Department for
Business, Energy
& Industrial Strategy

Green Heat Network Fund

Call for Evidence

Closing date: 13 October 2020

September 2020

Any enquiries regarding this publication should be sent to us at: heatnetworkdecarbonisation@beis.gov

Executive Summary

The Government is committed to achieving net-zero greenhouse gas emissions by 2050. Meeting this legal commitment will require virtually all heat in buildings to be decarbonised, and heat in industry to be reduced to near zero carbon emissions. Presently, heat is responsible for a third of the UK's greenhouse gas emissions. Heat networks are a crucial aspect of the path towards decarbonising heat[1]. In the right circumstances, they can reduce bills for consumers, support local regeneration and can be a cost-effective way of reducing carbon emissions from heating.

There are currently over 14,000 heat networks in the UK[2], providing heating and hot water to approximately 480,000 consumers. Heat networks can deliver heating, hot water, and/or cooling from a central source or sources to a wide range of buildings including domestic dwellings, public buildings, businesses, factories, sport facilities, hospitals and universities. They are uniquely able to unlock otherwise inaccessible large-scale renewable and recovered heat sources such as waste heat from industry and heat from rivers and mines. Heat networks currently provide 2% of UK heat demand and the Committee on Climate Change estimated in 2015 that with Government support, they could provide 18% of heat demand by 2050 in a least-cost pathway to meeting carbon targets. This emphasises the importance and potential of heat networks to meet carbon targets and reach net-zero.

Since 2013, government support for heat networks has been focussed on the development of the UK's growing heat network sector and creating the conditions necessary to build a sustainable heat network market. Initiatives in this respect have included the Heat Networks Delivery Unit (HNDU) and the Heat Networks Investment Project (HNIP)[3] which have provided financial support and guidance to the developers of networks. BEIS also launched the February 2020 consultation 'Heat Networks: Building a Market Framework'[4], which set out options for regulating the market in order to enhance consumer protections, whilst supporting market growth. Work is currently underway to engage further with stakeholders and refine the policy ahead of implementing the regulatory framework.

In addition to this, we have recognised that the potential for heat networks to access low-carbon heat solutions needs to be increased and accelerated if we are to meet our net-zero commitment. It was in this context that, in the March 2020 Budget, the Chancellor of the Exchequer announced £270 million of new funding for a Green Heat Network Scheme (hereinafter referred to as the Green Heat Network Fund or GHNF) to enable new and existing heat networks to adopt low-carbon heat sources.[5]

The effectiveness of this fund is dependent on ensuring that it is well suited to the heat network market. To meet this objective, our intention is to develop the scheme whilst taking into account the views and preferences of the industry. The GHNF will not only seek to decarbonise heat networks, but also seek to capitalise on the progress made by the Heat Network Investment Project and continue to strengthen the market.

[1] https://www.gov.uk/government/publications/what-is-a-heat-network
[2] https://www.gov.uk/government/publications/energy-trends-march-2018-special-feature-article-experimental-statistics-on-heat-networks
[3] https://www.gov.uk/guidance/heat-networks-overview
[4] https://www.gov.uk/government/consultations/heat-networks-building-a-market-framework
[5] Budget 2020v pages 63 and 81

This call for evidence is a part of the iterative stakeholder engagement process being held during the scheme design. As a part of this process, we have already held technical workshops with the industry to discuss our early policy proposals, met bilaterally on specific topics, and asked stakeholders for written feedback on particular aspects of our scheme design. Stakeholders have been engaged, providing useful feedback and lively discussions. Through this iterative engagement we have uncovered several pertinent factors for us to consider during the design of the scheme. The workshops have also confirmed the need for us to strengthen our evidence base and consider the views of the wider market.

We are therefore seeking evidence about the market, the potential pipeline for the fund and the wider financial, technological and consumer drivers for heat network decarbonisation. We are also looking for examples of best practice in scheme design, along with data to inform our analysis and modelling. All of this will help to better inform the development of the fund.

This call for evidence forms a key component of our overall engagement with stakeholders and will help us to refine our proposals for the fund. Our aim is to use the evidence provided in response to this document to produce a detailed set of options for the scheme on which we intend to hold a formal consultation later this year.

Contents

General information

Why we are calling for evidence

The Government is seeking evidence and data which will support the design of the Green Heat Network Fund (GHNF). The GHNF is a Government scheme which will have the objective of incentivising new and existing heat networks to utilise low-carbon heat sources. We are particularly interested in evidence which will inform the scope and design of the scheme, and how support arising from the fund may achieve the optimum impact. We invite your views and seek evidence in response to the questions below. Responses will help inform scheme design and future policy development.

Call for evidence details

Issued: 30 September 2020

Respond by: 13 October 2020

Enquiries to:

Heat Networks Team

Department for Business, Energy & Industrial Strategy

2nd Floor, Victoria 3

1 Victoria Street

London, SW1H 0ET

Tel: 020 7215 5000

Email: heatnetworkdecarbonisation@beis.gov.uk

Consultation reference: Green Heat Network Fund

Audiences:

We are keen to hear from Heat network operators, energy companies, energy investors, technology suppliers, housing associations and other social housing providers, property and housing developers, large businesses, SMEs, consumer organisations, financial institutions, local authorities, Energy Service Companies (ESCOs), Local Enterprise Partnerships, Non-Governmental Organisations, other heavy heat users, academics and anyone else with an interest in this area.

Territorial extent:

England and Wales

How to respond

Respond online at: https://beisgovuk.citizenspace.com/heat/designing-green-heat-network-fund-cfe/

Complete the pipeline questionnaire at: https://beisgovuk.citizenspace.com/heat/pipeline-questionnaire

Or alternatively

Email to: heatnetworkdecarbonisation@beis.gov.uk

Enquiries to:

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When responding, please state whether you are responding as an individual or representing the views of an organisation.

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome. You do not have to answer all of the questions; if you prefer, you need only answer ones that you feel are relevant to you.

Confidentiality and data protection

Information you provide in response to this consultation, including personal information, may be disclosed in accordance with UK legislation (the Freedom of Information Act 2000, the Data Protection Act 2018 and the Environmental Information Regulations 2004).

If you want the information that you provide to be treated as confidential please tell us, but be aware that we cannot guarantee confidentiality in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not be regarded by us as a confidentiality request.

We will process your personal data in accordance with all applicable data protection laws. See our privacy policy.

We will summarise all responses and publish this summary on GOV.UK. The summary will include a list of names or organisations that responded, but not people's personal names, addresses or other contact details.

Quality assurance

This consultation has been carried out in accordance with the government's consultation principles.

If you have any complaints about the way this consultation has been conducted, please email: beis.bru@beis.gov.uk.

1. Introduction

In the Clean Growth Strategy, the Government set an ambition to enable business and industry to improve energy efficiency by at least 20% by 2030. Clean Growth is one of the four grand challenges of the UK Government's Industrial Strategy and decarbonising heat is a vital part of this ambition. In June 2019, the UK committed in legislation to bring all greenhouse gas emissions to net-zero by 2050. There is demand for low-carbon heating solutions in the marketplace, for example as more local authorities declare climate emergencies and more consumers, both domestic and non-domestic, become concerned about their carbon impact.

Heat networks are well placed to play a key part in decarbonising heat and achieving net-zero commitments, due to their ability to serve a variety of consumers from a central heat source. Their carbon saving potential is further increased when they employ technologies which enable the use of low-carbon sources such as heat from energy from waste, waste heat from industry or environmental sources such as ground and river source heat. Section 5 covers the technologies in more detail, but to give an example of the potential that can be explored: in a 2013 report for the Mayor of London, Buro Happold estimated that 38% of London's heat demand at the time could be met from waste-heat recovery.[6]

There is also significant potential for the number and scale of heat networks to increase dramatically. It has been estimated that up to £22 billion of capital investment could be needed for heat networks to deliver their full contribution to net-zero[7]. We therefore need to consider how government interventions such as the Green Heat Network Fund can have a beneficial impact in terms of the supply chain, investment and overall market growth. In addition to this, we need to understand more about the financial drivers for heat networks to decarbonise and the whole-life costs that can underpin these.

A sustainable market must take account of consumers: how pricing regimes work for different types of consumer and how much additional value customers may see when supplied heat from low-carbon sources. We want to know more about this and about the barriers which can prevent networks from transitioning to low-carbon technologies. We would also welcome views on whether there are any incentives to decarbonisation which are not operating or functioning as intended.

We are also keen to ensure that the Green Heat Network Fund operates effectively and fairly. With this in mind, we would like to know your views on what makes a good scheme design, perhaps drawing on other schemes you are aware of. We would also like any analytical or statistical data you can provide, which will help us to gauge the potential effectiveness of the fund and help us to focus on achieving the key benefits.

We thank you in advance for your responses to the questions and requests for data in this document, which will help us to develop the Green Heat Network Fund.

[6] BuroHappold (2013), Secondary Heat Study- London's Zero Carbon Energy Resource
[7] IPPR (2017) Piping hot: The opportunity for heat networks in a new industrial strategy

2. Support for heat networks

Government support for heat networks has evolved over the years from help with early development of networks through to funding their construction. At the same time, work has been ongoing to develop a policy framework that enables a sustainable market. The key planks of government policy with respect to support for heat networks to date have been:

- The Heat Networks Delivery Unit (HNDU) in BEIS was set up in 2013 specifically to support local authorities in England and Wales through the early stages of heat network project development. Its remit has since expanded to include facilitating the delivery of a wider range of projects, both public and private, including in major housing developments and hospitals, and those utilising energy from waste heat sources. HNDU has invested over £20 million in grant funding to more than 200 projects across 140 local authorities.
- The Heat Networks Investment Project (HNIP), which began with a pilot in 2016, is investing up to £320 million to support the commercialisation and construction of heat networks in the public, private and third sectors across England and Wales, through the provision of capital grants and loans. It is expected that HNIP will leverage in approximately £1 billion of private and other investment. To date, we have announced over £70 million in funding to 12 projects from the main HNIP scheme, with more announcements in train.
- BEIS financial support for the development of heat networks is part of a wider programme of activity aimed at creating a sustainable market for district heating in the UK. 'Building a Market Framework', is the Heat Networks Market Framework consultation which BEIS launched on 6 February 2020. This sets out proposals designed to increase investment in the sector; ensure consumers on heat networks receive sufficient protections; develop technical standards and maximise the potential decarbonisation benefits of heat networks. The consultation closed on 1 June and responses are currently being considered.

The Green Heat Network Fund will represent the next logical stage in the direction of this policy, as it focusses on helping networks to move from lower-carbon to low-carbon heat generation. We are therefore looking to build on what has been learned from these initiatives, take account of recent market and technological developments and better ensure that a wide pool of investors can be encouraged to finance projects.

3. Supply chain opportunities

It has been estimated that up to £22 billion of capital investment is needed for the heat network market to deliver a full contribution towards meeting net-zero by 2050[8]. We recognise that in order to meet the objectives and bring about the maximum benefits for the Green Heat Network Fund, supply chains must be upskilled and scaled up.

[8] IPPR (2017) Piping hot: The opportunity for heat networks in a new industrial strategy

The near term published pipeline[9] shows over £1.7 billion of projects are coming forward, establishing the UK as one of Europe's growing new build heat network markets.

The continued expansion of the UK heat networks market is underpinned by over half a billion pounds of support from Government that will see the current UK supply chain stretched in terms of capability and capacity.

Continued Government support through HNIP, GHNF and, from 2022, the Heat Network Market Framework, gives businesses in the UK heat network supply chain certainty and the opportunity to make longer-term strategic investment decisions and expand their current UK offerings. Bringing in new investment, developing and testing new products and solutions and enhancing standardisation could speed up the development of the sector and may increase the value of heat networks to the UK economy. Examples of areas that could see value increase include:

- new jobs in design, engineering, manufacturing,
- reduced risk to projects through local capable deliver of solutions,
- reduced (capex[10]) through process innovation and standardisation,
- reduced capex costs through local volume solutions (reducing transportations costs, saving carbon emissions etc.), and
- enhanced UK supply chain using modern solutions that will allow the UK to export its capability and capacity across the worlds growing heat and cooling network industries.

We know there is significant potential for the number and scale of heat networks to increase. This expansion presents a substantial investment potential to investors and growth opportunities for the components of the heat network supply chain in the UK.

We are considering a range of options to support this development through the GHNF, taking into account previous capital support programmes. We would like to better understand the impact that the GHNF could have on the supply chain in terms of reduction in costs, enabling innovation and making processes such as procurement run more smoothly. We would like an understanding of what potential the GHNF has to increase UK business capability and capacity and e.g. enable businesses to plan their export strategy, having deployed leading technology and service solutions in the UK market.

Questions:

1. **What impact do you think that GHNF investment in projects could have on the supply chain in terms of e.g. risks and costs?**
2. **Do you think that GHNF investment in projects could give supply chain companies the confidence to stimulate investment in expanding their UK offering?**
3. **Which components of the supply chain would most benefit from GHNF investment in projects?**

[9] https://www.gov.uk/government/publications/hndu-pipeline
[10] Capital, operating and replacement expenditure for heat networks are referred to as "capex", "opex" and "repex", respectively, in this document.

4. **How can the GHNF help to encourage coordinated procurement (e.g. by stimulating standardisation, cost saving through volume, reducing costs for tendering in the supply chain and building stronger pipeline certainty)?**

5. **How can GHNF encourage continuous improvement of project design, construction and operation and ensure learnings are shared?**

   a). What innovation solutions could enable such sharing?

6. **How can GHNF target increased capability and capacity, offering to deliver lasting value to the UK?**

7. **How can we ensure there are lasting market benefits from the GHNF, looking at supply chain capability and capacity as well as socio-economic benefits?**

8. **How can the GHNF add value and bring about lasting supply chain benefits and a sustainable market?**

9. **What complementary activities alongside GHNF do you think would help to develop a sustainable heat network market in the UK?**

4. Financial drivers

Heat networks are a key technology to decarbonise heat and in high heat density areas can represent one of the most cost-effective means of decarbonising heat. However, the majority of existing heat networks have been fitted with natural gas combined heat and power (CHP) plants. The financial revenues achievable from selling electricity to the grid improve the commercial case for deployment.[11] We are therefore looking for evidence of the key financial drivers which could influence the sector to move toward low-carbon heating technologies, in place of the business as usual deployment of gas CHP.

With climate emergencies announced both nationally and locally, individuals, businesses and public sector buildings are re-evaluating what heat means to them. Heat supplied by a fossil based heat source such as natural gas or oil will not offer the carbon reductions required to achieve decarbonisation targets, particularly when compared to heat supplied by a low or zero carbon (LZC) source such as water source heat pumps, heat recovered from municipal/merchant incineration and wider heat recovered from industrial processes. With this re-assessment of the value of LZC heat may come an acceptance that gas can no longer be the comparator price for heat where the heat consumer is not a low-income household. It has been observed that some public and large commercial buildings are acknowledging the need to decarbonise now and showing a willingness to reflect that in the price they pay for heat.

Whilst a gas comparator might suggest a whole life cost of heat of 4-6p/kWh (accounting for purchase, installation, maintenance and ongoing fuel of a gas boiler), a LZC whole cost of heat may be higher depending on the technology and availability of higher grade waste heat. The economics of heat networks changes as the price of heat sold increases. We are keen to know

[11] www.gov.uk/government/publications/hndu-pipeline

to what extent you have observed a change in mindset with regards to the value of low-carbon heat and a willingness of public and large commercial consumers to consider paying for it.

We understand that certain forms of LZC heating technologies come at a greater cost to conventional gas heating or gas-fired CHP, where the value of electricity export can help offset the higher cost of the CHP engine. Technologies such as larger scale heat pumps that use non-conventional (in a UK context) heat sources such as mine water, waterways, marine, public sewers etc. may currently come at a premium due to a narrower supply chain and import requirements. As such, while there may evidently be a possibility for increased revenues, we feel that there is still a need to continue supporting the heat network sector in order to demonstrate the viability of large scale LZC heating technologies, as well as to help bring the core capital cost of projects down. This may be done through the increased volume of projects delivered and by continuing to demonstrate a strong and growing pipeline of projects.

Questions:

10. **Can you provide evidence for or against the observations made with regards to anchor load buildings', be they public or private sector, and willingness to pay more for low or zero-carbon heat relative to a fossil fuel alternative?**

11. **Can you provide high-level information on the size and scale of your heat network (i.e. generation capacity, buildings connected, and distribution network length) and define what proportion of capex goes on i) generation ii) distribution and in a fossil fuel and LZC example (or scenario if you don't have LZC assets)?**

    a). Can you provide the same on iii) operating revenues and expenditure, including fuel pricing and foregone revenues, in a fossil fuel and LZC example?

12. **To what degree do new networks which have secured funding (e.g. from subsidy) for generation still need other investment in infrastructure and distribution?**

13. **If an existing network replaces CHP with a low or zero-carbon alternative, what additional cost does that create in terms of the distribution network?**

14. **What do you consider to be the key factors driving heat network capital costs and to what extent could the GHNF in part help to bring these down?**

15. **Can you provide evidence on input electricity costs (for electrically driven heat networks) and the extent to which these can be reduced? i.e. the cost (p/kWh) itself and 'smart' optimisation: bulk purchasing (aggregation across a portfolio), PPAs (including virtual and sleeving), thermal & battery storage, time of day tariffs, demand side response, load shifting etc.**

16. **Can you provide evidence, e.g. in the form of examples, that, if a more competitive and tailored electricity purchasing framework were available to heat networks, projects would be able to access this without compromising existing commercial arrangements?**

17. **Can you provide any evidence that previous capital funding - e.g. in the form of capital grants from other funding streams - was sufficient to enable heat networks to decarbonise? What challenges, if any, were found?**

18. **What additional financial incentives do you believe can be accessed by networks using low or zero-carbon generating technologies e.g. demand side response, access to regional funds, levy avoidance, etc.**

5. Technology options for heat network decarbonisation

The aim of the GHNF is to decarbonise heat networks through the utilisation of low-carbon technologies, decreasing the carbon intensity of heat supplied and achieving carbon savings. We are therefore seeking the market's help in highlighting viable technologies that are likely to feature in application bids for the GHNF. What we are looking for are low-carbon technologies that meet the overall objectives of the fund and adhere to existing regulations, for example, rules around air quality standards.

We have listed below a range of prospective low-carbon technologies which we anticipate may feature in applications to the scheme. The list is not exhaustive or prescriptive and is intended as a guide only. We are asking stakeholders what types of low-carbon technologies they see as viable options for prospective GHNF projects. We would like to understand the breakdown of type of technology, the most common type and the most cost-effective technology stakeholders envisage being most likely to come forward.

Identified prospective technologies

- Heat pumps-ground
- Heat pumps-water
- Heat pumps-air
- Heat pumps-mine water
- Heat pumps-sewer
- Ambient networks
- Shared ground loops
- Energy from waste
- Hydrogen fuel cells
- Biomass - subject to the required air quality and sustainability standards
- Biogas - subject to required sustainability standards
- Deep geothermal
- Industrial processes with waste heat recovery
- Solar thermal

Questions:

19. **Of the low-carbon technology options covered, are there any which you think will play a particularly significant role in heat network decarbonisation i.e. be used more predominantly than others?**

20. **Are there any other low-carbon sources of heat or technology options that could be used by heat networks which we have not covered?**

21. **Are there any advantages or disadvantages associated with these technologies, e.g. cost, availability or ease of deployment?**

22. **What are the key drivers that will lead heat networks to transition to low-carbon heating technologies? Can you provide any evidence to support this?**

23. **Can you provide evidence as to the wider environmental impacts of these technologies e.g. in terms of trees felled, release of methane, use of refrigerants etc?**

6. Consumer pricing and protection

In the UK there are approximately 480,000 customers spread across approximately 12,000 communal heat networks (serving only one building) and 2,000 district heat networks (serving multiple buildings)[12].

In 2018 the Competition and Markets Authority concluded its market study[13] into heat networks and found that many consumers are supplied heat at comparable consumer standards and price to the gas and electricity markets. This was supported by our own consumer survey in 2017 which reported positive satisfaction among the majority of people living on a heat network.[14]

However, as the UK now looks to the decarbonisation of the heat network industry, more information is needed from the market to analyse the effects of decarbonisation on consumers.

We are considering what types of counterfactual heat supply could be used for the GHNF. These would be examples against which the application would be compared in terms of benefits and consumer detriment. The criteria against which a scheme's counterfactual is determined are still to be developed pending information from this call for evidence. Counterfactuals will allow for appropriate and consistent evaluation of applications and would be designed to limit detriment to consumers and prevent potential fuel poverty. We are looking for existing evidence available within the market to demonstrate the effect of existing pricing structures on consumers, and for data surrounding how pricing structures and counterfactuals are currently being calculated for heat networks.

[12] https://www.gov.uk/government/publications/energy-trends-march-2018-special-feature-article-experimental-statistics-on-heat-networks
[13] https://www.gov.uk/cma-cases/heat-networks-market-study
[14] Heat Networks Consumer Survey: consumer experiences on heat networks and other heating systems (2017)

Questions:

24. **How do you derive your prices for consumers? We are particularly interested in how you derive a connection charge, and fixed and variable prices. If you use a counterfactual, what is it?**

25. **Does your counterfactual differ geographically and/or e.g. between type of load, new-build and existing properties, etc.? If so, how?**

26. **Does your pricing structure distinguish between different types of customer and the range of benefits they receive? If so, how?**

27. **Are there barriers to agreeing a pricing structure with different consumer types? If so, please describe them.**

28. **Do your business models currently take account of consumer detriment? If so, how?**

29. **Are you able to provide evidence that customers are creating demand for low-carbon heat?**

30. **Can you provide an example of heat as a service, the role that heat quality plays and how this is then presented against a counterfactual?**

31. **Can you summarise any evidence that moving to low-carbon heat generation has had an impact on consumer standards for heat networks e.g. has it affected their performance against Heat Trust standards?**

7. Barriers and misaligned incentives

We understand that many heat networks face barriers to deployment, these can differ across types of heat network generation technology; a heat network with an air source heat pump faces very different challenges to one with an energy from waste plant. Barriers can also differ depending on the location of a heat network; networks in rural areas face different challenges to those in high density urban areas. Through initial scoping, we have identified barriers relating to commercial issues, financial issues, technical issues and the supply chain. We want to ensure that the scheme helps to overcome as many of these as possible. We would welcome your thoughts on any barriers that heat networks face when decarbonising and on which ones you feel are the most significant and important to address.

We also understand that whilst large city-scale concessions have been successful in deploying heat networks at scale, some existing arrangements lack sufficient incentives to expand and/or decarbonise networks in today's market. This is particularly evident where there is no certainty of operation beyond the short-term and the economic case to expand or decarbonise requires a longer-term investment decision.

Furthermore, there are likely to be a set of ancillary common challenges beyond the cost of re-planting a generation asset. These may include: decreasing case for carbon savings from gas CHP engines; loss of private wire revenues; current tariffs/pricing structures (against a gas counterfactual); secondary or tertiary heat network upgrades to enable lower temperature

supply; cost of grid re-enforcements (if necessary) and the higher input cost of electricity (where relevant) compared to gas. We would be keen to have more evidence on how the factors listed above, or others are likely to affect the ability of heat network operators to adopt low-carbon technologies and expand their networks further. We would also like to know whether you believe that there are any incentives currently in place that are not working in a way that would facilitate the decarbonisation of heat networks.

Questions:

32. **Can you provide evidence on the following (we are specifically looking to operators of larger gas CHP existing networks for this information)?**

    a). Whether the contractual length and scope of existing heat network operational arrangements (concession or otherwise) incentivise or inhibit the longer-term decisions decarbonise and expand heat networks?

    b). Whether the scope of existing heat network operational arrangements (concession or otherwise) limit the ability to access third-party heat (I.e. recovered or industrial heat)?

    c). Whether reliance on private wire revenues inhibits a network's ability to decarbonise and/or locks in a particular type of heat generation (i.e. other CHP technologies)?

    d). Whether secondary or tertiary upgrades will be required to enable lower carbon forms of heat and the indicative cost of these upgrades?

    e). Are tariffs pegged to the price of gas? If so, is there scope to legitimately peg them to low or zero-carbon generation in future?

    f). Whether grid re-enforcement costs are an opportunity or barrier to the decarbonisation of networks at a project level, and the indicative cost of these upgrades? Is this considered a 'cost' due to reinforcement or a 'revenue' due to avoided costs of reinforcement under an electrification of heat pathway?

33. **Can you provide us more information on distinguishable differences (both opportunities and challenges) which arise from constructing new low carbon heat networks, as opposed to decarbonising existing heat networks?**

34. **What other factors do you believe act as barriers to heat network decarbonisation?**

35. **Which are the most prominent barriers?**

36. **Can you provide examples of what you believe are misaligned incentives that act against heat network decarbonisation?**

37. **Which of these barriers do you believe would not be addressed by a funding intervention?**

38. **Do you have any examples of either a) barriers or b) misaligned incentives that could be impeding producers of waste heat from utilising it for the provision of low or zero-carbon heating?**

39. **Can any of the barriers that are not addressed by funding, be addressed outside of the fund by accompanying/supporting activity? If so, can you suggest how?**

8. Scheme best practice

A support scheme such as the Green Heat Network Fund needs to have an effective design. It needs to operate efficiently, make funding decisions fairly and have a solid set of criteria for determining eligibility, assessing applications and awarding support to successful applicants. It also must have effective safeguards against fraud and gaming and ensure that it is auditable, transparent and provides good value for the taxpayer's money.

In section 2 we covered HNDU and HNIP as these are the two schemes which are specifically set up to support heat networks across England and Wales. Many participants currently in the heat networks sector will be familiar with these schemes, may have applied for support from them, may be receiving support from them or are contemplating applying to them. However, we know that there are other support schemes run by central or local government, or by other bodies, which might provide examples of good practice that could be adopted in the design of the Green Heat Network Fund. We would therefore welcome you sharing your knowledge of those schemes with us.

Questions:

40. **What funding schemes do you believe have worked well in the past? Are there any lessons learned from them that should be adopted for GHNF? These can be any schemes – not just ones run by the government or specifically related to energy/heat.**

41. **What criteria do you feel eligibility and scoring should be predominantly based upon?**

42. **What lessons could be learned from HNIP and what changes do you feel should be implemented in the design of the GHNF to reflect these lessons learned?**

9. Project pipeline development

To be successful, a funding scheme requires a good pipeline of potential applicants. BEIS publishes a quarterly Heat Networks Pipeline[15] on Gov.uk which brings together heat networks investment opportunities in England and Wales. This is based on information supplied by project developers. It covers projects that have been supported through the development stages by HNDU and those that are seeking support for commercialisation and construction from HNIP. We would like to expand our understanding of the pipeline of heat network projects (both new and existing) that could potentially transition to low-carbon heat generation, if there were support available for them to do so.

[15] https://www.gov.uk/government/publications/hndu-pipeline

We would also like to ensure that there is continuity between HNIP and GHNF and to ensure that the pipeline we have reflects projects which, while they have expressed an interest in applying for HNIP, may also potentially be suitable for GHNF. With this aim in mind, we have also developed a pipeline questionnaire which can be found on Citizenspace (https://beisgovuk.citizenspace.com/heat/pipeline-questionnaire) as part of this call for evidence. We would be grateful if potential applicants for GHNF support could complete this alongside their response to the call for evidence.

Questions:

43. **What does the industry need to ensure an effective pipeline for 2022?**

44. **What worked well from HNIP and HNDU and what areas could be improved?**

45. **How can we ensure continuity and a smooth transition between the two schemes?**

10. Analysis

As part of the scheme development we will estimate the value for money of the Green Heat Network Fund, valuing costs and benefits relating to the fund. We will have to make a range of assumptions in our modelling, such as: the type of heat networks that will apply, what technologies they will use, the cost and performance of them and the financial viability of different technologies. Our current evidence base builds on a number of different sources, including, HNIP, HNDU projects and a range of previous stakeholder engagement. Despite this, there are still several evidence gaps, particularly in relation to some of the lower carbon technologies which are less prominent on a large scale in the UK.

To ensure our modelling is as robust as possible, we would welcome any information on the below questions to improve our current evidence base.

Questions:

46. **Based on current and expected heat network projects, with GHNF funding would you expect to bid for funding to build new heat networks or to retrofit an existing network with low carbon generation?**

47. **We would welcome any evidence on networks costs, both capex and opex, and whether using £/KWh or £/meter is the most effective way to estimate these.**

48. **What is the current technology mix of your heat networks and do you have any evidence on how this will change in the next five years?**

49. **Are your existing or planned heat network projects a) standard heat networks, b) ambient heat networks, c) shared ground loops or d) communal networks?**

50. **In Table 1 below, please provide any available evidence on cost, performance and lifetimes of the technologies listed (the table should be used merely as a guide, we are happy to accept alternative/additional evidence if it does not fit the table).**

Table 1: Evidence on Heat Network generation technology

	Coefficient of Performance (%)	Generation Capex (£/KW (th))	Generation Opex (£/KWh (th) per year)	Load Factor (%)	Economic lifetime of asset (years)
Air Source Heat Pump					
Water Source Heat Pump					
Ground Source Heat Pump					
Mine water heat pump					
Sewer Heat Pump					
Energy from Waste					
Waste heat recovery					
Solar Thermal					
Biomass					
Biogas					
Hydrogen fuel cells					

Annex A: Consolidated list of questions

1. **What impact do you think that GHNF investment in projects could have on the supply chain in terms of e.g. risks and costs?**

2. **Do you think that GHNF investment in projects could give supply chain companies the confidence to stimulate investment in expanding their UK offering?**

3. **Which components of the supply chain would most benefit from GHNF investment in projects?**

4. **How can the GHNF help to encourage coordinated procurement (e.g. by stimulating standardisation, cost saving through volume, reducing costs for tendering in the supply chain and building stronger pipeline certainty)?**

5. **How can GHNF encourage continuous improvement of project design, construction and operation and ensure learnings are shared?**

   a). What innovation solutions could enable such sharing?

6. **How can GHNF target increased capability and capacity, offering to deliver lasting value to the UK?**

7. **How can we ensure there are lasting market benefits from the GHNF, looking at supply chain capability and capacity as well as socio-economic benefits?**

8. **How can the GHNF add value and bring about lasting supply chain benefits and a sustainable market?**

9. **What complementary activities alongside GHNF do you think would help to develop a sustainable heat network market in the UK?**

10. **Can you provide evidence for or against the observations made with regards to anchor load buildings', be they public or private sector, and willingness to pay more for low or zero-carbon heat relative to a fossil fuel alternative?**

11. **Can you provide high-level information on the size and scale of your heat network (i.e. generation capacity, buildings connected, and distribution network length) and define what proportion of capex goes on i) generation ii) distribution and in a fossil fuel and LZC example (or scenario if you don't have LZC assets)?**

    a). Can you provide the same on iii) operating revenues and expenditure, including fuel pricing and foregone revenues, in a fossil fuel and LZC example?

12. **To what degree do new networks which have secured funding (e.g. from subsidy) for generation still need other investment in infrastructure and distribution?**

13. **If an existing network replaces CHP with a low or zero-carbon alternative, what additional cost does that create in terms of the distribution network?**

14. **What do you consider to be the key factors driving heat network capital costs and to what extent could the GHNF in part help to bring these down?**

15. **Can you provide evidence on input electricity costs (for electrically driven heat networks) and the extent to which these can be reduced? i.e. the cost (p/kWh) itself and 'smart' optimisation: bulk purchasing (aggregation across a portfolio), PPAs (including virtual and sleeving), thermal & battery storage, time of day tariffs, demand side response, load shifting etc.**

16. **Can you provide evidence, e.g. in the form of examples, that, if a more competitive and tailored electricity purchasing framework were available to heat networks, projects would be able to access this without compromising existing commercial arrangements?**

17. **Can you provide any evidence that previous capital funding - e.g. in the form of capital grants from other funding streams - was sufficient to enable heat networks to decarbonise? What challenges, if any, were found?**

18. **What additional financial incentives do you believe can be accessed by networks using low or zero-carbon generating technologies e.g. demand side response, access to regional funds, levy avoidance, etc.**

19. **Of the low-carbon technology options covered, are there any which you think will play a particularly significant role in heat network decarbonisation i.e. be used more predominantly than others?**

20. **Are there any other low-carbon sources of heat or technology options that could be used by heat networks which we have not covered?**

21. **Are there any advantages or disadvantages associated with these technologies, e.g. cost, availability or ease of deployment?**

22. **What are the key drivers that will lead heat networks to transition to low-carbon heating technologies? Can you provide any evidence to support this?**

23. **Can you provide evidence as to the wider environmental impacts of these technologies e.g. in terms of trees felled, release of methane, use of refrigerants etc?**

24. **How do you derive your prices for consumers? We are particularly interested in how you derive a connection charge, and fixed and variable prices. If you use a counterfactual, what is it?**

25. **Does your counterfactual differ geographically and/or e.g. between type of load, new-build and existing properties, etc.? If so, how?**

26. **Does your pricing structure distinguish between different types of customer and the range of benefits they receive? If so, how?**

27. **Are there barriers to agreeing a pricing structure with different consumer types? If so, please describe them.**

28. **Do your business models currently take account of consumer detriment? If so, how?**

29. **Are you able to provide evidence that customers are creating demand for low-carbon heat?**

30. **Can you provide an example of heat as a service, the role that heat quality plays and how this is then presented against a counterfactual?**

31. **Can you summarise any evidence that moving to low-carbon heat generation has had an impact on consumer standards for heat networks e.g. has it affected their performance against Heat Trust standards?**

32. **Can you provide evidence on the following (we are specifically looking to operators of larger gas CHP existing networks for this information)?**

    a). Whether the contractual length and scope of existing heat network operational arrangements (concession or otherwise) incentivise or inhibit the longer-term decisions decarbonise and expand heat networks?

    b). Whether the scope of existing heat network operational arrangements (concession or otherwise) limit the ability to access third-party heat (I.e. recovered or industrial heat)?

    c). Whether reliance on private wire revenues inhibits a network's ability to decarbonise and/or locks in a particular type of heat generation (i.e. other CHP technologies)?

    d). Whether secondary or tertiary upgrades will be required to enable lower carbon forms of heat and the indicative cost of these upgrades?

    e). Are tariffs pegged to the price of gas? If so, is there scope to legitimately peg them to low or zero-carbon generation in future?

    f). Whether grid re-enforcement costs are an opportunity or barrier to the decarbonisation of networks at a project level, and the indicative cost of these upgrades? Is this considered a 'cost' due to reinforcement or a 'revenue' due to avoided costs of reinforcement under an electrification of heat pathway?

33. **Can you provide us more information on distinguishable differences (both opportunities and challenges) which arise from constructing new low carbon heat networks, as opposed to decarbonising existing heat networks?**

34. **What other factors do you believe act as barriers to heat network decarbonisation?**

35. **Which are the most prominent barriers?**

36. **Can you provide examples of what you believe are misaligned incentives that act against heat network decarbonisation?**

37. **Which of these barriers do you believe would not be addressed by a funding intervention?**

38. **Do you have any examples of either a) barriers or b) misaligned incentives that could be impeding producers of waste heat from utilising it for the provision of low or zero-carbon heating?**

39. **Can any of the barriers that are not addressed by funding, be addressed outside of the fund by accompanying/supporting activity? If so, can you suggest how?**

40. **What funding schemes do you believe have worked well in the past? Are there any lessons learned from them that should be adopted for GHNF? These can be any schemes – not just ones run by the government or specifically related to energy/heat.**

41. **What criteria do you feel eligibility and scoring should be predominantly based upon?**

42. **What lessons could be learned from HNIP and what changes do you feel should be implemented in the design of the GHNF to reflect these lessons learned?**

43. **What does the industry need to ensure an effective pipeline for 2022?**

44. **What worked well from HNIP and HNDU and what areas could be improved?**

45. **How can we ensure continuity and a smooth transition between the two schemes?**

46. **Based on current and expected heat network projects, with GHNF funding would you expect to bid for funding to build new heat networks or to retrofit an existing network with low carbon generation?**

47. **We would welcome any evidence on networks costs, both capex and opex, and whether using £/KWh or £/meter is the most effective way to estimate these.**

48. **What is the current technology mix of your heat networks and do you have any evidence on how this will change in the next five years?**

49. **Are your existing or planned heat network projects a) standard heat networks, b) ambient heat networks, c) shared ground loops or d) communal networks?**

50. **In Table 1 below, please provide any available evidence on cost, performance and lifetimes of the technologies listed (the table should be used merely as a guide, we are happy to accept alternative/additional evidence if it does not fit the table).**

This consultation is available from: www.gov.uk/government/consultations/designing-the-green-heat-network-fund-call-for-evidence

If you need a version of this document in a more accessible format, please email enquiries@beis.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.