Response ID ANON-7X4C-RE5V-8

Submitted to Phasing out the installation of fossil fuel heating systems in businesses and public buildings off the gas grid
Submitted on 2022-01-12 18:50:10

About you

1 What is your name?

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3 What is your organisation?

Organisation:
Bennamann Limited

4 Are you happy for your response to be published?

Yes

5 Would you like to be contacted when the consultation response is published?

Yes

6 How did you hear about this consultation?

Where did you hear of this consultation?:
Email from BEIS

Other (please specify):

Introduction

The non-domestic off-gas grid building stock

The proposals

1 Do you agree with the principle of using the natural replacement cycle to phase out the installation of fossil fuel heating systems in non-domestic buildings off the gas grid? Yes/No. Please explain your response.

Yes

Please answer here.:

Timelines for implementing the proposals

2 Do the 2024 and 2026 timescales for introducing this policy provide sufficient lead in time for non-domestic off-gas grid consumers to prepare for their transition to low carbon heat? Yes/No. Please provide evidence to support your response where possible.

No

Please answer here.:

The challenges of preparing for decarbonising heat in the non-domestic off-gas grid smaller buildings sector at scale, including establishing suitable robust supply chains and a fully recruited and trained technical workforce, will require more than 2 years to achieve for policy introduction. The 2026 timescale for larger buildings is more realistic, but still very challenging given that the same timescale is being considered for similar policy aimed at decarbonising all homes off the gas grid.

3 Would an implementation date of 2024 (for large buildings) and 2026 (for smaller buildings) provide sufficient lead in time for industry to prepare for the increase in demand? Yes/No. Please provide evidence to support your response where possible.

No

Please answer here.:

The challenges of preparing for decarbonising heat in the non-domestic off-gas grid smaller buildings sector at scale, including establishing suitable robust supply chains and a fully recruited and trained technical workforce, will require more than 2 years from policy finalisation to implementation to achieve. The 2026 timescale for larger buildings is more realistic, but still very challenging given that the same timescale is being considered for similar policy aimed at decarbonising all homes off the gas grid.

4 Do you agree with our proposal to introduce this policy for the largest buildings first? Yes/No. If not, please explain your reasoning, using evidence to support your response where possible.

No

Please answer here.:

An adequate suite of alternative technologies and commercial models for efficiently, effectively and sustainably decarbonising heat in the non-domestic off-gas grid buildings sector at scale has not as yet been fully developed and it would be better to allow developers and the market the flexibility to prove new innovative systems and approaches on smaller building first.

Proposed low carbon technologies

Favouring heat pumps

5 Do you agree with our proposals to take a heat pump first approach to the replacement of fossil fuel heating systems in off-gas grid non-domestic buildings? Yes/No. Please explain your response.

No

Please answer here.:

In principle we do not agree with a "heat pump first approach" as it does not allow for competitive low carbon, zero carbon or better-than-zero carbon technologies and innovative commercial developments that may emerge in the coming years and represent better value in terms of costs, sustainability and achieving net-zero. Constraining innovation and the marketplace by effectively "backing a winner" does not make economic or policy sense.

6 Do you agree that most non-domestic off-gas grid buildings will be suitable for a heat pump? Yes/No. Please provide evidence to support your response, including examples of situations where the heat and hot water demand could not be met by a heat pump.

No

Please answer here.:

The majority of non-domestic off-gas grid buildings in England, and more broadly across the UK, are located in rural locations and typically use fossil fuel derived gas (ie propane etc) or oil for heat provision and have limited, or no, economically and technically viable low carbon options as alternatives. Solutions often proposed for such properties start with technologies for the electrification of heat provision, including heat pumps and hybrid heat pumps, but these are challenging to deliver, particularly across areas with limited power grid capacity and significant constraints on electricity supply.

The use of electrically powered heat pumps in such settings is often not technically possible and/or undesirable/difficult from the perspectives of the property owner. The technical issues can relate to high heat losses from buildings that cannot be bought down cost-effectively (ie there is a greater prevalence in rural areas of older, colder properties which are hard to treat with fabric refurbishment and energy efficiency measures) as well as a lack of physical space making installation difficult; the desirability issues can involve concerns around the historic or listed nature of the building or, in the case of sensitive settings, aesthetic considerations associated with surrounding landscapes or architecture.

Alternative low-carbon systems

7 What types of buildings are likely to fall into the ‘hard to treat’ category? Please provide evidence to support your response.

Please answer here.:

Historic/heritage buildings, converted agricultural and industrial buildings, buildings located in sensitive settings.

8 What low carbon heating systems do you foresee being used as alternatives to heat pumps in ‘hard to treat’ buildings? Please provide evidence to support your response.

Please answer here.:

The combustion of biomethane in compressed gas or liquid fuel form to produce heat for use in space and/or water heating offers a viable alternative option to heat pumps in ‘hard to treat’ buildings.

9 Will these alternative low carbon heating systems align with the net zero, sustainability, air quality and consumer experience criteria set out in the ‘Alternative low carbon systems’ section? Please provide evidence to support your response.

Please answer here.:

The combustion of biomethane in compressed gas or liquid fuel form to produce heat for use in space and/or water heating offers a viable alternative option to heat pumps and if locally sourced from farm manures, delivers a better-than-zero carbon outcome as well as a range of environmental, sustainability and air quality benefits. For example, under REDII the biomethane default value for manure is associated with a large methane credit of 206%; this significantly lowers the carbon intensity of biomethane production to -85gCO2e/MJ (https://bennamann.com/downloads/LowCVP-WTT_GHG_Emission_Factors-Review_and_recommendations.pdf). If produced efficiently and distributed effectively, it can also be commercially viable and affordable, increasing the energy security and resilience of rural communities.

Across the UK, rural communities have within them a considerable untapped resource of energy in the form of the biomethane that can be derived from the fugitive methane emitted by livestock manures. In many cases these sources of energy are relatively small, being at the small farm scale, but when used on-site and aggregated and distributed locally to meet local rural energy demand, they represent a considerable opportunity for decarbonisation of heat.

The challenge is how to access this unused better-than-zero carbon source of energy when the rural production site is small-scale; is not served by an injection point to the gas grid; and, as in many cases, suffers power grid connectivity constraints preventing biogas processing and/or export as generated electricity. To meet this challenge, Bennamann (www.bennamann.com) has been developing and proving a suite of technical solutions and business models that enable commercially viable off-gas and off-power grid utilisation of these local rural energy resources, in the form of compressed biomethane gas and liquid fuel, for the affordable decarbonisation of space and water heating in off-gas grid homes and non-domestic buildings (ie farms, community halls, schools, businesses etc). For example, the company recently secured £668,577 of European Regional Development Fund (ERDF) funding under Priority Axis 4 to support a truly ground-breaking development project in which farm sourced fugitive methane is being used to power mobile off-grid electric vehicle (EV) charging units, with waste heat recovery for use locally in space and water heating (https://bennamann.com/mobile-off-grid-ev-charger-with-bioheat/). This pioneering integrated energy-transport-heat project will demonstrate the application of the technology in a rural home, a rural car park with adjacent community (Women's Institute) hall, and in a rural business setting on a working farm. (A CHP combined with a heat pump can provide 200% of the calorific value of the methane and potentially works well for decarbonising heat in large properties such as schools and government buildings etc). Post-project, the development will deliver a step change to the roll-out of EV charging infrastructure, particularly in off-power-grid or power grid constrained rural locations, as well as help support a transition to more sustainable livestock farming, a green recovery led economic growth and levelling up, through the creation of clean energy jobs and business activity.

On the biomethane supply side, Bennamann has been commercially proving the efficient and optimised local, small-scale, capture, processing, storing, aggregation and distribution of fugitive methane in rural Cornwall (https://vimeo.com/663327514/26d642b959). For example, the company's £1.22 million "Energy Independent Farming" project, which is part-funded by the ERDF (https://www.cornwallislesofscillygrowthprogramme.org.uk/projects/energy-independent-farming/); https://bennamann.com/energy-independent-farming/), is demonstrating the use of livestock manure to establish energy independent dairy farming (including self-sufficiency in power, heat and fuel for farm machinery such as tractors [https://www.bbc.co.uk/sounds/play/p0bfx7ym]) and simultaneously generate farm business income through local sales of surplus fugitive methane, either as compressed gas or liquid fuel (https://www.fginsight.com/news/income-from-slurry-gas-110928); (https://bennamann.com/wp-content/uploads/2022/01/Farmers-Weekly-Bennamann.pdf).

Through the use of a low-cost sealed slurry lagoon, this approach can effectively take the farm off-grid from an energy perspective and provide the farm businesses with an additional revenue that can fully fund the investment through reduced energy costs. It also provides the opportunity to improve soil health, remediate compaction, underpin regenerative practices, and deliver improved soil carbon sequestration without the need for artificial fertilisers, resulting in further cost savings (https://vimeo.com/458903162). By using a sealed lagoon rain ingress is minimised resulting in significant savings in fuel, vehicle and manpower costs through the reduced need for slurry movement and spreading. Data gathered by Bennamann at Chynoweth Farm in Cornwall, which has our proprietary sealed slurry lagoon installed and captures and utilises the fugitive methane generated by the anaerobic digestion of the manure, indicates a return-on-investment period of between 4-6 years for such a system.

The commercial roll-out of rural off-gas-grid heat provision based on fugitive methane locally sourced from livestock manure slurry and processed to biomethane in small-scale upgrading plants, is scalable and viable in the UK. For example, there are circa 600 dairy farmers alone in the rural county of Cornwall (131,000 dairy cattle – 6% of the national herd), many of whom are off-gas-grid and subject to power grid constraints. Of these, there are an estimated 120 farmers in a position to adopt Bennamann's technologies and business models in the short-term, including the 58 dairy farms in Cornwall Council's own Council Farm Estate. Indeed, in the case of the latter, the Council has already begun a pilot installation on 6 of the dairy farms in the Estate which, if successful, is intended to lead to a wider roll-out across the county (https://bennamann.com/6-farm-pilot-with-cormac-biomethane-supply/).

In terms of scalability across the UK, there are circa 2,000 dairy farms in the South-West and around 35 – 40,000 cattle farms across the UK, of which approximately 71% (29,000 holdings) have herds with less than 150 cattle. With current farming practices, costs of traditional Anaerobic Digestion (AD) plant, and levels of low-carbon energy incentives, modelling has shown that only 3.5% of UK dairy livestock could be linked to economically viable on-farm plants for biomethane production (https://www.sciencedirect.com/science/article/abs/pii/S0301421513006162). For example, there is a total of only 45 small scale AD plants in the UK (ADBA, 2015). Alternatively, Bennamann's farm-scale biogas sourcing, biomethane processing, storage and distribution technology would enable 71% of UK dairy farms to become economically viable 'better than zero-carbon' energy producers. This would potentially result in an emissions saving of circa 34 Million tonnes CO2e annually for the UK, or 7.5% of total UK CO2e emissions, just from the mitigation of the manure slurry fugitive emissions, before accounting for the emissions savings that will accrue through the use of the derived biomethane for off-gas-grid heat energy provision.

Incentivising a scalable roll-out through stimulating demand for biomethane use in off-gas-grid rural heating would not only help decarbonise heat in non-domestic buildings, it would also enable dairy farm businesses to generate an additional revenue stream that can provide them with income diversity and increased profitability. In addition, stimulating biomethane production at the farm-scale for local distribution and use in heat provision would help improve the overall sustainability of farming, through on-farm use of some of the resulting zero-carbon energy, as well as improved nutrient cycling and soil biology practices by use of the resulting digestate as a regenerative replacement for artificial fertiliser. Implementing the latter through Bennamann's

proprietary digestate handling processes will substantially reduce the release of ammonia, thereby mitigating air quality degradation and helping to meet the policy objectives of Defra's Clean Air Strategy 2019. With the forthcoming introduction of the Environmental Land Management Scheme (ELMS) for farming to facilitate a post-Brexit phase-out of the EU's Basic Payment Scheme (BPS) under the Common Agricultural Policy (CAP), farm businesses need to find new sources of revenue based on environmentally beneficial practices to remain operational (typically the BPS provides around 50-80% of UK farms annual income, https://www.parliament.uk/documents/commons-library/Brexit-UK-agriculture-policy-CBP-8218.pdf) and Bennamann's approach offers one route to helping achieve such an outcome.

The successful incentivisation of biomethane combustion in non-domestic off gas grid buildings through the approach discussed above will help UK Government to realise a myriad of BEIS and other department policies, including:
- an attractive non-electric affordable net zero heat option which is particularly beneficial for decarbonising off-gas-grid locations (where building owners/occupiers typically resort to bottled gas, e.g propane, or oil for heating), especially where power grid capacity and constraints are an issue in meeting electrical demand;
- decarbonisation of difficult to tackle sectors, including heat and agriculture, in the quest to achieve the UK's legally binding net zero target by 2050 as well as meet the nation's Paris Agreement commitments;
- meeting the targets of the Global Methane Pledge that aims to deliver at least a 30% reduction in fugitive methane emissions by 2030 on a 2020 baseline (https://www.globalmethanepledge.org).
- climate emergency and net zero-carbon aspirations of rural local authorities nationwide, while simultaneously delivering distributed local energy, reduced fuel poverty, improved local energy security and rural resilience;
- green recovery led local growth, rural economic development, and delivering the levelling up agenda, through creating sustainable low carbon farming and local energy sector related jobs that improve rural livelihoods and drive post-pandemic economic regeneration.
- the Clean Air Strategy 2019 through the reduction of ammonia emissions from livestock farming;
- the Agriculture Act and Environmental Land Management Scheme (ELMS) through sustainable and regenerative low carbon farming that enhances biodiversity, delivers environmental growth, and creates a circular economy model for livestock agriculture.

Untreatable buildings

10 Are there instances where both heat pumps and alternative low carbon heating technologies will be unsuitable for meeting a building's space heating and hot water demands – i.e., 'untreatable buildings'? Yes/No. If yes, how and when do you foresee low carbon heating technologies developing to overcome these challenges? Please provide evidence to support your response.

Not Answered

Please answer here.:

The cost of transitioning

11 How do you foresee the costs associated with installing a heat pump in non-domestic buildings changing over the next 10 years? Please consider a range of system sizes in your response and provide evidence to support your answer.

Please answer here.:

12 How do you foresee the costs associated with installing alternative low carbon heating systems in non-domestic buildings changing over the next 10 years (i.e., other than heat pumps)? Please consider a range of system sizes in your response and provide evidence to support your answer.

Please answer here.:

13 How can the government support cost reductions in low carbon heating technologies suitable for non-domestic buildings, particularly heat pumps? Please consider buildings of differing sizes and energy use.

Please answer here.:

14 How accurate is our indicative modelling for the cost of transitioning to low carbon heat? Please provide evidence to support your response. This should include details on the types of buildings the costs are associated with, including its floor area (m2), energy use (kWh) and the type of heating system it currently uses.

Please answer here.:

15 How can we support the green finance market to develop the products and investor demand that businesses will need to fund their transition to low carbon heat?

Please answer here.:

Back-up heating systems

16 In what situations are fossil fuel back-up systems common and how frequently are they used? Please provide evidence to support your response.

Please answer here.:

17 What low carbon back-up solutions are available for buildings with a heat pump as their primary system? Please provide evidence to support your response.

Please answer here.:

Consumer protection

18 Taking into consideration existing certification schemes, are businesses adequately protected when installing a low carbon heating system up to 45-kilowatts? Please provide evidence to support your response.

Please answer here.:

19 Do businesses that install low carbon heating systems with a capacity over 45-kilowatts require consumer protection? Yes/No. If Yes, how should this differ from standards available for installations up to 45-kilowatts?

Not Answered

Please answer here.:

Managing compliance

20 Do you have any views on how best to ensure compliance with the proposed regulations laid out through this consultation? Please provide evidence to support your answer.

Please answer here.:

Other trigger points to reinforce the policy

21 What is the typical lifespan of a non-domestic heating system used in an off-gas grid building? How does this vary by system capacity? Please provide evidence to support your response, which should include the type and size of heating systems.

Please answer here.:

22 What are the potential implications for businesses of introducing an end date by which all buildings must have transitioned to low carbon heating (e.g. in the early 2040s)?

Please answer here.:

23 What are the potential implications for businesses of introducing trigger points for installing a low carbon heating system, in addition to the natural replacement cycle, such as at the point of let or sale?

Please answer here.:

Equality Act 2010

24 Do you have any evidence on how groups protected under the Public Sector Equality Duty may be affected by our proposals to phase out high carbon fossil fuel heating in non-domestic buildings off the gas grid?

Please answer here.:

25 Do you have any views on what more could be done to ensure businesses and communities affected by our proposals experience a smooth transition to low carbon heat? Please provide evidence to support your answer.

Please answer here.:

End of consultation

26 Please use this space to provide any further views not already captured in your responses to the previous consultation questions.

Please answer here.:

The combustion of biomethane for heat decarbonisation in non-domestic buildings off the gas grid is not incentivised through current policy and it is therefore critical to address this shortcoming to stimulate the growth of supply chains to deliver biomethane fuelled application technologies/systems suitable for use in such buildings as well as the biomethane fuel itself.

To stimulate initial market uptake of off-gas-grid biomethane heating solutions and associated equipment supply chains, the combustion of biomethane

for heat decarbonisation in non-domestic buildings needs to be supported through an appropriate financing mechanism such as a property owner grant scheme that provides a partial contribution towards the capital cost of equipment purchase and installation. Such support would help incentivise the growth of off-gas-grid decarbonised heat applications and their supply chains to meet demand for the building-level technologies, as well as the production and distribution of locally sourced biomethane in the UK's rural off-gas-grid communities.

In parallel with financial incentivisation, BEIS can help further with market addressing actions including, for example, ensuring a supportive regulatory environment for the safe use of biomethane for space and water heating in non-domestic buildings. Although it is relatively straightforward to technically achieve this, existing gas regulations do not allow the use of biomethane as a substitute for natural gas or bottled LPG in business and public buildings. Indeed, the current regulatory environment effectively restricts the deployment of replacement systems to Combined Heat and Power (CHP) applications where bioheat is provided into a building from outside and does not therefore recognise cases where oversupply of CHP based electricity will result, or support potentially innovative solutions that would enable biomethane to be used directly in converted natural gas (or LPG etc) fuelled boilers.
On the biomethane supply side, as highlighted in our answer to question 9, across the UK, there are circa 35-40,000 cattle farms but with current farming practices, AD plant costs, and low-carbon energy production incentives, only 3.5% of UK dairy livestock would be linked to economically viable on-farm plants. This situation acts as a significant barrier to increasing the supply of an underutilised and potentially energy rich heating fuel in the form of fugitive emissions captured from livestock manure, particularly in the case of small-scale farms.
Bennamann (www.bennamann.com) have developed a suite of technologies covering the entire biomethane supply chain from farm to consumer application that facilitate sustainable, commercially viable manure slurry fugitive emissions sourcing, processing/upgrading and storage, as well as distribution and consumer use, for livestock farms of any scale without the requirement of a gas or power grid connection (https://vimeo.com/663327514/26d642b959); (https://bennamann.com/wp-content/uploads/2022/01/Farmers-Weekly-Bennamann.pdf). However, current incentivisation schemes do not provide adequate rewards for smaller plants/operators and those without gas-grid access, and/or power grid connection/constraint issues, and the UK Government could galvanise equipment and fuel supply chains by addressing this deficit through appropriately structured support mechanisms. In this regard, BEIS, in partnership with other departments, particularly Defra, needs to put in place policy interventions, regulatory change, financial incentives, and investment-encouraging mechanisms that remove this barrier, along with a timebound roadmap for implementation. This should include support for the engineering development and commercially viable deployment of affordable, efficient equipment, including small-scale systems and options for biomethane production where proximity to a gas grid injection point is not available. Bennamann are researching, developing and demonstrating such plant and systems but does not see UK Government policy or regulatory support for their widespread development and/or deployment.

Bennamann regards as a missed opportunity the fact that the Green Gas Support Scheme is exclusively focussed on supporting biomethane injection into the gas grid and does not offer a support route for off-gas-grid sourcing, processing/upgrading, storage and distribution of biomethane, either in gaseous or liquid fuel form. The Committee on Climate Change (CCC) consider the production of biomethane from waste as a low-regrets option, recommending continued government support (UK Committee on Climate Change (2018)), Biomass in a low carbon economy). The lack of this support for the off-gas-grid and/or off-power-grid component of production is not only remiss, but also ignores the full low-regrets potential of biomethane to reduce greenhouse gas (helping to achieve the nation's Global Methane Pledge commitments - https://www.globalmethanepledge.org) and other emissions (including ammonia and N2O) from waste and agriculture, as well as support jobs in rural areas, contribute to delivering a green recovery and the levelling up agenda, reduce fuel poverty and build rural energy security and resilience capacity, through its local sourcing from manure slurry fugitive emissions, processing and distribution. Bennamann therefore recommends that BEIS explores more fully incentivisation of the use of biomethane sourced from livestock manure slurry fugitive emissions to heat the space and water in rural non-domestic buildings off the gas grid.