards long term decarbonisation through greater uptake of technologies such as heat pumps and biomethane.

Along with other renewable heat technologies, 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.

In addition, biomethane is an enabler for other technologies for decarbonising the gas grid such as the production of renewable hydrogen production from Steam

Methane Reforming (SMR) of biomethane. Encouraging increased biomethane production would stimulate the development of new technologies, such as Methanation, where CO_2 is reacted with hydrogen to create methane, effectively reducing emissions whilst also producing renewable fuel.

However, biomethane will be unable to play this role in heating if there is no continuity of support after the existing RHI comes to an end in March 2021.

Technology developers, and investors in the biomethane to grid (BtG) sector as well as the gas networks, require clarity and visibility as a matter of urgency on the long-term framework for funding projects, so that they can plan ahead.

Development and innovation on other green gases (e.g. Bio-SNG, Hydrogen, and Bio-Propane) will also need Government support, if we are going to meet our climate change commitments and decarbonise heat by 2050.

Within the biomethane sector, the RHI has stimulated business investment in the range of £400 – £800m, (on average £10 million per project) supporting the development of competitive supply chains, with a number of AD and biomethane equipment providers currently active in the UK and companies involved in the design, construction, operation of AD plants as well as grid connections and gas trading. According to our annual jobs and investment review[1], the biogas sector currently employs around 3,000 people across the UK supply chain and this sector turnover is around £356m. The sector also generated over £300,000 of export revenue in 2017 via the sale of Green Gas Certificates to non-UK gas consumers, a figure that is expected to rise significantly in 2018.[2]

If the RHI simply comes to an end at the end of March 2021, and support is no longer provided to new projects, development and investment will be stifled. With no long term plan for funding projects, investors will lose confidence in this market. In addition, this will have adverse consequences for companies across the supply chain, especially those involved in manufacturing, construction and installation, grid connections and grid-entry units. With no prospect of new development and growth, these companies will either go out of business or will have to move away from this sector, with considerable loss in terms of British-based jobs and skills. Tax payers' money that has been spent so far to support the development of these supply chains and British-based skills will not have been leveraged.

One of the key areas where considerable loss of skills will occur is the design capability, which includes the knowledge of how to integrate the various systems. We understand from members that civil contractors and, even more so M&E contractors, are particularly difficult to find.

Biomethane is a flexible energy source, able to make low carbon contributions to renewable heat, transport and power generation. Future development of the sector is dependent upon the biomethane sector supply chain being maintained up to and beyond the 2021 end date for the current RHI. There is a danger that the supply chain will start to be disbanded (or specialists are re-directed to other sectors) as we approach the deadline if clear signals on future support are not communicated early enough.

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[1] REVIEW publication, 2017

[2] The Green Gas Certification Scheme (www.greengas.org.uk) tracked 200,000 MWh of Green Gas Certificates sold to non-UK gas consumers, with biomethane plants receiving an estimated £1.50/MWh

If the Review's long term Heat strategy is to succeed it must build on already established markets and ensure its continuation in the immediate- and long-term.

Anaerobic Digestion (AD) can also help Government to deliver its wider goals. As well as helping decarbonise heat, this sector is key to deliver many of the public goods and help Government achieve many of the goals set out in its Clean Growth Strategy, Industrial Strategy and 25 Year Environment Plan.

Notably, Anaerobic Digestion can contribute to the delivery of the Government's Resources and Waste Strategy. The likely introduction of mandatory food waste collections across the whole of England (subject to the outcome of the current consultation) will require a means of processing and handling the increased amounts of organic materials. If no support mechanism is introduced after the existing RHI comes to an end, there is unlikely to be sufficient production capacity to deal with the additional quantities of feedstocks that will become available.

Biomethane and AD are recognised as playing a significant role in the establishment of a Circular Economy. The Ellen MacArthur Foundation, a major exponent of the Circular Economy, advocates the use of AD in its recent report 'Cities and Circular Economy for Food'. Removing any support for the technology at this time would be contrary to what the Government wishes to achieve in Waste Management and the creation of a Circular Economy.

AD allows significant GHG emission abatement from agriculture and industry and, as recommended by the CCC, this technology needs to be used more widely on farms [and in our view factories too] if the UK is to meet its fifth carbon budget. There is also extensive scientific evidence available showing the benefits to soil health and crops of repeated organic materials applications such as digestates to agricultural land. These include reduced soil erosion and compaction, increased soil biodiversity, improved soil physical and biological processes, nutrient availability and organic matter. AD can therefore help farmers deliver more and better quality food with fewer manufactured fertiliser inputs.

We set out below our views on which policy options would be required to support a continued and steady growth in the volumes of biomethane injected into the gas grid after March 2021, whilst maintaining the supply chain and skills that have been built so far within this sector underpinned by the RHI.

2.1 The simplest option: another RHI post March 2021

In our view the simplest option would be to continue with the RHI, with a few minor modifications (i.e. the addition of biofuels for heating).

The RHI provides a bankable income stream. Stable and predictable prices are required to provide project bankability. The RHI currently gives the only, long-term bankable income stream for biomethane production and biomass heat projects. The ability to continue to access the RHI, or an alternative form of support after March 2021 is a prerequisite to the deployment of more biomethane projects.

Continuing the RHI in its current form would provide the long-term continuity of policy, as well as maintain the supply chains, British-based skills and knowledge that have been developed under the RHI, and, crucially, maintain investors' confidence in this market.

In addition, extending an existing policy is a great deal more time-efficient for both the Department and industry, than creating a new framework.

In our experience it is reasonable to assume that developing a new policy would typically take three years from inception to implementation[3]. So, to design a replacement policy for 2021 we would need to know what the preferred approach is and have this published around now. Since this has not happened yet, developing and implementing a new policy will inevitably create a hiatus. Even a fairly time limited extension to the RHI after 2021 could play a crucial role in providing stability to the renewable heat sector while new support mechanisms could come into replace it.

Additional reasons to continue with the existing framework is that the changes that came into effect under the Non-domestic Renewable Heat Incentive regulations 2018 on 22nd May, as well as the amendments in effect from 20th June and 1st October, have closed down the 'loophole' issues that the department was concerned about and should have addressed concerns about value for money. For example, the new feedstock restrictions for biogas plants that come into effect on 22nd May are encouraging greater use of wastes and residues and ensure AD is only supported if it provides value for money and cost effective GHG emission abatement.

In the immediate term, we also take this opportunity to re-iterate joint trade associations' urgent request that BEIS swiftly introduces a grace period or an extension to the completion deadline for projects with a Tariff Guarantee. This would enable biomethane plants in development to be completed in conditions whereby injection commencement is unavoidably delayed due to reasons completely outside of their control.

Following the passing into law of the reforms to the Renewable Heat Incentive (RHI) and their coming into force on 22 May 2018, there are now 27 biomethane plants to date that have successfully applied for a Tariff Guarantee as a route to commissioning under the RHI with more still progressing through the application process. These plants constitute investment into the anaerobic digestion industry of £300-450m. This will add to the RHI success story of biomethane providing green gas to decarbonise the heat supply of over 100,000 households.

The date of 31st January 2020, or the earlier date set out in these projects' Tariff Guarantee Notices, now present an extremely tight deadline in respect of typical build times, but the situation is made worse by the two winters that fall during this time. Gas transporters have legislative requirements to provide secure supplies, and may therefore need to limit connection activity during periods where high demand is anticipated. There is insufficient resilience in the system to accommodate works on high pressure mains during the period from October to May, so it is even more challenging for plants which are due to connect to the higher pressure tiers of the distribution network, in addition to the requirements for longer HSE notifications.

In the absence of the swift introduction of a grace period or an extension to the relevant deadline, many biomethane plant developers and funders may abandon their investments and write-off money spent to date. This is likely to halt worthwhile low carbon investment, disrupting the industry and its supply chains.

[3] Primary legislation for RHI was in the Energy Act 2008 (Autumn) and the RHI came in 3 years later. Feed in Tariffs were quicker, but there was a lot of political drive behind that to get them in before the May 2010 election. Similarly, the money for expanding biomethane in the scheme was allocated in Nov/Dec 2015 and only became available May 2018.

2.2 A green gas obligation

Another option would be an obligation placed on licenced gas suppliers[4] to source an increasing proportion of the gas they supply from renewable [or low carbon] sources. The obligation would work in a similar manner to the Renewables Obligation, but for gas injected into the UK gas network.

The trajectory for this obligation over time should be consistent with meeting the UK's current and likely greenhouse gas emissions reduction target.

This is in line with one of the key recommendations highlighted in the recent report entitled *Pressure in the Pipeline* published by Bright Blue.

Eligible gases – Biomethane, BioSNG, Renewable hydrogen, and other renewable gases of non-biological origin (e.g. methane and propane): These gases have very different production costs and the Obligation would need to be banded to accommodate this. It is envisaged that biomethane would be eligible for 1 certificate/MWh of gas, whilst others have multiples (similar to different numbers of ROCs/MWh in the RO). The GHG and sustainability requirements would replicate those used in other schemes. An officially-recognised body for administering the scheme would be required. This could be Ofgem or it could be done by the Green Gas Certification Scheme (in which case its role would need to be expanded to encompass additional functions).

Target levels

The Obligation could start out as X certificates required / volume of gas supplied, and thereafter be set at a certain margin (e.g. 10%) higher than the projected renewable gas certificate generation, so the market would always be short and the certificates will always have a value[5]. Alternatively annually increasing targets could be set in advance.

The total cost of the policy would be capped by the buy-out price, which is the maximum possible cost to consumers.

Gas suppliers would meet their obligation by a combination of:

- Presenting Renewable Gas Guarantee of Origin (RGGO) certificates bought from green gas producers to the scheme administrator
- Where suppliers do not have sufficient RGGO to cover their obligation, they would pay into the buy-out fund.

The proceeds of the buy-out fund could be paid back to the gas suppliers in proportion to how many RGGOs certificates they have presented. For example, if they were to submit 5% of the total number of RGGOs submitted they would receive 5% of the total funds that defaulting supply companies paid into the buy-out fund.

[4] Any person who holds a Gas Supply Licence, which is a licence granted or treated as granted under section 7A(1) of the Gas Act 1986. This is restricted gas which has been conveyed through pipes to the relevant premises. Very small gas suppliers could be exempted.

[5] If the obligation exceeds the available quantity of low carbon gas, the market would be short and the certificate value would be close to the buy-out price

Green gas production facilities would be registered/accredited and issued with RGGO certificates for the green gas they supply, which they then sell on (ultimately to the suppliers).

Gas suppliers would recover the cost of the obligation from consumers.

For green gas producers, this would in effect be a premium on the top of the revenue from the sale of the green gas.

It is envisaged that (at least initially) gas will be injected into the UK network, but clearly there is scope for international trade in green gas certificates and if there are similar obligations in operation in the EU, then mass balancing across the European gas network could be explored.

We suggest the mechanism works in line with the Renewable Obligation (RO) as opposed to the Renewable Transport Fuel Obligation (RTFO). The key reasons for this are that under the RO:

- The market is structurally short so the certificates will always have a value. Under the RTFO it is very difficult to make the market short since there is in practice no limit to how much biofuel could be imported and put into the fuel system.
- The RO issues certificates directly to the producers, whist the RTFO awards certificates at the duty point. For liquid fuels this is generally not the producer but the person who blends it into the finished fuel and very often this is the same entity that has the obligation. This results into a small number of relatively large companies that control both sides of the market, which are mostly companies whose main business is in fossil fuels.

An additional point is that it is imperative additional costs imposed on suppliers are not simply passed onto consumers. Some mechanism, in addition to the capped buy-out price, will likely need to be implemented to control costs borne by consumers and to protect vulnerable groups such as the fuel poor.

RGGOs

There are two green gas certification schemes already in place in the UK[6] however they currently replicate the REGO system in power, not the RO. ROC and RTFC are a supplier facing systems, whilst RGGOs and REGOs are consumer facing. A parallel system could be established where the Scheme issued plants with one certificate which could only be used by suppliers in the same way as a ROC, and another that could only be used by consumers.

How this could be brought in

There is already a requirement on all electricity suppliers in Great Britain to disclose to their customers the mix of fuels used to generate the electricity supplied annually[7].

Suppliers are required to publish fuel mix information at least annually to each customer that receives a bill or a statement, provided that the licensee has supplied electricity for a full disclosure period. Renewable Energy Guarantees of Origin (REGOs) is the primary evidence for identification of supply as renewable source.

[6] The Green Gas Certification Scheme (GGCS) run by REAL, and the Biomethane Certification Scheme (BMCS) run by Green Gas Trading Limited.

[7] As introduced in the Electricity (Fuel Mix Disclosure) Regulations 2005 (SI 2005 No. 391)

Equivalent requirements are not in place for Renewable Gas Guarantees of Origin (RGGOs), although gas suppliers can use those in their Fuel Mix Disclosure.

A green gas obligation could be introduced as an extension to the above.

In terms of legislation, there is provision in the primarily legislation (Energy Act 2008) for a levy on fossil fuel suppliers. This could be used, or specific new legislation could be introduced by government. This would clearly take much longer than the option of continuing the existing or an amended version of the existing RHI.

Consideration should be given on how such an obligation should encourage domestic production and supply of green gas rather than imported green gas, which would increase energy security and reduce the dependence on imported fossil gas. In addition, considerations should be given to the upcoming requirements of the updated RED II for Guarantees of Origin that will be issued for renewable gas. These should be mutually recognised between member states and certain non-EU countries.

<u>Complementing this scheme with an Off-gas Grid Decarbonisation Obligation for Biofuels for heating and Biomass</u>

The Green Gas Obligation would not cover road-distributed biomass, biopropane or liquid biofuels. If an RHI is continued and includes off-gas grid applications, it is should encompasses biopropane and liquid renewable fuels (such as biodiesel and bio-kerosene). However, if an RHI is not continued, then we would suggest that off-gas grid heating fuels (e.g. solid biomass, biopropane and bio-kerosene) are captured within the obligation mechanism outlined above.

Suppliers of these fuels could be issued with certificates which they could sell to licenced gas suppliers. While not supplied through a grid system, the supply chains are suitably closed and audited to allow for such a trade mechanism to operate either in conjunction with, or separate to, a Green Gas obligation. Given the different nature of the off-gas grid market this needs further consideration which we would be happy to liaise on with BEIS.

Biopropane is chemically identical to conventional propane and as such LPG or biopropane boilers will work with existing (oil or solid fuel) heating systems and the current housing stock in the countryside. Whilst the initial move may be to use high efficiency LPG boilers in homes, these could readily be integrated with heat pumps to create hybrid systems. NB Hybrid systems in off-gas grid areas will need a biogas to run the boiler.

As well as hybrid systems biopropane could be used with CHP, gas heat pumps or fuel cells, thus offering the opportunity to increase system efficiencies even further.

It is also worth noticing that there are a number of additional production pathways for biopropane i.e. biorefineries, anaerobic digestion and power-to-gas (using renewable hydrogen), and policy should support the development of different biopropane production pathways, that could be supplied by sustainable domestic feedstocks.

2.3 CfD type mechanism

A CfD type policy could also be considered for supporting renewable gas. This would be a top-up payment linked to market price of gas.

The top-up payment would be determined by the difference between a strike price (price a plant would require to be commercially viable) and the wholesale market reference price.

This approach could also cater for Bio-SNG, renewable hydrogen and other green gases.

The price discovery aspect might appeal to government and it may be more politically popular than other options as it introduces competition to support, theoretically driving down costs to consumers, and aligning with State Aid requirements.

It is, however, an option less favoured by developers due to a much higher allocation risk.

2.4 RIIO 2 price control framework

Ofgem sets price controls for the companies that operate the gas and electricity networks in Great Britain using the RIIO Framework, determining the outputs that the gas and electricity companies deliver for consumers and the revenues they are allowed to recover in doing so.

They are currently consulting on the methodology that will be applied for setting the RIIO-2 price controls for the gas distribution and gas and electricity transmission networks and the electricity system operator. These price controls will run from 2021-2026.

Ofgem is keen to ensure the outputs and incentives that apply in each sector deliver value for money to consumers. They are also seeking views on whether there should be other outputs and/or mechanisms not identified in the consultation which Ofgem should be considering.

Ofgem needs to ensure the price control framework enables the transition to decarbonised heat at the lowest cost for consumers. However, disappointingly they are not proposing to include any mechanism within the framework to:

1) Incentivise more biomethane projects to connect to the networks, and
2) Incentivise the networks to provide capacity and reduce the CapEx of biomethane injection.

Cost reductions have already been made to some extent (Gas grid Entry Unit costs have already been reduced by 50% in the last 7 years) but there is significant potential for further cost reductions, especially within the biomethane injection regime, so long as Government continues to provide a stable support mechanism at the right level for industry.

It is absolutely crucial that BEIS is actively engaged in this consultation, to ensure key barriers to biomethane growth such as capacity and costs can be overcome. A joined-up approach across Government and the regulator is paramount.

RIIO2 should also provide appropriate innovation funding/incentives to support ongoing work on the scope for H_2 injection – with suitable consultation/engagement of wider industry stakeholders.

3. Phasing out fossil fuels from off gas grid properties

BEIS will be publishing a consultation in the coming weeks on the regulation of the off-gas grid market and this will cover regulatory frameworks and timescales.

In the Clean Growth Strategy, which BEIS published in October 2017, the government confirmed its intention to focus on off-gas grid heat during the 2020s with a view to phasing out the use of fossil fuels by 2030.

Given this very welcome ambition and challenging timeframe, it is essential that the Review of Evidence does not ignore the current heat market or the technologies which are ready to deploy today in order to see immediate carbon reductions. In particular, there is distinct lack of focus within the Review on the role of Biomass Heating options despite the establishment of this market through the RHI and its so far instrumental role in decarbonising heat both in the UK and Europe. Between the Non-Domestic RHI's inception and the end of 2018, bioenergy, in particular biomass, provided more than 96% of the total renewable heat supplied by the scheme. This is now an established market and should be considered the starting point for a long-term decarbonisation strategy, not ignored in favour of future technologies.

Similarly, the Review also doesn't recognise the role that on-site Anaerobic Digestion could play in decarbonising heat used on farms and factories. Within the agricultural sector specifically, most farms are off the gas grid in the UK, particularly small ones. In these situations, on-farm anaerobic digestion would enable replacing fossil fuel heat required for the farm buildings and the farmer's own household with renewable heat from biogas. In factories, especially in the food and beverage sector, AD could provide part of the heat requirement for the manufacturing process, which would replace some of the fossil fuel heat. Nestlé, Diageo, and First Milk are examples of companies using on-site AD to process biodegradable production residues to generate heat and power that could be utilised on-site. This approach would need to be combined with other low-carbon technologies that are dispatchable and can generate high-grade heating, such as biomass.

There is concern that the strategic Inferences identified by the Review will encourage policy makers to focus on possible future solutions at the expense of continuing to support available bioenergy solutions today. If this happens, much like in the Biogas industry, the loss of expertise, supply chains and immediate carbon reductions will render the Government's Clean Growth strategy ambitions impossible to meet. As such, policy makers will need to find policies that both build on the industries that have now been established through the RHI and delivering support to new innovation, like gasification and hydrogen, that offer the possibility of further carbon savings in the future.

Below we outline a number of policy proposals that would usefully build on the RHI post-2021, while not requiring a direct fiscal subsidy. It is likely that a combination of the below ideas will be required in order to simultaneously send a strong market signals for decarbonisation, while providing the necessary support to help people transition from fossil-based to renewable systems. These will both help Government meet its 2030 ambition through the continued deployment of renewable heat technologies, thereby continuing progress towards decarbonisation, while also allowing future technologies the time to commercialise.

3.1 Future heat policies should focus on both Quality and Usage of Renewable Heat systems, rather than just quantity of installations

Before examining a range of future policy proposals we wish to stress two important factors that must be considered in all future heat policy design, which we also feel is not sufficiently addressed in the Review of Evidence. Building on lessons learnt from previous heat support mechanism it should be recognised that:

1) Policy should be quality- rather than quantity-focused. This should be addressed through strong industry standards that understand heating systems must be appropriate to properties' heating requirements while clearly demonstrating both carbon abatements and strong particle emission controls.
2) Ensure that any future support mechanism not only incentivises deployment but results in real usage of the technologies. In the past the use of grants, and some building regulations, has seen the installation of inappropriate and inefficient systems, meant to meet quotas rather than the specific heat needs of a building. This damages public trust in new technologies and slows deployment.

3.2 Policy Proposals for decarbonising Off-Gas Grid Properties[8]

A clear Trajectory for escalating fuel duty on fossil-fuels for heat

A trajectory for a gradually increasing fuel duty on brown fossil-fuel heating, such as oil, would send an appropriate and strong price signal to the market for the use of renewable alternatives including biomass, heat pumps and bio-based heating fuel replacements, such as bio-kerosene and biopropane. Having a clear trajectory in place, would itself make users consider the future costs of using fossil-based heating options when replacing heating systems and would drive demand for renewable options in the early 2020's, even if the additional duty started low.

If Government is to meet its 2030 target then a clear price signal like this needs to be introduced to the market in the absence of a wider Carbon Tax working across the economy.

It is of course recognised that such a policy could negatively affect the fuel poor if introduced without appropriate protections. The revenue raised from such a policy should therefore be directly spent on enabling such households to make the switch to renewable systems and increase energy efficiencies in off-gas grid properties.

Appropriate installation standards should also be used to ensure quality systems are installed and appropriately meet the heat requirements of the property.

Tax Breaks on Income Tax

Enabling households with renewable heating installation to claim a tax rebate on areas like income tax, spread over 3-5 years, would further incentivise investments in renewable heating options. Such schemes are used to good effect in other European countries, for example Italy, where tax rebates and credits are paid to

[8] Please note that most of these proposals could also be used to encourage the decarbonisation of the heat on the gas grid.

individuals who install energy efficiency and emissions abatement technologies in their properties.

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 simply supply evidence (potentially in the form of an updated EPC) to demonstrate the change, and to apply for a reduction in their tax bill going forward.

A benefit of tax rebates or credits is that they can be offered to both individual customers in a domestic context and to businesses in a commercial context. Rebates on council Tax could also be considered in this regard, although the loss of additional administrative costs for Local Authorities, and potential loss of revenue, likely makes such a rebate difficult to deliver.

Variable Stamp Duties and encouraging more Green Mortgage products

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. Analysis from UKGBS[9] suggests that schemes which encourage the introduction of renewable heating systems at this point could deliver between 135,000 and 270,000 additional retrofits per year, annual carbon savings of between 209,000 and 417,000t CO_2 and contribute £404m-£807m to GDP a year (with a near-zero annual direct cost to Government).

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.

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 subsequent to moving into a new home.

At the same time Government should continue to work with banks to see more Green Mortgage products become available to the market, with the first such products being made available in 2018. 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, will again drive demand for properties going onto the market to retrofit renewable heating systems allowing potential owners to benefit from better interest rates.

[9] UK Green Building Council, "Retrofit Incentives", http://www.ukgbc.org/policy-and-advocacy/task-groups/retrofit-incentives

Amending the Energy Savings Opportunity Scheme (ESOS)

Administered by the Environment Agency, the ESOS is a mandatory energy assessment, carried out every four years, for organisations that fall within the qualification criteria. The focus of the scheme could be changed from focusing on energy savings to CO_2 reduction, incentivising the deployment of on-site low carbon heating options in the commercial sector. The existing scheme has been successful in reducing energy usage through the adoption of technologies like LED lighting, moving onto ensuring renewable heating solutions are installed should be considered within the next evolution of the scheme.

This option directly addresses emissions from the commercial sector, which are considerable, and would work well in tandem with a grant or soft loan mechanism. This is because, following installation, ESOS encourages the continued use and improvement of low-carbon heating systems/efficiency measures.

We recommend that the relevant metric for ESOS be changed from energy savings to CO_2, thereby driving down emissions.

Enhanced Capital Allowances (ECA) and Enterprise Investment Scheme

Given the forthcoming closure of the RHI, it is appropriate that support should now be provided through Enhanced Capital Allowances and tax relief in the form of Enterprise Investment Schemes.

ECA's provide a one-off upfront tax benefit, rather than ongoing Government expenditure while providing an attractive headline for investors and developers by bringing the tax relief of their asset purchase forward to the first year. Similarly, Enterprise Investments Schemes have the potential to particularly support community scheme, including heat networks.

Previously, energy generation schemes, including heat, had been excluded from venture capital schemes due to fears of double-subsidies and overcompensating developers. With more projects looking to build subsidy free, it is appropriate that this exclusion is reconsidered. In the current market, we believe ECAs and EIS could provide a cost-effective alternative for encouraging commercial investment. What is more, the WHA (a subsidiary of the REA) suggests that combining ECAs with a gradually ratcheting duty on fossil-fuels used for heating tax would not only incentivise a transition to low-carbon heating technologies but that proceeds from this tax could fund the ECAs themselves.

A further benefit of ECAs or any form of 'soft loan' is that a proportion of the capital can be factored into covering the cost of fuel storage (e.g. wood pellet store houses).

Low-Interest Loans for Commercial Heating Schemes

As an alternative to venture capital schemes, given the low interest rates open to Government lending, larger scale nascent renewable heat sectors could greatly benefit from Government lending. This, in turn, will also help further de-risk projects and encourage private investment into the sector, eventually surpassing the levels of

Government investment. Lessons can be learnt from the success of the Green Investment Bank in the renewable power sector when it was publicly owned.

Future Ban on uneconomic Gas Connections

Putting in place a future ban on gas connections which do not pay for themselves would have the effect of discouraging uneconomic connection of properties to the gas grid. Instead, and in tandem with several of the options outlined above (e.g. fuel duty and tax credit), consumers would be encouraged to adopt a source of low-carbon renewable heating.

Alternatively, Government should also consider a blanket ban on gas connections with exceptions made for renewable gas connections such as hydrogen and biomethane. This has also been recommended in the most recent report from the CCC[10]. It is unlikely that this would generate any further administrative burden as all planning applications for connections to the gas grid are already processed by bodies such as National Grid.

4. Additional Considerations: Heat and Electricity

Conversations in the EV Energy Taskforce, on which the REA sits on Work Package 1 and 2, indicate that electricity networks (eg DNOs) are concerned about making major new investments in expanding network capacity to facilitate the transition to electric vehicles without a clear steer from Government on the extent of the electrification of heat. This is partly as a full-scale electrification of heat would multiply the UK's electricity demand by several factors, dwarfing new demand from electric vehicles. Even a partial electrification of heat will require both distribution and likely transmission system upgrades. Such major network upgrades can take a decade or more to complete, partly due to the time it takes to secure planning and regulatory consent. As such, the REA urges Government to make early, high-level statements as to their intentions for heat so that market actors, including those involved in the EV sector can begin to plan. Any delays may also impact the Government's Industrial Strategy ambitions for being a world-leader in electric vehicle manufacturing, for which a national charging infrastructure network is crucial.

Moreover, heat electrification (to any degree) needs to be carefully considered within the context of the debate surrounding domestic three-phase electricity supply connections in new homes, which the REA believes will be necessary to facilitate a world of decarbonised heat (including the roll-out of heat pumps), EV charging (at 7kW or 11kW), and greater onsite generation (three-phase will raise the amount of solar that can be domestically deployed from a functional cap of 4kW). The discussion about domestic electricity supply connections also needs to be had in context of the Road to Zero strategy (OLEV), which outlines the Government's intention to mandate EV chargers on new all new domestic properties.

[10] CCC (Feb, 2019) *UK housing: Fit for the future?* Available: https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/

Finally, in the context of managing heat electrification, consideration should be given at an early stage to the communications protocols that will be used to manage the load. OLEV have indicated that all new government-funded domestic chargers will need to be 'smart' by July 2019. Using similar communications protocols for domestic heat demand management as to those used by the EV charging industry would lead to greater interoperability and smoother roll-out. A properly managed approach could also lead to additional value-added services, such as a customer being able to charge their vehicle, heat their home, or use electricity to heat their boiler at optimal times for networks and / or to be aligned to half-hourly price signals from a smart meter. Such a development may allow customers (or an algorithm) to prioritise certain types of demand to keep a home below its maximum demand rating – e.g. price signals may indicate an optimal time to charge a vehicle or heat a boiler. Alternatively, a customer may be able to prioritise vehicle charging over heating a boiler for a certain period of time (or vice versa).

5. Conclusion

The arguments forwarded above highlight that, in addressing the urgent need to decarbonise heat, this Review of Evidence offers little consideration to the current status of the UK's renewable heat industry. As expressed at the outset, such consideration is imperative if we are to make the desired transition to a decarbonised heat system. Established markets like biogas, biomass heat and biofuels for heating are readily deployable at scale today, delivering near-immediate carbon savings whilst the technological portfolio of medium- and longer-term heat decarbonisation strategy is decided. Relatedly, any policy proposals which aim to decarbonise heat in the long-term (such as the widespread electrification of heat) must begin by offering a consideration to other areas of the energy system (such as power), as well by capitalising on the UK's existing renewable heat markets, technologies and infrastructure.

Finally, it is worth reiterating that the options outlined above are starting points in a hopefully extended and fruitful conversation with Government as to options which will successfully and rapidly decarbonise the nation's heat whilst also benefitting the renewable economy and end consumers.

REA, February 2019