Department for Energy Security & Net Zero

Green Heat Network Fund

Evaluation of the Green Heat Network Fund Transition Scheme

Final report

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Glossary

BEIS – The Department for Business, Energy and Industrial Strategy (now dissolved).

Commercialisation (of heat networks) – Activities that progress heat network projects from concept designs (RIBA 2 or equivalent) to detailed design stage (or equivalent) and arrange necessary contracts and agreements to enable subsequent heat network construction and operation (e.g., energy supply agreements, customer supply agreements, bulk sale agreements, planning permissions, utility connections, infrastructure delivery contracts, commitment of non-GHNF funding).

Construction (of heat networks) – Activities to build heat networks to get to a stage where networks are operational, including construction mobilisation, construction of energy centre and pipework, customer connections.

DESNZ – The Department of Energy Security and Net Zero (inaugurated in February 2023 as a result of the restructuring of the Department for Business, Energy and Industrial Strategy).

DPD – Detailed Project Development stage

Energy from Waste (EfW) – A facility that combusts municipal waste and harnesses the heat to generate electricity. Heat left after this process can be distributed via a Heat Network.

Gated Metrics – The core eligibility metrics of the GHNF that determine whether or not an application qualifies for funding subject to a deliverability assessment. The calculation of gated metrics and resulting outcome values are available to applicants on applying, providing transparency to projects on whether or not they meet GHNF requirements. Gated metrics include the maximum carbon intensity of thermal energy supplied (carbon gate), the social internal rate of return, the minimum heat demand met by the network (in the first five years from first connection), and the total grant (pence) available per KWh of heat delivered to customer.

Green Heat Network Fund (GHNF) – The Green Heat Network Fund is a three-year, £288 million capital grant fund that opened to applicants in March 2022 to provide support to commercialise and construct low-carbon heat networks.

Heat Network Transformation Programme (HNTP) – Encompasses a range of Government interventions which aim to continue to develop and grow the heat network market and to address some of the challenges of decarbonising the UK's heat sector.

Heat Network – A heat network is a distribution system of insulated pipes that take heat from a central source ("energy centre") and delivers it to a number of domestic or non-domestic properties.

Heat Networks Delivery Unit (HNDU) – This DESNZ team provides support and guidance to local authorities in England Wales who wish to explore heat network opportunities.

Heat Networks Investment Project (HNIP) – The previous Government capital grant fund for heat networks, providing £320 million of capital funding to gap fund projects in England and Wales.

Main Scheme – See 'Green Heat Network Fund' above. The GHNF Main Scheme refers to the £288 million capital grant fund, as opposed to the interim £10 million GHNF Transition Scheme.

Market Transformation Commitments (MTC) – As part of the grant award to projects, they will be required to deliver against a series of specific 'Market Transformation Commitments to ensure that the GHNF investment benefits the whole market.

Transition Scheme – The GHNF Transition Scheme was launched in the interim period between HNIP concluding and GHNF launching its full scheme (in March 2022), comprising £10 million in grants to aid commercialisation.

Triple Point – Triple Point Heat Networks Investment Management (Triple Point) has been contracted by BEIS to deliver the Green Heat Network Fund.

Executive Summary

Introduction

RSM UK, supported by ACE-Research, CAG Consultants and Winning Moves, have been appointed by the Department for Energy Security and Net Zero (DESNZ) to evaluate the **Green Heat Network Fund** (GHNF). The GHNF is designed to incentivise the heat network market transition to low carbon heat sources via targeted financial support, to stimulate the deployment of low carbon technologies. To achieve this - and be different to the preceding Heat Networks Investment Project (HNIP) - GHNF requires projects to be low-carbon.

This report provides an evaluation of the **GHNF Transition Scheme**. The Transition Scheme ran from June 2021 to March 2022. It was set up as an interim measure between the arrival of the Green Heat Network Fund Main Scheme (and wider Heat Networks Transformation Programme[1]) and the conclusion of Heat Network Investment Project (HNIP) scheme. The Transition Scheme had a budget of £10 million for grants to applicants and comprised two application rounds opening in early July and late August 2021, respectively. It was administered in-house by the Department for Energy Security and Net Zero (DESNZ); formerly the Department for Business, Energy and Industrial Strategy (BEIS).

The Transition Scheme was designed to act as an enabler for the GHNF Main Scheme, recognising the long timeframes it can take for projects to commercialise and be ready to begin construction. It only provided grant funding for commercialisation activities, and it aimed to build a pipeline of construction-ready projects in time for the launch of the GHNF Main Scheme. It funded up to, but not including, 50% of a project's total combined commercialisation and construction costs.

In total, **seven projects** were funded by the GHNF Transition Scheme, representing a total of £4.74 million investment. The projects included three local authority-led projects, two university-led projects and two private sector projects.

The **purpose of this evaluation** is to assess the processes and impacts of the GHNF Transition Scheme. The process evaluation seeks to understand how effectively the Transition Scheme was designed and delivered, building on learnings from HNIP and feeding into the ongoing evolution of the Main Scheme. The impact evaluation considers what benefits and outcomes can be attributed to the Transition Scheme, how, for whom, and under what circumstances these impacts were realised, and how behaviour is changing. The evaluation report will be made available publicly, to provide transparency for this large capital scheme.

It should be noted when interpreting the results below that the Transition Scheme is materially smaller than the Main Scheme in its level of funding and had a shorter timeframe for support.

[1] The Heat Networks Transformation Programme is a collection of projects designed to support a sustainable heat networks market, a part of which is the GHNF.

As a result, limited wider impact, for example on the heat network market, is expected at this stage.

Evaluation Methodology

The evaluation consortium has been appointed to evaluate the GHNF over its full lifetime, focusing on the Transition Scheme in Phase two of the evaluation (current phase, November 2022 to March 2023) and the Main Scheme in Phases three and four (May 2023 to March 2027).[2] This report reflects a **process and impact evaluation** of the GHNF Transition Scheme. The **process evaluation** looked at: the design and delivery of the scheme; the support and guidance from BEIS; project experience of application and the barriers faced; project experience of commercialisation and the barriers faced. The **impact evaluation** focused on the impacts for the GHNF Main Scheme; on applicant and participant organisations; on the wider market; and on BEIS. Both were based on a theory of change and evaluation questions (see Annex 1: Evaluation Questions and Annex 2: Transition Scheme Theory of Change).

Data has been collected via interviews (using Microsoft Teams) with **GHNF Transition Scheme participants[3], unsuccessful applicants, and non-applicants,** and, through group discussions with **BEIS representatives**. The interviews and group discussions took place during January and February 2023.

The impact evaluation also incorporated **realist interviews** with applicants and successful projects, to explore how different types of actors (organisations) responded to the resources provided by the Transition Scheme and how this led to different outcomes in different circumstances (see Annex 5: Realist Analysis).

Process Evaluation Findings

The following draws together our findings to answer the core process evaluation question of ‘what works and what doesn’t work, for whom and in what context?’

Scheme Design

What worked well:

- The **low-carbon requirement** was not deemed by any stakeholder (applicant, non-applicant, BEIS) to be a barrier to entry or something that projects changed their design for. Although motivations for decarbonisation varied by organisation type (Net Zero ambitions, planning policies, reputation, added value) in all cases projects were already planning a low-carbon network prior to the Transition Scheme funding.

[2] Phase one of the evaluation involved evaluation scoping and set up to enable the future phases of work
[3] Those who successfully applied to the GHNF Transition Scheme and participated in it.

- No project had any concerns with the **Market Transformation Commitments**, with evidence that they will align with social value and sustainability goals across organisations. In practice, it was too soon for evidence to emerge on delivering against the commitments specifically, but in principle, no participant reported a challenge.

What worked less well:

- For all stakeholders (BEIS, Participants, Unsuccessful Applicants, Non-Applicants) the **tight deadlines and short delivery window** represented a significant challenge. The knock-on effects of short deadlines were felt across the Transition Scheme and included: acting as a barrier to application; reducing the scope of commercialisation works able to be completed for projects; limiting the amount of grant that it was possible to spend (because of procurement timeframes, third-party project delivery). Tight delivery timeframes were most acutely felt by local authority participants due to more complex governance arrangements.

Scheme Delivery

What worked well:

- BEIS was able to deliver a successful scheme in-house where **time was too limited** to onboard a delivery partner.
- The Transition Scheme has been valuable as a **learning process and pilot scheme,** informing the design of the Main Scheme e.g., supporting the update of metrics and criteria, designing Market Transformation Commitments, ensuring effective on-boarding of delivery partners and providing case studies of best practice.
- No **recurring procedural blocks** were identified in how projects mobilised from funding offer to delivery. Evidence found that, compared to public sector applicants, private sector applicants were able to mobilise more quickly, given they had dedicated teams and relatively straightforward approvals processes.

What worked less well:

- The **limited dedicated BEIS time-resource** for the scheme posed a significant challenge to its successful delivery. The teams involved in delivery were generally felt to be suitably skilled to deliver the Transition Scheme, and where skills and experience required augmenting, elements were contracted out (i.e., application assessment, stakeholder engagement and communications). However, the actual delivery burden had been underestimated and the resource dedicated to delivery was not sufficient to ensure the process was as smooth and effective as it could have been. Although there was limited evidence of projects feeling the effects of this, a minority of projects reported a lack of clarity in requirements and to some extent broken lines of communication.
- Sending **offers of funding too close to Christmas** meant that projects faced additional hurdles to mobilise quickly due to office closures and annual leave of decision-makers.
- Public sector respondents had more trouble understanding and **completing financial reporting.**

Application and Criteria

What worked well:

- The **application process** - although described by even the most experienced of applicants as a challenge to get all the required information in order - was broadly commended as being smooth, logical, transparent, and proportional to the grant requested, and for those with experience of both, an improvement on the HNIP application. Even for non-applicants, the actual process of application was not cited as a barrier to entry. Where projects had prior application experience (e.g., HNIP) or had completed robust feasibility work, the application process was made more straightforward.
- The **application criteria** were found by participants and BEIS respondents to appropriately minimise gaming and led to deliverable projects across applicant types, requiring only minor tweaks to meet metrics. The change in criteria between round one and two (moving from a gated metric of a maximum of 3.33 pence of grant per kWh of heat to 4.5 pence of grant per kWh of heat) of the Transition Scheme has improved the accessibility of the scheme to more innovative heat sources.
- Projects were found to be most successful at application and commercialisation stages when **previous feasibility work** was completed to a high technical standard.

What worked less well:

- Only Local Authorities and Universities are represented in the scheme's public sector applicants and specific challenges were highlighted for **NHS Trusts**. NHS Trusts have not had the same level of influencing and 'hand-holding' as local authorities (e.g., from HNDU), and strategic conversations (e.g., between Trusts and Local Authorities, BEIS and the Department for Health and Social Care) are not happening, meaning Trusts aren't considering heat network projects. Issues with Capital Departmental Expenditure Limits (CDEL) limits including decarbonisation investment were also posited as barriers.
- One challenge, to be explored further in the early stages of the GHNF main scheme evaluation, was the possibility that the **application criteria** were **holding back more innovative or larger heat network projects**. Concerns were raised that the deliverability assessment may dampen ambitions. Others suggested that the 4.5 pence per kWh was still a barrier for deep mine water projects given project uncertainties, cost of drilling, and need for contingency. In addition, some non-applicants found the Social Internal Rate of Return (IRR) too high for their project, until they were able to demonstrate feasibility.
- A small number of projects raised concerns that **external factors would prevent them meeting Main Scheme criteria**. One identified capital cost increase as increasing the burden on the sponsor organisation given the percentage capex limits. Another project highlighted delays in wider capital projects limiting the amount of heat load that the network could service in the first 5-10 years, making the project not financially viable based on the grant that could be awarded.

- For smaller schemes, evidence suggests that the **cost of application** was a barrier to applying for funding. This edged out smaller and rural schemes as well as applicants with less resource to undertake application work.
- For **more complex heat networks** (e.g., heat networks that are part of a wider low-carbon development), applicants faced difficulties in supplying the information needed to meet with the application requirements.

Communications and Guidance

What worked well:

- The **communications and support** received from BEIS was perceived by participants to be appropriate, timely, accessible and had positive impacts on their projects (i.e., in relation to signposting participants to information that influenced their project). Participants were more likely to respond positively regarding the communications and support they received where their experience of commercialisation was more straightforward, and they were broadly able to meet their project objectives.

What worked less well:

- Where projects experienced difficulties during commercialisation, these participants were more likely to report challenges with **communications and support from BEIS.** These projects highlighted issues of uncertainty (i.e., regarding changes and extensions), lack of clarity around points of contact, and delays in communication. As such, these projects required greater input from BEIS (e.g., decisions on extensions to projects). It is unclear to what extent this is a consequence of project extensions into the Main Scheme delivery timeframe.

Project Commercialisation

What worked well:

- Funding enabled projects to **progress towards final investment decisions** at an earlier stage than would have been possible, ensuring project momentum did not dissipate.

What worked less well:

- **Tight timescales** for projects to complete project activities. Some projects were unable to complete commercialisation activities within the original Transition Scheme timeframe and either had to request project extensions, or not draw down the full grant award, instead funding remaining commercialisation works from their organisations' reserves.
- **Applicant over-optimism** with budgets and timings was not fully identified and rectified at application stage, causing challenge and frustration to those delivering the scheme.
- Where heat networks are planned in areas that are electricity constrained, there is a challenge to identifying a suitable source of low carbon heat that is feasible within the timeframes of GHNF.

Impact Evaluation Findings

The following presents our key findings on the emerging impacts of the Transition Scheme, how they were achieved, for whom, when, and what contextual factors applied. GHNF applicants refers to all organisations that made an application to the Transition Scheme, and GHNF participants refers to those organisations which were successful in their application and participated in the Transition Scheme.

For GHNF applicants:

- For all applicants, the Transition Scheme **did not, in itself, cause applicants to switch from proposing a fossil-fuel-powered heat network scheme** to a low carbon heat network scheme. Applicants had already made this decision at an earlier stage. In some cases, applicants mentioned that HNIP rules about pathways to decarbonisation, and the general availability of future funding for low carbon heat networks, had contributed to these earlier decisions.
- The Transition Scheme led to a number of projects applying **to undertake commercialisation work earlier than they otherwise would**, where they would not have had access to other commercialisation funding within the next 12 months.
- For Transition Schemes applicants where other commercialisation funding might have been available, there were **still advantages to Government grant funding** that motivated project teams to apply. Gaining Government grant funding was reported to increase in the credibility of projects (in the eyes of senior management and other potential funders/investors), increase the possibility for raising match funding and reduce the need for more costly loan funding.
- There was evidence that the Transition Scheme application process helped applicants (whether successful or not) to **gain experience and gather information that would support an eventual Main Scheme application**.

For GHNF participants:

- Through Transition Scheme-funded activities, all participants were able to progress their commercialisation work - at least to some degree - **towards a final investment decision**. However, further commercialisation work was needed in all cases to reach a final decision.
- All participants reported securing Transition Scheme funding had played, or would play, a role in **building the credibility of their scheme** with project stakeholders (internal or external).
- Transition Scheme participants reported that **they developed capability and knowledge about low carbon heat networks** through their involvement in the Transition Scheme. Where Transition Scheme participants were not already specialists in heat network development, capability and knowledge gains were achieved primarily through their interactions with external consultants involved in the application or commercialisation process. For those already specialist in this field, there was evidence

that capabilities developed as a result of signposting by BEIS project staff and increased networking opportunities.

- For **participants**, the Transition Scheme improved the capability and knowledge about heat networks of those not already specialist in this field, and for those with already sufficient heat network expertise, it provided signposting from BEIS staff to improve their project delivery.

For BEIS:

- The Transition Scheme demonstrated the capability of BEIS Teams to deliver a scheme of this nature, and improved cross-departmental relationships. There was some evidence of upskilling within the team to deliver schemes of this sort.
- The Transition Scheme set the Main Scheme up for a stronger first year of delivery than might otherwise have been possible, ironing out any challenges and refining criteria, requirements and delivery.
- The Transition Scheme socialised the GHNF amongst stakeholders and provided confidence to the wider market of the support. It did not achieve its full ambition of construction-ready projects to apply for round one of the Main Scheme but has built a wider momentum.

For the Wider Market:

- Learnings and impacts were constrained by the limited engagement at the Transition Scheme stage with consumers, supply chains and investors. Although not fully explored by the evaluation, willingness amongst consumers to connect to heat networks seemed to be driven by concerns about energy prices as a result of the wider energy bill crisis context, rather than the attraction of low carbon heat networks per se. The amount of funding and limited opportunity for open tenders constrained impact on the supply chain. No direct impacts on the investment market were identified as a result of the Transition Scheme.

Update of Programme Theory

Based on the findings of the evaluation this report updates the Transition Scheme's Theory of Change (ToC) and refines the realist theories developed for the Transition Scheme i.e., 'Context-Mechanism-Outcome' (CMO) configurations. These updates provide learning for the design and delivery of future Transition Schemes, as well as providing valuable insights into the delivery of the GHNF Main Scheme.

Next Steps

The next phase of the evaluation (Phase three) will run from April 2023 to February 2024 and will be an interim impact, process, and economic (value for money) evaluation of the GHNF Main Scheme. This phase will build on learnings from the Phase two evaluation of the

Transition Scheme and will focus on early impacts of the GHNF Main Scheme on projects, the market and supply chain, and provide insights on what works well and less well with the Main Scheme. Phase three will introduce more technical analytical elements and expand primary research activities, to include larger samples of respondents and focus on wider stakeholder groups. As in the evaluation of the Transition Scheme, the Phase three evaluation will further test the ToC and realist assumptions.

Report Scope and Introduction

*RSM UK, supported by ACE-Research, CAG Consultants and Winning Moves, have been appointed by the Department for Energy Security and Net Zero (DESNZ)[4] to evaluate the **Green Heat Network Fund** (GHNF) from May 2022 to March 2027.*

*This evaluation report will focus on the processes and initial impacts of the **Transition Scheme**. It represents a learning phase for DESNZ, drawing insights on project experience and challenges faced, and will be used to inform delivery of the GHNF Main Scheme.*

This chapter provides an overview of the UK heat network market, GHNF, its Transition Scheme, and the structure of the remainder of the report.

Heat Networks

The UK heat network market is currently in early development, delivering 3% of the UK's heat demand. There are approximately 14,000 heat networks providing heat and hot water to 480,000 consumers.[5] 80% of buildings connected are classed as residential.[6] Gas is the dominant fuel source, used by 90% of networks[7], although there has been increasing usage of heat pumps, accounting for a third of successful Heat Networks Investment Project (HNIP) applications.[8] Developers to date include local authorities, Energy Service Companies (ESCOs), property developers, waste heat developers, or community organisations. Recent/new market entrants include companies looking to utilise waste heat.

While the market is considered relatively immature and currently in early development, heat networks represent one of the biggest growth potentials for energy networks in Europe, with investment potential between £60 billion and £80 billion by 2050.[9] They are expected to play a significantly increased role in the decarbonisation of heat, with research by the Climate

[4] As a result of UK Government restructuring, the Department for Business, Energy and Industrial Strategy (BEIS) was dissolved in February 2023 and four new departments (including DESNZ) were created. Given BEIS was the Department responsible for the Transition Scheme, throughout the remainder of the report we will reference BEIS.
[5] BEIS. (2018). Experimental statistics on heat networks. Retrieved 08 15, 2022, from https://www.gov.uk/government/publications/energy-trends-march-2018-special-feature-article-experimental-statistics-on-heat-networks
[6] BEIS. (2018). *Experimental statistics on heat networks.* Retrieved 08 15, 2022, from https://www.gov.uk/government/publications/energy-trends-march-2018-special-feature-article-experimental-statistics-on-heat-networks
[7] BEIS. (2021). Opportunity areas for district heating networks in the UK. Retrieved 08 16, 2022, from https://www.gov.uk/government/publications/opportunity-areas-for-district-heating-networks-in-the-uk-second-national-comprehensive-assessment
8 Triple Point. (2022). Rising use of heat pumps in heat networks. Retrieved 10 19, 2022, from Triple Point Heat Networks Investment Management: https://tp-heatnetworks.org/rising-use-of-heat-pumps-in-heat-networks/
[9] BEIS. (2022). Heat Networks: Proposals for Heat Network Zoning. Government Response*:* *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1083318/heat-networks-zoning-consultation-government-response.pdf*

Change Committee's (CCC) suggesting that 18% of heat demand could be supplied via heat networks by 2050.[10]

However, there are many challenges that can constrain the growth of the heat network sector, many of which are currently being addressed by government and the industry. These include:

- high upfront capital costs to deploy heat networks relative to alternatives.
- investors' perception of the risks associated with heat networks, such as lack of regulation.[11]
- lack of supply chain capacity and capabilities.[12] and
- the lack of competitive pressure to offer reasonable prices, reliable supply, and high quality of service.

Whilst the heat network market has been unregulated with no sector-specific protections for heat network consumers, there has been some self-regulation of the market through Heat Trust[13]. Primary legislation is now going through Parliament which will, subject to Royal Assent, appoint Ofgem as the heat networks regulator. This legislation will also give local authorities in England new powers to designate heat network zones, with new domestic properties and large existing non-domestic buildings within zones required to connect to a low carbon network.[14]

There are a range of funding schemes for decarbonising heat in the UK, reflecting the Government's commitment to achieve Net Zero emissions by 2050, and as part of this, to increase heat supply from (low carbon) Heat Networks. Funding to upgrade existing Heat Network systems is available from the Heat Network Efficiency Scheme (HNES) and, prior to GHNF, funding was also available through the Heat Network Investment Project which had twelve funding rounds in total, between January 2019 and January 2022. HNIP aimed to provide £320 million of capital funding to gap fund heat network projects in England and Wales. Building on HNIP, the GHNF is in place to support the commercialisation and construction of new low and zero carbon heat networks and the retrofitting and expansion of existing heat networks aiming to provide £288m in grant funding for applicants.

Another funding option is via the Heat Networks Delivery Unit (HNDU) set up in 2013 which provides grant funding and guidance to local authorities in England and Wales for heat network

[10] Climate Change Committee (CCC). (2015). Research on district heating and local approaches to heat decarbonisation (Element Energy). https://www.theccc.org.uk/publication/element-energy-for-ccc-research-on-district-heating-and-local-approaches-to-heat-decarbonisation/
[11] Climate Change Committee (CCC) (2020). The Sixth Carbon Budget – The UK's path to Net Zero: The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf (theccc.org.uk)
[12] BSRIA. (2019). *District energy and network components.*
[13] Heat Trust is an independent, non-profit consumer champion for heat networks that hold suppliers to account for the benefit of everyone involved. They aim to make sure customers enjoy the benefits of heating systems fit for the future by setting the standards they should expect, making sure they are treated fairly and working with suppliers to deliver high-quality customer service. https://www.heattrust.org/
[14] As well as public sector buildings to be mandated, but not yet agreed

project development.[15] Since its inception, HNDU has run twelve funding rounds – awarding £30 million in total – and is currently running round thirteen. The Public Sector Decarbonisation Scheme does not provide direct support to heat networks per se; the £1 billion scheme was created to decarbonise public sector buildings, whereby 100% grant funding for capital costs is secured for heat decarbonisation projects within public sector non-domestic buildings.

The Green Heat Network Fund

The GHNF is designed to incentivise and stimulate the heat network market in transitioning to low carbon heat sources via targeted financial support. The objectives of the GHNF are as follows:

- achieve **carbon savings** and decrease carbon intensity of heat supplied.
- increase the total amount of **low carbon heat utilisation** in heat networks (both retrofitted and new heat networks).
- contribute towards a **market transformation** across the investment landscape and supply chain (increasing capability and capacity) that will better prepare the heat network sector for further decarbonisation and expansion.

The **GHNF Transition Scheme,** which ran from June 2021 to March 2022**,** was set up as an interim measure between the arrival of the Green Heat Network Fund Main Scheme (and wider Heat Networks Transformation Programme)[16] and the conclusion the Heat Networks Investment Project (HNIP).[17] The GHNF Main Scheme was announced (with limited detail) at the same time as the Transition Scheme.

The Transition Scheme encompassed a £10 million budget for applicant grants and comprised two application rounds opening in early July and late August 2021, respectively. It was administered in-house by the Department for Business, Energy and Industrial Strategy (BEIS), ahead of appointing a delivery partner for the delivery of the GHNF Main Scheme[18]. The Transition Scheme was designed to act as an enabler for the Main Scheme, recognising the long timeframes it can take for projects to commercialise and be ready to begin construction. It only provided grant funding for commercialisation activities,[19] and it aimed to build a pipeline of construction-ready projects in time for the launch of the GHNF Main Scheme.

[15] HNDU provides support to local authorities in England and Wales through the early stages of heat network development, focusing on heat mapping; energy master planning; techno-economic feasibility and detailed project development

[16] The Heat Networks Transformation Programme is a collection of projects designed to support a sustainable heat networks market, a part of which is the GHNF. The GHNF Main Scheme represents £288 million in capital funding for Heat Networks

[17] HNIP closed to applications in December 2022 and the GHNF Main Scheme was launched in March 2022

[18] Triple Point Heat Networks Investment Management have been appointed to deliver the GHNF Main Scheme

[19] Commercialisation activities refers to a range of works that will take the project from having completed feasibility studies and developed business cases, to making a final investment decision. Activities might include final contract negotiations, procurement, planning requirements, agreeing utility connections, environmental impact assessments, geological surveys and exploratory investigations. The GHNF Main Scheme funds up to 50% of a project's total combined commercialisation and capex costs.

Although funding was only available for commercialisation activities, applicants to the GHNF Transition Scheme were required to submit details of the construction phase of their proposed project at the point of application, although this did not guarantee that successful applicants would be funded by the GHNF Main Scheme in the future.

In total, seven projects were funded by the GHNF Transition Scheme representing a total of £4.74 million investment, including three local authority-led projects, two university-led projects and two private sector projects (see Table 1).

Table 1: Transition Scheme Project Profiles

Type	Location	Grant Awarded	Application Round
University	Greater London	£792,900	1
Private Sector	North West England	£412,200	1
Local Authority	Greater London	£250,000	1
Local Authority	Greater London	£310,000	1
Local Authority	North East England	£2,220,000	2
Private Sector	Yorkshire and the Humber	£650,000	2
University	South East England	£100,000	2

Purpose of this Report

The **purpose of this report** is to assess the impact of the GHNF Transition Scheme, and how it achieved these impacts. The process evaluation will look to understand what works, for whom, under what circumstances and how, building on learnings from HNIP and feeding into the ongoing evolution of the scheme. The impact evaluation will consider what benefits and outcomes can be attributed to the Transition Scheme and how behaviour is changing. It should be noted that the Transition Scheme is a smaller scheme with a shorter timeframe and limited wider impact is expected. The evaluation report will also be made available publicly, to provide transparency to this large capital scheme.

Report Structure

Subsequent chapters of the report are structured as follows:

- **Report Scope and Context**: This chapter introduces the report, summarising the UK heat network market, the GHNF, and the Transition Scheme.

- **Evaluation Methodology:** This chapter describes the theoretical underpinning of the evaluation, the evaluation approach, methods chosen for data collection and analysis.
- **Findings:** This chapter synthesises findings from quantitative, qualitative and realist analysis (shown in full in Annexes 3, 4 and 5) to provide an integrated narrative on findings relating to processes and impacts of the Transition Scheme, structured around the evaluation questions.
- **Implications:** This chapter details the lessons learned from the evaluation for future short-term one-off schemes and for ongoing delivery of Main Scheme.
- **Next Steps:** This chapter provides a brief summary of the next stage of the evaluation of GHNF to set this evaluation report in the wider context of the GHNF evaluation.

The report is supplemented by a number of Annexes, supplied as a separate document. These Annexes include:

- **Evaluation Questions:** containing the full list of agreed evaluation questions.
- **Initial Transition Scheme Theory of Change:** providing a narrative overview of the initial Theory of Change, tested and validated through this evaluation.
- **Application and Monitoring data analysis:** providing summary data tables, analysis and visualisation of application and monitoring data.
- **Qualitative Thematic Analysis:** providing detailed thematic findings from interviews with participants, unsuccessful applicants, non-applicants and BEIS, structured by evaluation question.
- **Realist Analysis:** detailing approach to and detailed findings from realist evaluation activities.

Evaluation Methodology

This chapter outlines our approach to the evaluation, presenting the Transition Scheme's Theory of Change (ToC), a summary of key evaluation questions and details of our data collection and analytical methods.

Methodology Overview

The evaluation has adopted a theory-based approach in order to evaluate GHNF processes and impacts, given the challenges in identifying a suitable counterfactual group to deploy full experimental or quasi-experimental methods. A Realist Evaluation[20] lens has been employed to unpack the behavioural and explanatory pathways relevant to the decision-making of various stakeholder groups. Realist evaluation takes a 'zoomed in' look at specific causal pathways within a Theory of Change. It is a resource-intensive methodology (in terms of theory development, evidence gathering and analysis) and therefore a realist lens will be applied to specific elements where change is likely to be observable. To support this realist approach, additional, non-realist methodologies (e.g., thematic analysis) have been employed to ensure the evaluation responds to the full breadth of evaluation questions and provides the necessary insights into processes and impacts for policymakers. This final report synthesises realist and non-realist analysis to present a harmonised assessment of processes and impacts.

This approach has been co-designed with BEIS, with BEIS providing steer to the evaluation team and input into evaluation theories, research tools, and analysis methods. The evaluation has looked to collaboratively understand and share findings through a presentation and subsequent workshop with BEIS policy and delivery teams involved in the GHNF.

Theory of Change

In the scoping stage of this evaluation, a Theory of Change (ToC) for the GHNF Transition Scheme was developed through desk research, and interviews and workshops with GHNF Transition Scheme design and delivery teams, shown in Figure 1 overleaf. Through evaluation activities and analysis, we have sought to test and refine the validity of the ToC assumptions inherent to it, producing an updated ToC based on our findings.

[20] Realist methodology is based on the assumption that the same intervention will not work everywhere and for everyone. The focus is on "what works, for whom, under what circumstances and how". The key questions in realist evaluation concern causation (the act of causing something) and attribution (the act of attributing something) *(Public Health England, 2021. A Brief Introduction to Realist Evaluation)*. The use of realism in this evaluation will enable evaluators to determine how the GHNF impacts on stakeholder thinking and behaviours, and how this informs programme outcomes. Specifically, the use of a realist approach will enable evaluators to develop an improved understanding of 'in group' differences and similarities in terms of how, why, for whom and in what circumstances (context) the GHNF has led to observed and reported outcomes.

Inputs - the inputs profiled within the Transition Scheme ToC reflect inputs from Government (financial, policy design, experience) and the applicant organisation (feasibility work, internal financial and people resource, internal influencing).

Activities – activities cover project related elements (applications, commercialisation activities, market transformation activities) and the scheme delivery elements from BEIS (pre-application marketing and supporting projects, application assessment and decisions, and ongoing support for participants, including project monitoring).

Outputs – outputs capture the direct results of the activities (for example, completed Heat Network designs).

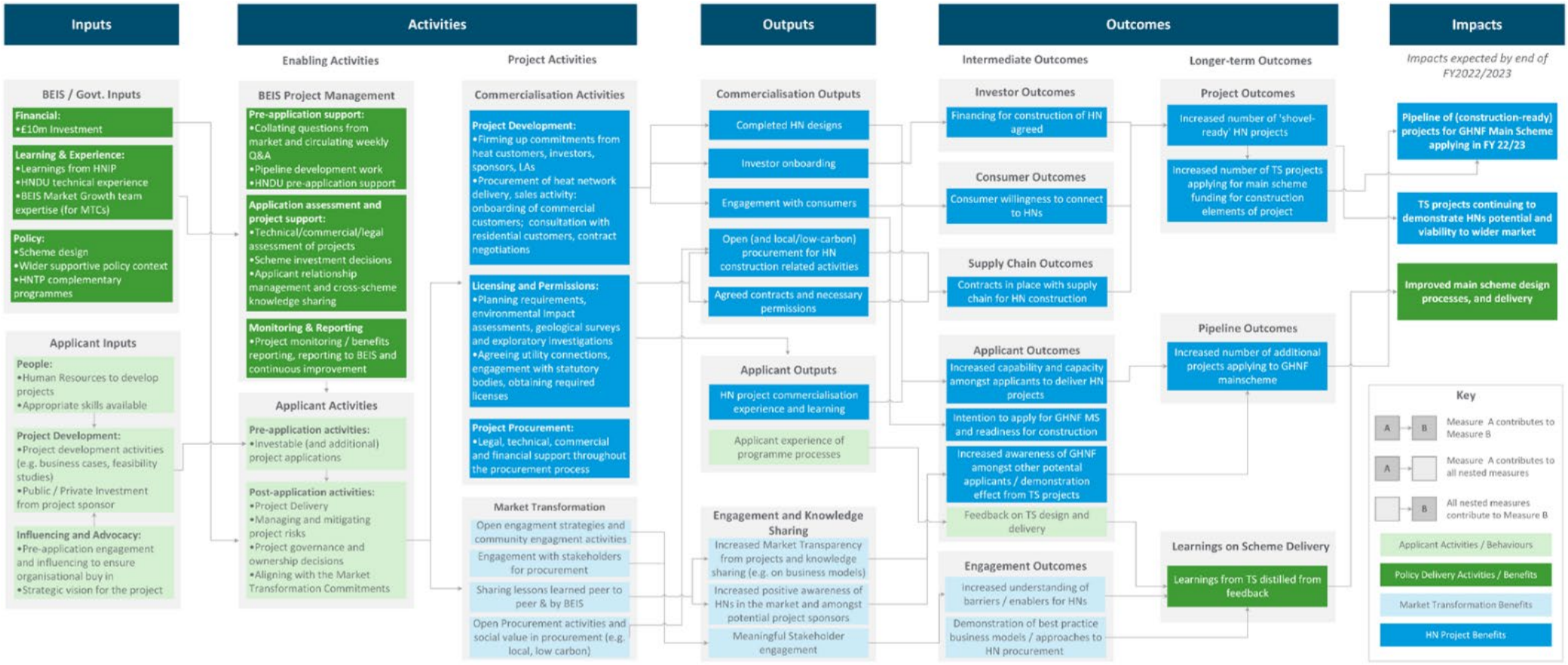
Outcomes – outcomes have been divided by stakeholder group, with an expectation of outcomes for investors, consumers, and supply chain feeding into projects being ready for construction. Applicant outcomes relate to improved capacity and contributions to their intention to apply for the Main Scheme, building the pipeline of projects. **Outcomes** relating to market transformation reflect the engagement that projects will have with the market.

Impacts - three core impacts of the Transition Scheme were identified, which align with the aims of the Scheme. These were:

- providing a **pipeline of projects ready to apply for Main Scheme construction funding** in round one, making an assumption that the Transition Scheme funding would enable projects to complete all necessary commercialisation work at a sufficient pace that they would be 'shovel ready' projects for round one of the Main Scheme.
- Providing a **demonstration effect to other potential projects** to raise the profile of GHNF funding and build the pipeline of Main Scheme projects more. This makes the assumption that the project activities undertaken by Transition Scheme projects would be visible to the wider market.
- **Improving Main Scheme design and delivery**, through the learnings that the Transition Scheme would provide on what worked well and what worked less well. This assumes that BEIS would use the Transition Scheme as a pilot for the Main Scheme.

Annex 2: Transition Scheme Theory of Change provides a full narrative of the initial Transition Scheme ToC.

Figure 1: Initial Transition Scheme Theory of Change



Candidate CMOs[21] for **applicant theory** (for successful applicants who progress to become participants, and for unsuccessful applicants) set out three hypotheses summarising the possible organisational reasoning informing applications to the Transition Scheme. The first two CMOs (A1 and A2) hypothesise that organisations submit applications either because the Transition Scheme enables a proposed low carbon heat network project to go ahead (A1) or because the Scheme has led to an organisation changing from a planned fossil fuel-based scheme to a 'low carbon' project (A2). The third CMO (A3) represents a counterfactual hypothesis under which the applicant might have progressed commercialisation of a low carbon heat network project anyway, even without funding from the Transition Scheme, and is acting opportunistically to take advantage of the availability of 'free' money:

- A1: The Transition Scheme enables the progression of this planned low carbon heat network project that would not otherwise have been commercialised.
- A2: 'Let's go green' – the Transition Scheme influences the applicant organisation to progress a low carbon heat network project instead of a gas CHP project.
- A3: 'Funding opportunism' – this low carbon heat network project would probably have been commercialised anyway, but the applicant organisation wants to take advantage of funding offered by the Transition Scheme.

Candidate CMOs for **participant theory** (for successful applicants) set out possible reasons how and why the Transition Scheme participation might influence outcomes for participating organisations. These hypotheses could apply in parallel and are not mutually exclusive. **The participant CMOs can be** summarised as:

- B1: Transition Scheme funding supports commercialisation activities (i.e., the project progresses towards an investment decision because necessary commercialisation tasks are undertaken, funded by the Transition Scheme).
- B2: The GHNF Transition Scheme act as a 'quality badge' that supports commercialisation (i.e., internal or external stakeholder support is strengthened because the project wins Transition Scheme funding).
- B3: Participation in the GHNF Transition Scheme improves the capability of the HN project development team within the sponsor organisation.

The candidate CMOs were tested and refined through the realist analysis (see Annex 5: Realist Analysis). Refined CMOs are presented in the Interpretation of Findings section of this report.

[21] A Context-Mechanism-Outcome (CMO) configuration is a hypothesis about which mechanisms are likely to operate in different contexts and the outcomes that will be observed when they do.

Key Evaluation Questions

The evaluation is structured by a set of evaluation questions, listed in full in **Annex 1**. These cover both process and impact questions. Key questions that the evaluation sought to answer included:

- What works and what does not, for whom, when, how, and in what context for the different types of applicants throughout the scheme's application and commercialisation stages?
- What are the emerging impacts of the Transition Scheme and how these were achieved, for whom, when, and what contextual factors applied?

Process evaluation questions sought to explore the design and delivery of the scheme, the support and guidance from BEIS, projects' experience of application and the barriers faced, projects' experience of commercialisation and the barriers, and projects' experience of delivery processes.

Impact evaluation questions focused on the impacts for the GHNF Main Scheme, on applicant organisations, on the wider market, and on BEIS.

Approach to Data Collection and Analysis

Our evaluation has sought to gather data to answer evaluation questions, test candidate CMOs and refine the ToC in the following ways:

- **Realist interviews:** online interviews with unsuccessful and successful applicants (participants) to the transition scheme. The topic guide for successful applicants (i.e., participants) was designed to test the CMOs in both applicant theory and participant theory, while the topic guide for 'unsuccessful applicants' was designed to test applicant theory CMOs only.
- **Process and Impact interviews:** online interviews and group interviews with all respondent groups, based on segmented topic guides, and following a semi-structured approach. To reduce consultation burden and fatigue among respondents, where relevant, process and impact questions were asked as part of the same interview.
- **Application and Monitoring data analysis:** Review and analysis of scheme application data and monitoring data. Accessing up-to-date monitoring data posed a challenge for the evaluation team, which limited the extent to which analysis could be carried out. Projects did not consistently report on time, and therefore the BEIS delivery team did not consistently collate reports into a single dataset that could be analysed – refer to Annex 3 for further details.

Our approach to sampling and recruiting interview respondents was as follows (see Table 2):

- **Census of all participants and unsuccessful applicants:** we reached out to all Transition Scheme participants and unsuccessful applicants[22] to participate in both realist and non-realist (process and impact) interviews.
- **Purposive sampling of BEIS groups involved with delivery:** to engage as wide a range of BEIS individuals involved in the design and delivery of the scheme, we identified five key groups and arranged group interviews with each. These groups were: the Transition Scheme Delivery Team; the GHNF Policy Team; the GHNF Investment Committee; the BEIS Central Grants and Loans team; and the Contingent Labour Consultants team.
- **Purposive sampling of non-applicant organisations:** based on a list of organisations who indicated intention to apply (by requesting an application form), we conducted purposive sampling to identify a range of organisation types, to ensure we had broad coverage of non-applicant perspectives and contexts. To accommodate for non-responses, a second sample was identified and contacted, following the same approach.

We recruited interviewees between January and February 2023, inviting them to an interview of between forty-five minutes to one hour and thirty minutes (depending on respondent type). Respondents were recruited via email and interview took place on Microsoft Teams. Table 2 details the response received to our request for interview.

Table 2: Interview respondents[23]

Type	Interview	Population	Target	Respondents
Participants	Realist	7	6	6
Participants	Non-Realist	7	5	5
Unsuccessful Applicants	Realist	2	2 (1)[24]	1
Unsuccessful Applicants	Non-Realist	2	2 (1)	1
Non-Applicants	Non-Realist	65	10	6
BEIS	Non-Realist	5[25]	5	5

Our approach to analysis of evaluation data has included:

- **Thematic analysis of interviews:** This was achieved using a spreadsheet, created to collate responses, initially segmented by stakeholder group and topic guide question, and subsequently by relevant overarching evaluation question. Responses were coded

[22] Excluding one unsuccessful applicant that was omitted at BEIS' request given this unsuccessful applicant had since successfully applied to the Main Scheme
[23] There were seven successful applicants to the scheme, and two unsuccessful. One additional applicant withdrew their application.
[24] Our initial interview plan proposed to talk to all the unsuccessful applicants, of which there were two. BEIS asked us not to contact one of these organisations, and therefore the total interview sample possible was one.
[25] These interviews were conducted as group interviews, with one group interview per each group of BEIS stakeholders.

and codes used to develop ‘themes’ for each evaluation question and both inter-group and inter-theme links were explored. Themes were presented alongside an explanation and supporting quotes.

- **Realist analysis of (realist) interviews:** This was achieved using a spreadsheet to code and analyse the evidence against CMOs for the theories being tested. Excerpts from the transcript from each realist interview were coded as ‘case-specific’ contexts, mechanisms, and outcomes relevant to the applicant and participant theories, respectively. For each case, tailored ‘case-specific’ CMOs were created. These detailed why each organisation applied to the Transition Scheme (applicant CMOs) and – for GHNF Participants – how Transition Scheme participation influenced outcomes of their project (participant CMOs). The tailored ‘case-specific’ CMOs were then reviewed across the sample, and compared to the initial theory, to find patterns and similarities between cases. The revised CMOs were developed iteratively through a series of collaborative meetings between researchers.
- **Quantitative analysis:** where data availability allowed, application and monitoring data was collated and cleaned, leaving only variables deemed useful for evaluation purposes. Descriptive and statistical analysis was applied alongside data visualisation.

Limitations

Given the size of the Transition Scheme, sample sizes of both participants and unsuccessful applicants are limited, and findings in this report are therefore based on responses from a relatively small sample and should be interpreted within this context. Additionally, as previously discussed, project monitoring data was in some cases incomplete, adding additional limitations to the insights this report provides.

Evaluation Findings

This chapter synthesises findings from quantitative analysis of application and monitoring data (where it was available), thematic analysis of interviews with participants, unsuccessful applicants, non-applicants and BEIS, and realist analysis of realist interviews with participants and unsuccessful applicants. It provides an integrated narrative of findings relating to both the processes and impacts of the GHNF Transition Scheme. Findings are presented thematically, referencing the relevant evaluation questions that have been addressed. The full quantitative, thematic and realist analysis is presented in Annexes 3, 4 and 5, respectively.

Design and delivery of the Transition Scheme

This section covers the 'process' element of the evaluation and captures insights across stakeholders into how the Transition Scheme was designed and delivered, as well as the experience of application to the scheme, participation in the scheme and commercialisation of heat network projects. Across these themes, we have drawn out findings of what works and what does not, for whom, when, how, and in what context (process evaluation question 1). The report highlights the relevant evaluation questions being addressed, using the evaluation number that corresponds to the list of questions in Annex 1.

Design of the Transition Scheme

Relevant Process Evaluation Questions:

7. Which parts of the design and delivery of the Transition Scheme enabled or frustrated the desired impact of the projects? How, why, and in what ways?

6. To what extent have projects changed their initial design to integrate a zero/low carbon heat source as a result of GHNF funding?

Evaluators explored with respondents how they felt the **design of the scheme** had enabled and/ or frustrated impacts:

- The key challenge in scheme design, as highlighted by projects and those involved in the delivery of the Transition Scheme, were its **short timescales**. One individual commented, *"realistically, we needed a year for the Transition Scheme, and we had less than six months."* Project respondents made clear that to be able to mobilise the project, go out to tender, complete the work and then have it invoiced and paid within this timeframe was an *"unrealistic expectation."* These concerns were echoed by those involved in delivery.
- The knock-on impact of the short window of delivery was that for most projects, **grants were not fully spent** in the allocated timeframe. In the majority of cases, projects were

able to extend beyond this timeframe. In other cases, the costs of incomplete work were covered by internal or other funding.

- For a minority of applicants, the main impact of short delivery timescales was in the application and mobilisation phase, where certain **elements of commercialisation were descoped** to meet the timeframes, and two BEIS respondents suggested that non-applicants **ruled themselves out** of applying for the scheme, opting to wait for the Main Scheme.

A key design change for the GHNF Transition Scheme applicants, compared to the previous HNIP programme, was its **low-carbon requirement**. The evaluators explored to what extent **projects had changed their original design** to meet this requirement and assess if this aspect of design had frustrated the desired impact of the Transition Scheme.

- Feedback overwhelmingly found that the low-carbon requirement matched the intentions and expectations of applicants and non-applicants. Considering organisational climate targets and sustainability objectives, there was a sense amongst these two groups that heat decarbonisation was being seen as an increasingly crucial challenge to address. As such, the low-carbon design did not put off applicants nor force applicants to significantly change their intended project. One comment summed up a number of respondent views by stating: *"Energy centre decarbonisation is the single biggest opportunity to decarbonise our heating" (Transition Scheme Participant)*
- A very small minority (of applicants and non-applicants) referenced considering the fossil fuelled "*CHP route*"[26] for their network. For one, this was at an early design stage, and it was rejected as it didn't make sense given their climate targets. For the other, it was only specific constraints with utilising heat pumps (electricity grid constraints) that prompted the suggestion of a 'CHP for the meantime' approach.
- No evidence was found of projects changing their design to integrate a low carbon heating source because of GHNF funding.

Realist interviews identified the various drivers of low-carbon heat networks across organisations:

- For local authorities, the drivers for low carbon heat networks were reported to be the need for heat decarbonisation to meet net zero targets, the potential for heat networks to reduce fuel bills for residents (helping to tackle fuel poverty) and the potential for them to reduce bills and improve energy security for businesses (contributing to economic regeneration).
- For organisations based in London, supportive planning policies[27] for heat networks, combined with zero carbon ambitions, were reported to be important drivers of low carbon heat networks.
- For universities, the reputation of the university in the eyes of students was reported to be an important driver for decarbonisation and low carbon heat networks, with a number

[26] CHP refers to combined heat and power.
[27] e.g., The London Plan (Greater London Authority, 2021), available at https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

of league tables reported to publish rankings of universities in terms of sustainability metrics.

- For private developers, the drivers were reported to be a combination of Government policy (including planning policy and Building Regulations) and a corporate ambition to sell low or zero carbon homes because this was an added selling point for customers.

BEIS Delivery of the Scheme

Relevant Process Evaluation Questions:

3. How is the Transition Scheme being delivered and what improvements can be made? What should be done differently in the Main Scheme?

7. Which parts of the design and delivery of the Transition Scheme enabled or frustrated the desired impact of the projects? How, why, and in what ways?

27. What have been the benefits/challenges of delivering the Transition Scheme in-house?

We explored with respondents how the Transition Scheme was delivered, what worked and what didn't, and the impact delivery had on project outcomes:

- For BEIS respondents, the key piece of feedback was that, **without enough full-time dedicated capacity** specifically earmarked for delivery within the BES team, in-house delivery was a challenge. A majority of these respondents commented that the level of effort required to administer and deliver the scheme had been underestimated and given the fact that delivery of the Transition Scheme was on top of their normal responsibilities. One remarked, *"the amount of time and effort we could dedicate to it was not sufficient"* and others described it as a second or third priority. A number reflected that this lack of dedicated resource may have *"hindered"* elements of the delivery of the scheme such as project management and engagement with applicants.

  "We were trying to run it on a bit of a shoestring, and it showed [at] times" (BEIS Group Interview)

- Evidence was mixed, but on the whole respondents thought **BEIS had the required skills in-house** to deliver the scheme. However, it was also acknowledged that all teams had some upskilling to do and that, to augment in-house skills, certain elements had to be contracted out (i.e., application assessment, stakeholder engagement and communications, webinar delivery). The expertise of the Grants and Loans team was identified as filling an important gap regarding administrative processes. Some feedback highlighted that bringing the Grants and Loans team into the design process at an earlier stage would have helped simplify and reduce complexity the processes developed by other teams, to make it "*more time efficient"* given their expertise.

- The benefits of delivery in-house included a demonstration of BEIS' capacity and skills to do so, improved relationships across BEIS teams, and are reported in more detail in the Impact Evaluation section.

- **Projects' feedback** on BEIS' delivery of the scheme was largely positive and only in a minority of cases did projects identify specific challenges related to elements of the delivery such as payments or support, commenting:

  "Ongoing requirements are clear and ongoing support is there, the team are responsive. They'll always answer questions or will defer to those who do. We work well with the team" (Transition Scheme Participant)

- There was feedback from a small minority of projects highlighting areas that didn't quite meet expectations regarding delivery. One project described the support they received as *"quite fluid"* referencing the fact that BEIS were *"developing the process themselves"* as they were delivering and sensing that they were *"guinea pigs"* in this process. In these cases, issues most often related to uncertainty with communications and guidance, which is discussed fully in the following section.
- Isolated feedback on challenges with payments are reported in the 'Project Experience of the Scheme' section.

BEIS Communications and Guidance

Relevant Process Evaluation Questions:

2. How effective has the communications, support and guidance been in supporting projects' progress in all stages of the Transition Scheme project cycle?

15. How well was the Transition Scheme communicated to potential applicants, and to what extent is this cutting through?

20. Is the guidance and support available meeting the needs of projects?

The evaluation team have drawn out findings relating to the effectiveness and appropriateness of communication and guidance provided at all stages of the Transition Scheme.

- BEIS' **communication for the Transition Scheme** was perceived to have generated a lot of interest in the wider market. One individual commented that the scheme was "*expecting a few expressions of interest to come in, but with communications and workshops [it was] sort of inundated."* Activities included both broad communications (e.g., using email lists and regular workshops) and more bespoke activities to identify the most suitable projects. Bespoke activities included market intelligence workshops and seminars, activities to work out the potential pipeline of Transition Scheme applicants, based on coordination with market and local authorities.
- A small minority of BEIS respondents did question the extent to which the Transition Scheme had **reached as many of the good applicants** as it could have done, noting that there could have been more (bespoke) promotion, but in the main, BEIS respondents were positive at the extent to which the mechanisms to identify the right projects had worked.

- Evidence from three BEIS group interviews suggested that many had used the Transition Scheme communications as a first look at the **Main Scheme application process**, explaining the large level of interest in webinars and accessing application forms. This was an additional benefit of the scheme to prepare Main Scheme applications:

  "We did all the hard work early so that then everyone could use the Transition Scheme to familiarise themselves with what we're trying to do, how it differs from HNIP and then prepare themselves to make a Main Scheme application in the knowledge that it won't have materially changed" (BEIS Group interview)

- Applicants and non-applicants found it difficult to identify **how they had found out about/ been referred to** the Transition Scheme. The most common response was that consultants (e.g., those who the project engaged with at feasibility stage) had suggested an application to the Transition Scheme, but a number highlighted specific conversations with the Heat Networks Delivery Unit (HNDU) which prompted their further engagement.
- In addition, webinars were cited by most applicants and non-applicants as helpful opportunities to understand requirements and get answers to questions.

For support and guidance during the application stage:

- Most applicants found that the **guidance materials** worked well, acknowledging that materials were to some extent, necessarily "high level" to be able to apply across project types, and that specific queries relating to projects (e.g., eligibility of specific technical elements) were best resolved in workshops or bespoke conversations.

There were mixed views from project respondents relating to their **experience of communications and support** from BEIS:

- For the majority of participants, the experience was positive, and projects felt in good, close communication with BEIS: *"Generally, when I sent questions across, [BEIS] responded to in a couple of days".*
- However, a significant minority of applicants highlighted that, particularly for specific queries, there were delays in receiving responses from the project delivery team. Three projects talked about having project-specific queries, either during application or project delivery which took a more significant amount of time to receive a response.
- This distinction may be explained by the level of complexity and challenge between projects and the skills within the organisation. There was a sense that, for those who had a more straightforward project, the communications and guidance were deemed to be appropriate and proportional, with relatively straightforward queries addressed quickly and good access to appropriate individuals. For those projects with a less straightforward project or pathway to commercialise their project, there was a sense that fielding queries was more challenging, leading to blockages of communication channels. A small number of projects recalled that, for some queries, they waited for prolonged

periods for responses from BEIS, with one indicating that in one case it may have been up to two months.

- A minority of projects highlighted specific issues regarding identifying who the project's point of contact was, as monthly catch ups had dropped off diaries, no "*formal handover"* to Triple Point had occurred, and increased pressure on BEIS with launching the Main Scheme made it difficult to *"get answers from the right people*."[28]

Transition Scheme Application Process

Relevant Process Evaluation Questions:

8. What is the experience of the overall application process, and how does this vary by applicant or project type and why?

9. Are the eligibility and scoring criteria suitable, is there any gaming, and if so, how does this impact the delivery of GHNF?

Feedback on the experience of the application process highlighted the following:

- All Transition Scheme applicants described the **process as challenging** and requiring a specific technical skillset to complete. One BEIS respondent nuanced this, suggesting that it was not the application itself, but rather, taking the project to a stage where the information, agreements and documentation are in place to enable an application that was the challenge:

  "If you're sufficiently experienced and get all your paperwork in a row, you can apply relatively quickly. But if your project is not at that stage, then you've got months and months of work to get to that stage." (BEIS Group Interview)

- Nearly all applicants used consultants to complete the application, citing a lack of skillset within their organisations to develop the information required and to complete the "*very detailed"* spreadsheets. The lack of skillset was particularly acute within public sector organisations.
- Despite the challenge of getting the information in place, there was broad consensus that the application requirements were **proportional to the level of grant being sought** (particularly when a likely Main Scheme application is factored in). Respondents (both applicants and non-applicants) described their experience of applying as *"smooth"* and *"not arduous"* and highlighted the *"logic"* and *"transparency"* of the application as points of praise.
- For a large majority of applicants and non-applicants that had previously been through the HNIP application process (four interview respondents had previous experience of

[28] It is unclear the extent to which this type of ongoing support was envisaged within the Transition Scheme, given its role as a stopgap between HNIP and the Main Scheme and intention to have projects complete by the end of FY2021/22. This potentially unmet need of ongoing support and engagement is likely a consequence of long protracted project timescales.

submitting HNIP applications[29]), they felt that the Transition Scheme application was more straightforward, and specifically, found application templates *"more user friendly*", that it *"flows through much better"* and that the process as a whole was more *"streamlined"* with the gated metrics a welcome replacement to the pre-application stage of HNIP.

- The only challenge, cited by a significant minority of applicants, relates to when the projects were less straightforward, highlighting that the *"one size fits all approach"* made it difficult to provide the relevant information in some cases. Examples provided by projects included where applicants were the sole recipients of the heat, and where the heat network was part of a wider low-carbon development.

With regard to the suitability of **Transition Scheme application criteria**, findings include:

- Only a very small minority of GHNF Participants highlighted a specific challenge with meeting any of the criteria of 3.33 pence of grant per kWh of heat (which was then subsequently changed for Round Two of the Transition Scheme). Beyond "*minor clarifications*" and "*slight tweaks to meet the metrics",* others did not identify issues.
- A minority of non-applicant respondents did highlight a number of specific challenges to projects meeting the pence per kWh and social Internal Rate of Return (IRR) metrics. One highlighted that for their more complex and higher risk portfolio of projects, with significant additional costs to access low-carbon heat, the grant available (while complying with the 4.5 pence per kWh metric) was too small to drive sufficient progress. Another highlighted that the social IRR was too high a hurdle to meet initially and suggested a graduated approach, expecting their project's IRR to increase as feasibility is demonstrated.
- In addition, a minority of BEIS respondents raised a concern that the deliverability assessment had an impact on the scale of schemes applying to the Transition Scheme. A respondent described the Transition Scheme projects as having a *"pioneer network mindset"* and *"not a zonal level"* suggesting that this may have been a result of having to be able to deliver heat in the first five years. Schemes that may have considered larger projects (e.g., 100 GWh) may have been put off by the fact that applications may have been rejected based on the assessment of deliverability.

  "That's always the challenge with these kind of capital schemes is that you want big aspiration, but it's what you actually build in the first five years. That tends to be what constrains it down to a 20 GWh to 30 GWh project rather than the kind of town or city scale that that we'd want." (BEIS Group Interview)

Transition Scheme projects did however highlight some **challenges they envisaged looking toward Main Scheme application rounds**. A minority of Transition Scheme projects identified specific external blockages to compliance with the Main Scheme metrics.

[29] In most cases, this was applications for other heat network projects that the sponsor organisation (e.g., private sector, local authority) had previously progressed, or projects that a consultant organisation progressed on behalf of another heat network project. In one case this involved a project application to HNIP that was ultimately funded on the GHNF Transition Scheme.

- One project explained that although their scheme is technically viable, because of delays in wider capital development, the loads that the network would be able to pick up in the short- to medium-term were reduced. This meant that the grant available under the current metrics is significantly smaller than required for construction, leaving the project in limbo.
- Another similarly 'stalled' project suggested that with the economic context of inflation and capital cost increases, the upper capex percentage limited for the Main Scheme application also posed a challenge as there was now a bigger gap to fill on the applicant side.

The evaluation has explored if any 'gaming' of the Transition Scheme application had occurred, and the following was noted:

- A large majority BEIS respondent groups commented on **'gaming'** in the Transition Scheme. All felt that the risk of 'gaming' was minimal. They pointed out that applications had to be credible and deliverable, and the criteria and gated elements of the application were described as rigorous and very specific. All these factors were cited as key to ensuring that the projects that came through were most appropriate and led one stakeholder to state:

  "I think we removed the potential for gaming as much as possible." (BEIS Group Interview)
- In all cases, applicants had planned the project prior to the announcement of the GHNF Transition Scheme, but it was not the case that projects had secured alternative funding to commercialise the project. It was observed amongst applicant organisations that one rationale for seeking Transition Scheme funding was to provide assurance to senior stakeholders to continue to progress with the project and secure further internal investment. Some projects had received earlier support (e.g., HNDU support for Local Authorities) enabling them to progress to feasibility stage, requiring additional support from the Transition Scheme to move past this point.
- There was no evidence of projects significantly altering their design to fit within scheme rules, with successful applicants describing *"slight tweaks"* to meet the gated metrics.

Barriers and Critical Success Factors to Transition Scheme Application

Relevant Process Evaluation Questions:

10. What types of projects are successful/unsuccessful at the application stage, and why? At what points are applicants dropping out and why?

12. What has prevented potential applicants from applying?

13. How has the low-carbon requirement impacted the types of projects that are successfully applying?

14. What are the barriers to applying for the Transition Scheme?

In this section we explore the barriers to application, as well as the critical success factors for successful application.

- The **low-carbon requirement** was found not to have a significant negative impact on the type of organisation that would apply, with the majority of applicant and non-applicant respondents describing an ambition for heat decarbonisation that could be realised through the deployment of low carbon heat networks. BEIS respondents concurred explaining that the low carbon requirement had not particularly nuanced the type of applicant organisation beyond the wide group of those who have Net Zero targets or emissions reduction targets. There was a suggestion from BEIS respondents that the communications surrounding the Transition Scheme may have captured the imaginations of organisations that had not previously engaged with HNIP (although all those interviewed who applied to the scheme had ambitions of a low carbon network prior to application).
- However, whilst the low-carbon requirement in principle was not a barrier to application, two non-applicant respondents (who represented a larger pipeline of potential projects) cited challenges in **securing a low-carbon heat** source as a blockage for their applications. One non-applicant cited challenges in demonstrating feasibility and mitigating risks of more exploratory, mine water heat sources that was reported to be holding back a pipeline of mine water projects. Additionally, a minority of non-applicants identified challenges in securing sufficient electricity supply to run a heat pump, with one providing an example of a potential project unable to get sufficient grid access until 2031.

  "The heat pumps problem is just so complicated at the moment, mainly because of the electricity supply question. This is the biggest barrier for [potential applicants] with their enormous amounts of demand." (Non-applicant respondent)

- A minority of applicants did raise a concern that the **cost of application** relative to the funding on offer for the Transition Scheme was a consideration when they were making a decision to apply, as any application would require input from consultants. Although both did apply, they cited the greater ability of their organisations to bear this cost, and that smaller, less resourced applicants may have struggled to carry the risk. One non-applicant specifically cited smaller, rural, community schemes as feeling the challenge of this.

  "We weren't sure that we had capacity [to complete the application] but didn't want to end up in a situation to spend tens of thousands of pounds [on consultants] to get a bid of [removed as disclosive – a relatively small amount of money]." (Transition Scheme Participant)

As shown in Figure 2, the only public sector applicants to the Transition Scheme were **local authorities and universities**.

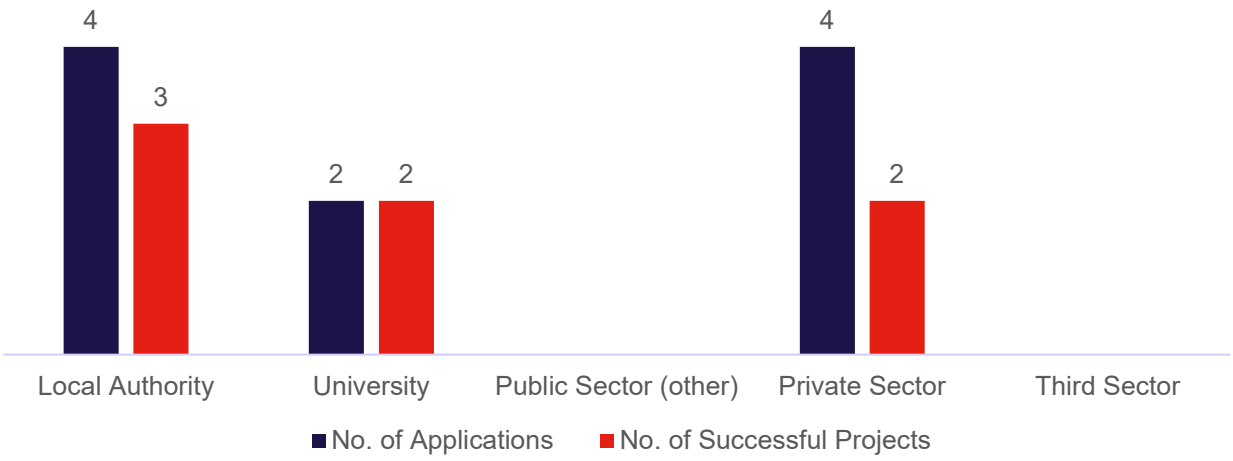
One non-applicant respondent provided insight into why **NHS Trust applicants** faced barriers:

"[having been involved in many NHS decarbonisation strategies] not a single one of them actively considering the heat network as a result and it's not because they don't want to. You see, it's because there isn't this engagement. They're not being engaged [by BEIS, HNDU or local authorities]." (Non-applicant respondent)

- The key barrier was a lack of engagement and joined up thinking between NHS Trusts and local authorities, and the Department of Health and Social Care (DHSC) and BEIS. As Trusts are less familiar with heat networks, there is much more influencing and handholding required, with the respondent unable to *"think of a single productive conversation between the local authority and a hospital about a heat network."*
- As the NHS is currently investing in heat decarbonisation, when it comes to mandated connection to heat networks, the respondent envisages a reluctance to connect given long pay-back times on current investments.
- Additionally, Capital Departmental Expenditure Limits (CDEL) in the NHS were identified as a barrier, where a limit is placed on the amount of public money distributed to hospitals to ensure parity across Trusts. Given that decarbonisation investments are included in these calculations, *"this is a huge barrier"* and changing this would unlock a lot more NHS action.

  "Hospitals have said to me, 'sorry, but we've reached our CDEL envelope for the year, so we're going to have to put in gas here because we can't spend any more money' and that's like a hard stop." (Non-applicant respondent)

Figure 2: Type of organisation applying to the scheme[30]

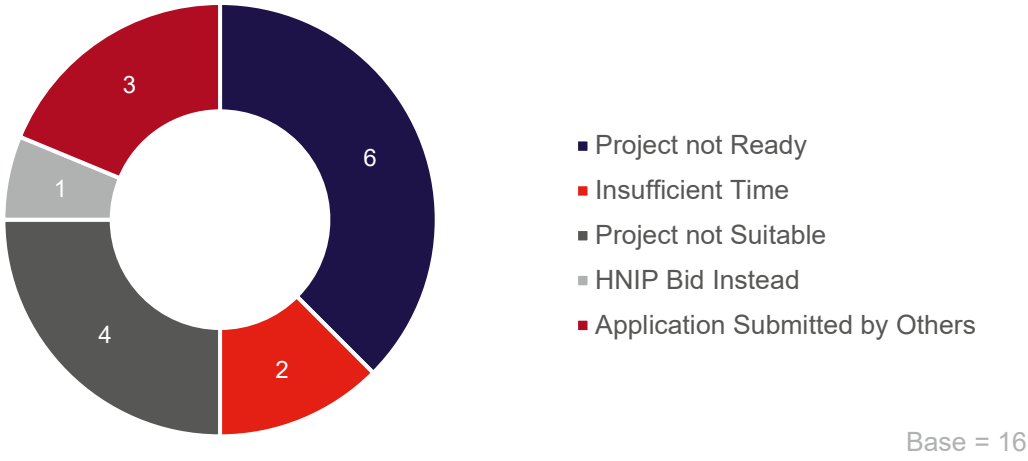


Beyond these more fundamental barriers to applications, a number of additional reasons why projects were unable to apply **for the Transition Scheme** have been explored. BEIS reached out to all organisations that did not apply to the Transition Scheme, despite requesting an application form, asking them for the reason(s) for not submitting an application. Just over half of respondents indicated that timing was the key barrier to application, either that their project

[30] There were seven successful applicants to the scheme, and two unsuccessful. One additional applicant withdrew their application.

was not ready, or they did not have sufficient time to submit a bid, compared with just a quarter whose projects were not suitable and one project which opted to apply for the final round of HNIP instead. Figure 3 breaks down the reported reasons for not applying to the Transition Schemes.[31]

Figure 3: Reasons for non-applications from those who expressed interest[32]



- As previously discussed, **short timescales** to develop an application and complete the work deterred non-applicants. Two BEIS respondent groups suggested those concerned by tight timescales may have opted instead to apply for the Main Scheme. At the time of writing, 6 non-applicants, recorded as interested in the Transition Scheme, had applied to the GHNF main scheme
- A significant minority of non-applicants reported that they had not received enough notice on the Transition Scheme, to enable an application and one BEIS respondent acknowledged this stating *"there wasn't enough run up to get as many projects as [BEIS] wanted."*

  "A challenge is a number of [government] support schemes that turn up on short notice and they are all different to each other, [the difficulty is] preparing ourselves for the complexities and challenge [of each of the different schemes at short notice]." (Non-applicant respondent)

- This point should be contextualised by the fact that, after the Main Scheme was announced, there was **less impetus for projects to 'pull out the stops'** to apply for the Transition Scheme within the timeframe. One commented, that had the Main Scheme not been coming through soon after, the Transition Scheme may have got twice as many applicants.
- The fact that the Main Scheme offered construction funding alongside commercialisation in one process may have also been a factor considered when projects opted to wait for the Main Scheme. One non-applicant interviewed (in addition

[31] Not all the organisations that expressed interest in the Transition Scheme but did not apply provided feedback to BEIS. The graph represents only those that provided feedback.

[32] Data from BEIS feedback from non-applicants

to the one non-applicant surveyed) chose to apply for the final round of HNIP, rather than the Transition Scheme, explaining that HNIP was more appealing given both construction and commercialisation would be funded.

In addition to timescales being tight to develop applications, the following challenges for Transition Scheme applications were explained:

- As highlighted in Figure 3, the main reason, cited by half of non-applicants, for non-application was simply that projects were **not at a suitable stage of maturity** to be able to apply to the Transition Scheme. Respondents described the significant 'groundwork' required prior to application, with its significant costs and time burden. However, a very small minority of non-applicants highlighted that a number of projects that they were involved in are more stuck in the feasibility stage, rather than progressing through it. The projects represented by this comment were all relying on higher risk and less technologically advanced heat sources, and therefore required a significant amount of funding to be able to complete exploratory work and develop contingency plans, causing difficulty in getting sign off to progress to the next stage of work.
- A very small minority of non-applicants highlighted that, for private sector companies, the lack of earlier stage funding for feasibility was a challenge. They explained that *"for a private business, it's [preparing a heat network] a bit of a punt"* and as earlier stage funding wasn't accessible, they struggled to get to application stage.
- We found no evidence from interviews of projects who began applications and then subsequently dropped out, although this is caveated by the small sample size of non-applicant respondents.

Two themes emerged as **enablers of successful applications**: previous heat network funding experience and strong feasibility work.

- All successful applicants with prior experience of HNIP cited their experience of HNIP applications (either for previous projects or unsuccessfully for their current project) had been invaluable to gain an *"understanding of what was needed"* within the Transition Scheme application (two successful applicants interviewed had experience of HNIP).
- A small minority highlighted that the challenges for their application were in the remaining uncertainties of their project plan, and that getting to a more progressed stage of Detailed Project Design (DPD) made an application much more straightforward.

Project Experience of the Scheme Post Award

Relevant Process Evaluation Questions:

11. What happens between application success and initiation and are there any recurrent procedural blocks?

16. What has the overall experience been for project types and different stakeholders?

18. How do outcomes differ between projects and why?

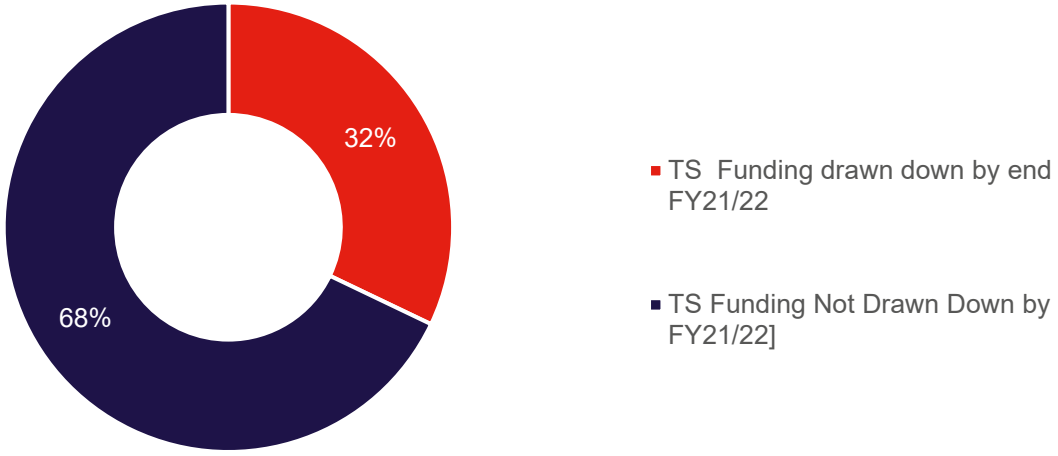
23. Are projects on track to deliver on time and budget? If not, what barriers have influenced this?

24. Will annual funding allocations be spent? If not, why? What bottlenecks have been identified?

26. What has the experience been like with projects providing timely and/or accurate application and monitoring data? What further support could be offered by BEIS to improve those projects with a poor record of reporting?

Findings on project experience of the scheme (post award) focused, in the main, on the ability of projects to be able to **spend the grant awarded within the allocated timeframe**. Figure 4 and Figure 5 show the level of spending of projects on the Transition Scheme both within the 2021/22 financial year and in total (provided by BEIS as per the end of FY22/23), to capture additional spend from projects extending beyond the deadline[33]. It is evident from Figure 4 that projects were not able to spend their full allocations within the allocated timeframe, with only 32% of funds drawn down by this point (compared to 94% drawn down by the end of the following year). Qualitative interviews with scheme stakeholders have explored reasons for this.

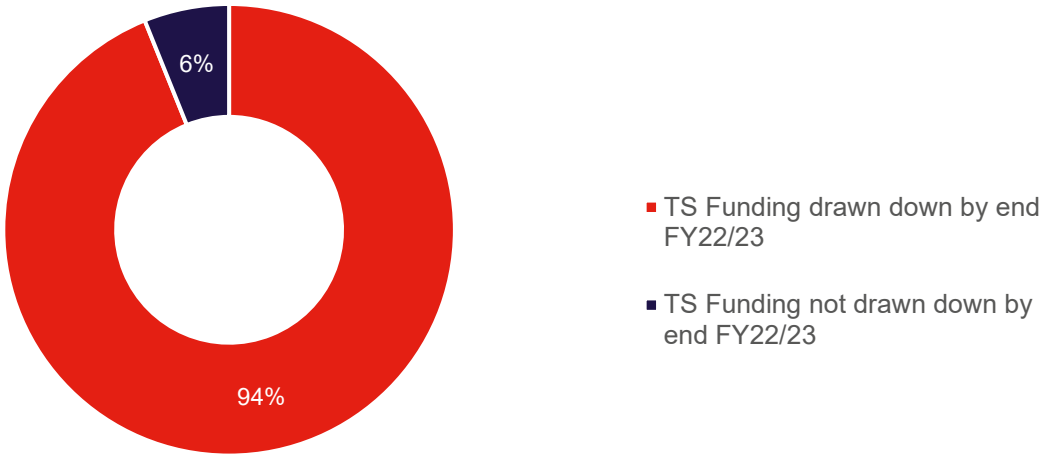
Figure 4: Project funding drawn down (% of awarded grant) at end of Financial Year 2021/22



* Spend figures based on most up to date monitoring data

[33] Spend figures are based on most up to date monitoring data available and may not fully reflect the spend projects have been able to achieve.

Figure 5: Project funding drawn down (% of awarded grant) at end of Financial Year 2022/23



* Figures based on analysis from BEIS Delivery Team

The key challenge, discussed previously, cited extensively by respondents, was the challenging and "*unrealistic"* timescales of the Transition Scheme.

> *"[The Transition Scheme was] unrealistically too short, and there was never going to be enough time to disperse the money and get the spend within the financial year, as we were technically required." (BEIS Group Interview)*

> *"I think some of the projects didn't achieve full drawdown. Quite a few of them didn't because of the timescales. I think the timescales were the killer really." (BEIS Group Interview)*

Both internal and external barriers (or 'bottlenecks') to delivering to timescales and budget were identified by interview respondents:

- A significant minority of projects described that the delays they experienced were often a result of **external funded activities** critical to project progress, (for example, subcontracted design elements, legal document and contracting work) where timescales are out of project's direct influence:

  > *"[the work is] tied to third party programmes and when they can actually do the work and they'll only work as fast as they can" (Transition Scheme Participant)*

  A significant minority of projects cited delays in wider capital development projects (for which the planned heat network will service) were a bottleneck for project progress. Planning delays, and lengthening timescales for development, have a knock-on impact on the heat network being able to effectively commercialise, stalling any project progress.

- A minority of projects cited **the time required for procurement** as a key challenge in spending full funding allocations within the timeframe, describing it as *"incredibly challenging to get a tender done and on board and get them to do the work by March 31st".* BEIS respondents saw this pattern across projects, stating that those projects that had already procured were much quicker to set up and begin delivering.

- A majority of BEIS respondents highlighted **long and complex approval processes within public sector organisations**, particularly local authorities, as a key factor in the slow mobilisation of projects and their ability to be able to spend quickly.
- There was a challenge of **applicant over-optimism** with regard to the budgets and timescales they had outlined at application stage, with an expectation that the Transition Scheme might *"top up"* budgets as needed. BEIS respondents explained that projects promised a lot at the application stage, and at the time of application there was a reasonable expectation within the delivery team that projects would be able to spend within the time allocated, however, with hindsight, respondents reflected it would have been very challenging for some of the projects to deliver as promised:[34]

> *"There was pretty huge optimism bias around spend profiles and none of the projects were able to actually achieve the amount of spend that we wanted within the time" (BEIS Group interview)*

Evaluators also explored with respondents their **experience of mobilising projects**, following an offer of funding, and if any procedural barriers slowed this process:

- The majority of projects did not identify specific procedural hurdles to mobilising projects. Particularly for round one applicants, there was a sense that money was awarded *"fairly quickly."*
- For those applicants that cited more acute challenges in mobilisation, these were not related to procedural blocks, but timing. A majority of respondents specifically highlighted that offers came very close to Christmas holidays, which made it challenging for organisations to get documentation in place and sign off from senior individuals, impacting on timelines overall.

With regard to the project's experience of **ongoing reporting requirements**:

- A majority responded positively, stating that the reporting required was *"relatively light touch."*
- However, for half of projects, there was a sense that the requirements (how to fill out templates, how often to do so) lacked clarity and could have been better communicated by BEIS.
- A minority of projects highlighted that it was not clear to their organisation how to report the project financial information in the monitoring reports and that it felt that the cashflow reporting was more suited to private than public sector organisations. One aspect of reporting which a number of projects highlighted as challenging, although was a requirement of the scheme and set out in the application stage, was that, to draw down funding, work had to be invoiced and paid, which was likely to take a month to complete, further reducing the time in which the projects had to deliver.

[34] Within the scheme rules there was protection against over-optimism, with projects required to either claim in arrears of spend (non-LAs) or evidence spend commitment after funds were paid (LAs) so the Delivery Team had opportunity to either not pay out or claw back.

- One BEIS group suggested that private sector participants were better at providing forms to time and to date and that organisations that were paid up front were less prompt in providing data.
- The evaluation team found that in some cases, the most recently available monitoring data from projects was quite dated[35] and did not fully reflect project progress. Reasons for this relate in part to the limited resource and other priorities of the delivery team, meaning pushing for project monitoring data was de-prioritised, and data received from projects did not arrive consistently and was not collated straight away.[36]
- It was also reflected by a BEIS respondent that quarterly reporting, rather than monthly, would have reduced the burden on those administering the scheme.

Project Experience of Commercialisation

Relevant Process Evaluation Questions:

17. What types of projects are successful/unsuccessful at the commercialisation stage and why?

4. How are projects interacting with and navigating the supply chain to deliver the market transformation commitments?

21. Has the low-carbon requirement created any difficulties for projects during the application and commercialisation phase?

25. Do particular types of projects experience delays or unexpected costs, and could these be identified earlier at application stage?

The experience of commercialisation of the seven Transition Scheme projects was varied, with some progressing their heat network to a suitable stage to apply for the Main Scheme and others altering their approach to commercialising their project. This section draws out findings on the types of projects that were successful and unsuccessful in commercialisation and explore whether particular types of organisations experience unexpected costs or delays.

A number of factors have contributed to the varying experiences of projects:

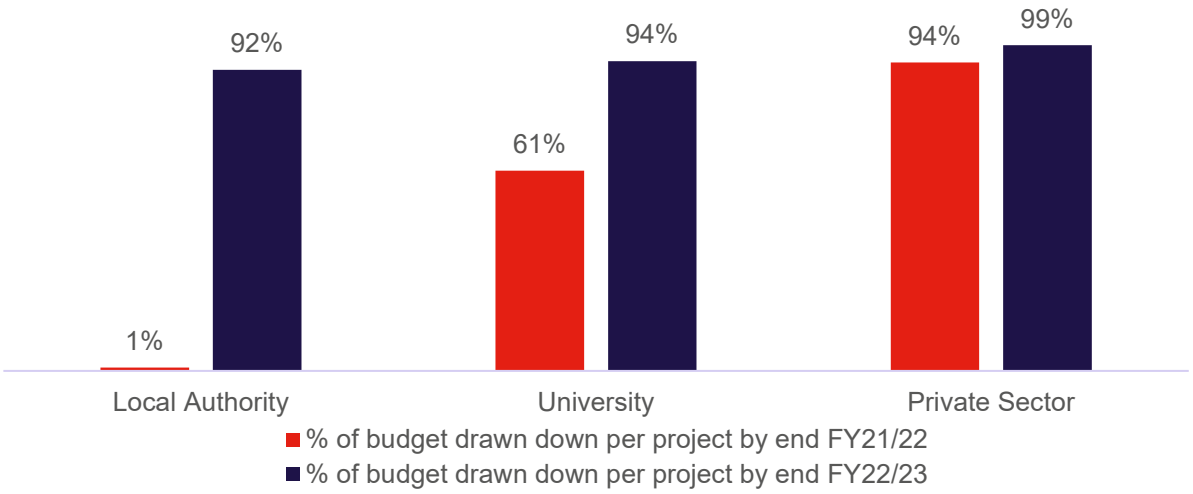
- A key point of difference highlighted by multiple BEIS respondents was between **private and public sector organisations**. As is shown in Figure 6, private sector projects were the most successful in spending their budget allocations, with the highest percentage spend by the end of FY21/22 (envisaged scheme end date) and in total (by end FY 22/23). BEIS respondents felt private sector organisations were more familiar and more equipped for shorter delivery timeframes, that they had more in-house dedicated resource, and that they had shorter and less complex approval lines than public sector organisations. In this way, private sector organisations were described as possessing

[35] The most recent Monitoring Report received was dated October 2022 and the oldest was dated February 2022
[36] Even though the BEIS delivery team were not always able to get monitoring reports, the delivery team had regular calls with projects to check progress.

the *"nimbleness"* to commercialise more quickly and effectively. Although public sector organisations were able to spend more than 90% of their allocated budget, Figure 6 shows that this was significantly slower than with the private sector.

- Additional key contexts for one of the private sector developers was that they were specialists in delivering low carbon heat networks of a particular type (i.e., large scale water source heat pumps).[37]

Figure 6: Project funding drawn down (% of awarded grant) by applicant type[38]



Two further interrelated factors contributing to successful commercialisation were the **size of the scheme** and the **quality of the previous feasibility work** completed.

- One BEIS respondent commented that larger schemes will have more challenges in meeting deadlines and spending quickly because of a larger number of stakeholders to coordinate and more technical elements to deal with within the project, adding additional layers of complexity to navigate and, in the end, delays to project timing.
- A key success factor identified by a majority of BEIS respondents was the quality of work done prior to application. Where projects had completed detailed feasibility work pre-application – one respondent specified adhering to HNDU techno-economic feasibility study specification – they were much more likely to succeed in commercialisation. Projects that needed to change their plans from the feasibility work, either because the work was flawed, or the plan was unable to be worked out in practice (e.g., heat sources not working out), had a much more challenging experience of commercialisation.

With regards to experience and challenges in **commercialising low-carbon heat sources**:

- This was not a challenge across the board, but where projects experienced challenges with commercialisation, this was often in commercialising the heat source. Where technology was more novel (e.g., deep mine water) or projects had to agree heat prices

[37] The second private sector organisation did not participate in the evaluation.
[38] Spend figures are based on most up to date monitoring data available, as of January 2023 and may not fully reflect the spend projects have been able to achieve. Figures for FY22/23 have been provided by BEIS as monitoring data was not available for analysis.

with other organisations, costs could be significant and made the project difficult to get to commercial viability. A number of projects also highlighted electricity grid constraints as a challenge for making heat pumps viable to meet the demand required.

When asked about their experience of delivering against the Transition Scheme **market transformation commitments**:

- A majority of projects cited that the GHNF commitments aligned with their pre-existing social value and sustainability ambitions and therefore didn't pose a significant challenge:

  "A lot of it was already on our mind anyway, it [organisations sustainability and social value ambitions] embodies a lot of [the market transformation] commitments anyway" (Transition Scheme Participant)

- However, given the limited supply chain engagement that projects experienced, and the fact requirements on projects were intentionally more light touch (than would be on the Main Scheme) there is limited evidence on how projects experienced delivering these requirements.

Impact of the Transition Scheme

This section covers the impact element of the evaluation and captures insights across stakeholders into how the Transition Scheme performed against its intended outcomes and impacts, how, why, for whom, and in what circumstances.

Overall Emerging Impacts

Relevant Impact Evaluation Questions:

1. What are the emerging impacts of the Transition Scheme and how these were achieved, for whom, when, and what contextual factors applied?

Our research highlights that:

- **The Transition Scheme did not, in itself, cause applicants to switch from proposing a fossil-fuel-powered heat network scheme to a low carbon heat network scheme**. Applicants had made the decision to progress a low carbon heat network scheme at an earlier stage, driven by a number of factors including their organisation's Net Zero ambitions and supportive planning policies. In some cases, applicants mentioned that HNIP rules about pathways to decarbonisation, and the general availability of future funding for low carbon heat networks, had contributed to these earlier decisions.
- **The Transition Scheme led to a number of projects applying to undertake commercialisation work earlier than they otherwise would, where they would not**

have had access to other commercialisation funding within the next twelve months.

- For Transition Scheme projects, where other commercialisation funding might have been available (from internal or external sources), **there were still advantages to Government grant funding that motivated project teams to apply**. These advantages included that grant funding was seen as 'free money'; and where internal stakeholders were cautious, Government funding would build support amongst senior management; that being accepted onto the Transition Scheme would help them to progress to get further Government funding from the Main Scheme and, in due course, external public (e.g., for London-based schemes via the GLA) or private investment.

The benefits of commercialisation activity and scheme participation for Transition Scheme participants were that:

- All Transition Scheme participants were able to progress their commercialisation work, to some degree, through Transition Scheme funded activities. This **reduced project uncertainties and helped them to progress towards a final investment decision**. However, further commercialisation work was needed in all cases to reach a final decision. This was particularly marked in those cases where Transition Scheme funds were only part-spent because of timing constraints.
- All Transition Scheme participants reported that being successful in winning Transition Scheme funding had, or would, play a role in **building the credibility of their scheme** with project stakeholders (internal or external). This was because the stakeholders trusted that the scheme had been thoroughly assessed by BEIS.

  "For [..] a project like this with assurance from BEIS, because for the Transition Scheme they will look at the technique or concept, they will look at a financial assessment and our engagement. Also, a lot of [..] what we promise to do after the completion of the project. That covers a wider range of the general [working] of the project to give confidence of how reliable the [scheme] can be. That makes our application to other funding schemes easier, so they understand the project is also being monitored by BEIS, a more professional and more capable organisation, who can help us and monitor the project over the long term." (Transition Scheme Participant)

  "Anything where the government have bought into your proposals gives maybe a slight degree more of confidence, at least that an independent party has looked at it and also agreed it's worth pursuing to that extent. So, it could've been kicked out at any stage. It hasn't been, so at least there's maybe a little bit of degree of confidence there. It depends possibly who you're talking to as well." (Transition Scheme Participant)

  "I think it also made it much easier for us to win the internal arguments about taking a low-carbon route, [..] and taking a communal route that would allow us to provide low-carbon heating to other institutions that are not yet on the scheme. I think it gave us enough leverage to build something that will be good for us but also good for the area in the future. It allowed us to think longer term." (Transition Scheme Participant)

- Transition Scheme participants also reported that **they developed capability and knowledge about low carbon heat networks** through their involvement in the Transition Scheme. Where Transition Scheme participants were not already specialists in heat network development, capability and knowledge gains were achieved primarily through their interactions with external consultants involved in the application or commercialisation process. In the case of those already specialist in this field, there was evidence of capability development as a result of signposting by BEIS project staff and increased networking opportunities.
- In addition to these benefits for Transition Scheme participants, there was evidence of the Transition Scheme application process helping applicants (whether successful or not) to **gain experience and gather information that would support an eventual Main Scheme application**. Where BEIS had issued clarification questions on the Transition Scheme bid or imposed grant conditions on the Transition Scheme grant, meeting these requirements was expected to help applicants make successful applications to the Main Scheme. One Transition Scheme applicant had already been successful in obtaining Main Scheme funding at the time of the research.
- Interview evidence indicated that **the beneficial impacts of Transition Scheme support appeared to be greatest** for project teams that had less in-house expertise and experience in delivering low carbon heat networks, and for projects that were at the right stage of project development (e.g. had reached the DPD stage); that needed to progress commercialisation urgently, ahead of the Main Scheme (e.g., because they wanted to match the timescales of heating systems decisions by external customers or new property developments); and that did not face major delays in implementing their proposed commercialisation work (and could therefore spend a greater proportion of their funding within the timeframe of the transition Scheme).

Impacts for the Green Heat Network Fund Main Scheme

Relevant Impact Evaluation Questions:

3. How much, and in what ways is the Transition Scheme enabling and unlocking value of the Main Scheme

Our research highlights that:

- A majority of BEIS respondents reflected that the Transition Scheme has set the Main Scheme up for a **stronger first year** than would have been the case without the Transition Scheme, including more applications in early Main Scheme rounds than expected. This reflects the role of the Transition Scheme in building and maintaining the momentum from HNIP and raising awareness of the Main Scheme at an early stage i.e., to give projects the required lead in time to be ready for a Main Scheme application. The Transition Scheme was also described as instilling confidence in the wider market in the support.

  "If we hadn't done the Transition Scheme, I suspect the picture for year one of [the Main Scheme] would have been worse… I think in the round we probably didn't hit the

ambition, but actually not doing [the Transition Scheme] would have been worse for GHNF". (BEIS Group Interview)

"*It's really important to maintain that momentum. And I guess that's what it did". (BEIS Group Interview)*

- There has been some success in the Transition Scheme supporting organisations to **progress towards a final decision to start construction** and apply for early stages of the Main Scheme. Three projects have already applied for the Main Scheme, and two others anticipate submitting applications in future application rounds. However, with all Transition Scheme projects, the Transition Scheme "*didn't get the project all the way there"* in terms of commercialisation and more work was required to commercialise the heat network before construction could begin. For two projects, challenges experienced in commercialising their projects have meant that Main Scheme applications are a long way off.
- The experience and knowledge from the Transition Scheme application process has meant that **for projects who participated, the Main Scheme application was more straightforward** as a *"lot of the hard work"* has been done and projects understood much more clearly the requirements. In some cases, grant conditions imposed by BEIS gave them a clear indication of the work that needed to be done before a Main Scheme application would be successful. Even for those who didn't end up applying for the Main Scheme, their participation in webinars has enabled further applicants to have a better understanding of the application process.

A key benefit for **BEIS** was that the Transition Scheme helped **refine elements of the Main Scheme**. Benefits include: improving the pipeline from the start by removing barriers felt by certain projects (e.g., regarding the pence per kWh threshold); reducing the potential for gaming of applications by identifying the challenge of duplicate funding; improving the guidance and support for projects by providing best practice examples for the Main Scheme and by helping to develop the MTCs through experience with actual projects to test what was *"reasonable"* to ask projects to do.

The Transition Scheme was critical in testing and refining delivery processes ahead of the Main Scheme launch, and evidence suggests that it was unlikely this benefit would have been as pronounced had the Transition Scheme not been delivered in-house.

The experience of in-house delivery also meant that BEIS could more actively steer the Main Scheme delivery partner (Triple Point) on how they would like delivery to occur: *"So as a training module for an intelligent client function, it was absolutely invaluable."*

Similarly, respondents cited the Transition Scheme as particularly useful in testing the eligibility criteria ahead of the Main Scheme to make sure BEIS "*weren't being ridiculous [with] questions and requirements".* Through the Transition Scheme, one project was able to *"compellingly"* challenge the 3.33 pence of grant per kWh metric with project data, confirming anecdotal evidence received and enabling a tweak to the scheme.

Impacts on Applicant Organisations

Relevant Impact Evaluation Questions:

6. What effect is the Transition Scheme having on sponsors/projects' capability and capacity, and how has this been achieved?

The Transition Scheme helped to develop participants' **capability and knowledge** in two ways:

- Firstly, for those participants who had less in-house expertise and experience in delivering low carbon heat networks, by giving them exposure to techno-economic consultants who supported the preparation of Transition Scheme bids and to design consultants (e.g., mechanical and electrical consultants) who implemented commercialisation activities funded by the Transition Scheme. This contributed to their capability and knowledge about low carbon heat networks.
- Secondly, for participants including those with in-house expertise and experience in delivering low carbon heat networks, by giving them access to signposting by BEIS project staff. This gave them useful information for commercialisation of their current or future low carbon heat networks. For example, one project team had previously been unaware that a local authority was developing plans for a heat network that was adjacent to theirs.

  "They [BEIS] did [..] act as a bridge between us and the Council at first, so [..] they helped facilitate that relationship because originally, we weren't aware that the Council had been successful in the funding for the [Council scheme]. [..] We're developing a wider scheme essentially, so they did put us in contact with people like the Council and a few other people that assisted us with the commercialisation. So, they acted as an enabler as well as a funder, so it was good." (Transition Scheme Participant)

Impacts on the Wider Market

Relevant Impact Evaluation Questions:

4. What impact did projects' Market Transformation Commitments have (and how were these perceived) by projects/applicants?

14. What effect did the Transition Scheme have on projects engagement with the supply chain and market. Have they seen any new market entrants?

8. Is there a sense that consumers are willing to connect to heat networks? Have there been any differences in willingness to connect between different consumer groups?

10. What effect is GHNF having on the heat networks investment and what are the mechanisms involved?

Our research suggests that:

- The potential to transform the heat network market through the Transition Scheme has been very limited. This is a result of the relatively small amounts of money involved (thereby lacking transformational potential) and the limited level of engagement with supply chains. Given the short timelines to deliver, most projects already had consultants appointed or frameworks in place. A BEIS respondent noted:

  "In terms of changing the market, I think probably just the [number of] project[s] and the Transition Scheme are just too small to have much of an impact" (BEIS Group Interview)

- A small minority did question the extent to which significant market transformation could be sufficiently driven by GHNF-funded projects coming online, as a piecemeal number of projects in a given area would not build confidence for supply chains to invest in an area and suggested that the Market Transformation Commitments needed to be accompanied by additional Government funding.

That said, one BEIS respondent highlighted an example where the Transition Scheme had encouraged innovation by SME developers, where an "*effectively abandoned"* scheme, which had been looked at by HNDU two or three times previously, was picked up by a private sector organisation who ran with it and have *"far exceeded the original study ambition".* The respondent highlighted that:

> *"We can't just have incumbents doing the same old same old. We need people to be hungrily looking for projects and scouring the old HNDU projects that have been shelved, reinventing them, looking at them afresh." (BEIS Group Interview)*

On **consumer perspectives** of heat networks, the following points were identified:

- For many Transition Scheme projects, conversations with consumers to date have been limited and a full view on their willingness to connect will not be apparent until the projects progress further.
- Projects have had light touch conversations with consumers, and in the context of the energy bill crisis, although some responses from consumers were mixed, heat networks were not dismissed out of hand, but rather cost was the key consideration. For this reason, some domestic consumers expressed a concern about private sector led schemes, given the assumption that the private sector would control prices.
- A significant minority of respondents highlighted that non-domestic consumers (schools and businesses) were actively engaging with the scheme to see if they could connect. This was being largely driven by high energy costs from other sources. In one of the examples, it is possible that interest came as a result of being close to a EfW facility and not a consequence of scheme activities.

On transformation within the **investment market**, the evaluation has identified that:

- Projects have had limited formal engagement with the investment market and most conversations have only been exploratory. However, for most, this element of

commercialisation was not felt to be something that was particularly challenging and there was a sense from projects that *"appetite to invest in heat networks is growing."* A number of respondents highlighted that investors had expressed an interest as a result of visibility from the BEIS Heat Network Pipeline database.

"We've probably had approaches from five or six investors shall we call them. Some of them are just looking for an investment opportunity to build and sell on. They would need build and construction partners. Probably have three that it feels on the face of it with a similar vision for the city and would be looking at this as a long-term option." (Transition Scheme Participant)

- There was some evidence of variation in the types of investors that were starting to engage with projects, including traditional investment houses, pension schemes and those who would develop a funder-operator model.

One BEIS respondent referred to the role of the Transition Scheme in instilling confidence to the wider market ahead of the GHNF Main Scheme.

Impacts on Department for Business, Energy and Industrial Strategy

Relevant Impact Evaluation Question:

22. Has delivering the Transition Scheme in-house had an impact on BEIS capacity to deliver such schemes or provided key learnings to BEIS?

In addition to the impacts (described above) on the Main Scheme, in-house delivery of the Transition Scheme has:

- **Improved cross-departmental relationships** between teams delivering the scheme. However, it was suggested by one BEIS stakeholder that, despite in-house delivery success, the appointment of an external delivery partner is a more efficient approach and that it would free up BEIS team members to focus on other areas of heat network policy and would provide the necessary expertise required to provide a multidisciplinary assessment of multiple and detailed applications for high value funding awards:

  "I think hiring Triple Point is a better longer-term solution because they can pull into Triple Point the capabilities and it can be their complete focus; their number one priority, whereas in-house, there are competing priorities." (BEIS Group Interview)

- **Demonstrated the skills and capability** across the BEIS teams. Respondents felt that demonstrating these skills and developing useful tools to effectively manage the scheme was a benefit.

Remaining Barriers to Low Carbon Heat

Relevant Impact Evaluation Question:

15. Have projects experienced any barriers or constraints that have impacted their ability to access low carbon heat?

Our research highlights that:

- All projects reported challenges in securing low carbon heat, to varying degrees of significance for the project's commercialisation.
- A significant minority of applicants and non-applicants found that **electricity grid constraints** in their locality were significant challenges to being able to run heat pumps, with difficult timescales for grid upgrading:

  "[the area is] very electrically constrained, which is probably one of the biggest challenges on the project to be honest… if there's no electrical capacity, then there's no scheme" (Transition Scheme Participant)

- For projects that relied on accessing waste heat from others there were challenges related to **negotiating prices for heat.** In one case a project *"couldn't reach suitable commercial terms"* and has had to find an alternative heat source, and in another, because of capital cost increases, Energy from Waste (EfW) suppliers have sought to re-negotiate tariffs to account for their rising capital costs for connection.
- A significant minority of projects proposing to utilise heat pumps described regular engagement with the heat pump supply chain, identifying, as expected, **long supply chain timescales** (three to six months) which may cause an issue for project timescales moving forward.
- For one project utilising mine water heat source, the key challenge was the **exploratory nature of this heat source,** with expensive drilling required to test viability. With questions of its theoretical viability as well as risky and expensive nature of the source (requiring contingency heat sourcing), this has posed a challenge to commercialise.
- More generally, realist analysis highlighted the **complex and technical nature of heat network commercialisation**. For example, where progress in determining their future heat systems depended on support from multiple internal stakeholders within the sponsor organisation; on technical factors; on economic factors (including the cost of fossil fuels); and (for networks that aimed to include external customers or new developments) on external customers' timetables. Further insights can be found in Annex 5.

Implications for Transition Scheme Theories

This chapter reflects the findings and lessons from the evaluation research in updated Theories of Change and CMO configurations for the Transition scheme to provide learnings on how the Transition Scheme worked in practice, compared to expectations, and to draw out insights for ongoing delivery of Main Scheme.

The **Executive Summary** gives an overview of the **lessons learned** on what worked well in the Transition Scheme, and what worked less well, as well as capturing the impacts of the Transition Scheme on various stakeholder types and in particular contexts. The following sections translate these learnings into updates to the theories outlined in the **evaluation methodology** chapter.

Updated Theory of Change

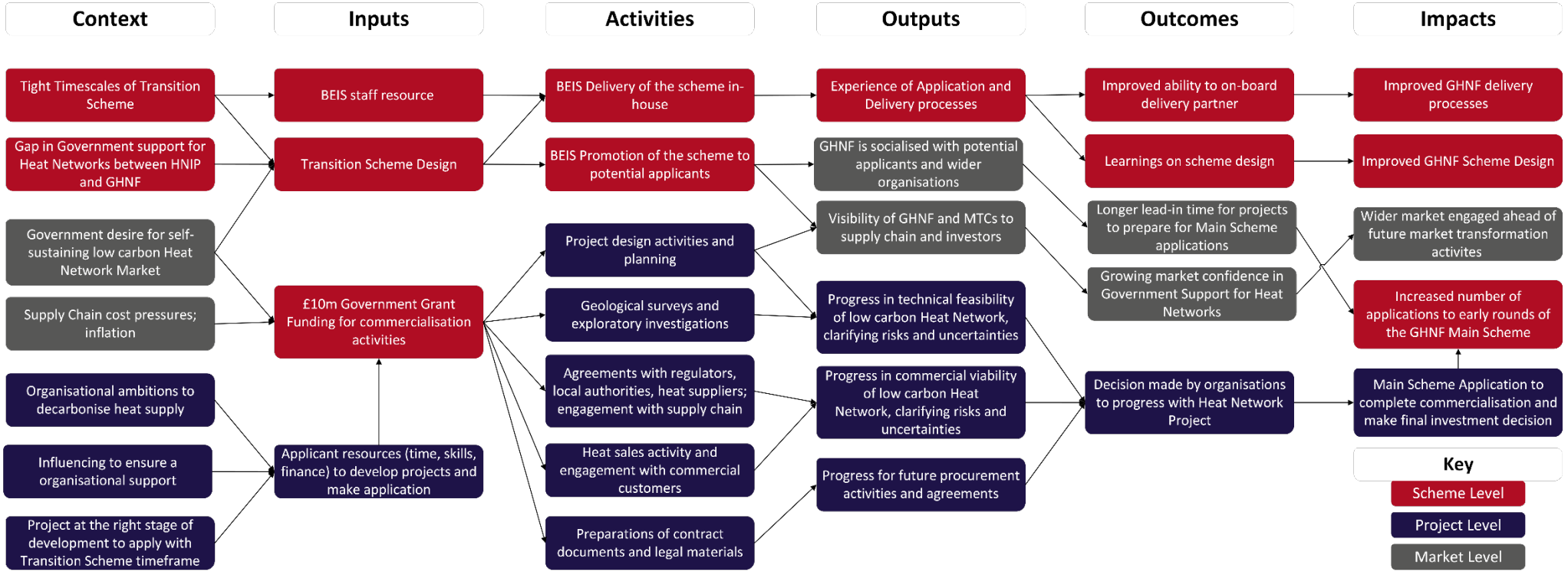
Based on the findings from the evaluation of the Transition Scheme, we have updated the Transition Scheme ToC, shown in Figure 7. The following changes have been made from the original Transition Scheme ToC:

- A **context section** has been added drawing out the key contexts specific to the Transition Scheme. These include potential for market hiatus following HNIP closure, tight timescales, supply chain cost pressures, and projects being at the right stage to apply.
- The **inputs column** has been simplified to capture the core inputs to the Transition Scheme, namely: Department staff resource, Scheme design, grant funding of up to £10 million and resources within the applicant organisation. Realist interviews have highlighted that the fact the funding was grant, rather than loan, was significant for their project decision making.
- The **activities column** has been refined to reflect the specific project activities undertaken by projects. Activities undertaken by the Department have been simplified to include delivery in-house and promotion of the scheme.
- **Outputs, outcomes and impacts** have been adjusted as these were not as far advanced as intended by the Transition Scheme. The Transition Scheme did not get any projects to ‘shovel ready’ status on its own as envisaged originally. Further commercialisation activities were required in all cases to reach a final investment decision and some projects were quite a long way from this.
- Given minimal substantive engagement with **supply chains** (beyond design consultants and exploration work) and limited formal engagement with **investors and consumers**, the scope of outcomes for these stakeholders in the Transition Scheme ToC has been reduced. It now includes reference to the wider role that visibility of the GHNF at an

early stage has had on confidence (anecdotal evidence only). For this reason, the Market Transformation Commitment element of the ToC was also reduced as evidence showed that the projects had not engaged significantly nor had transformational impact on the market occurred.

- It was further emphasised in outcomes and impacts the role that **socialising the scheme** to wider potential applicants has had on early stages of the Main Scheme, increasing lead-in times for projects to develop applications.
- In addition to the role of the Transition Scheme in piloting and providing lessons for the Main Scheme, the improved ability to **on-board a deliver partner effectively**, and the resulting improvement of delivery process, was included.

Figure 7: Updated Transition Scheme Theory of Change



Refined Context-Mechanism-Outcome Configurations (CMOs)

The CMOs for the Transition Scheme have been updated and refined based on our evaluation findings and are presented below (see page 18 for comparison).

CMOs for **applicant theory:**

A1: 'GHNF Transition Scheme commercialisation funding enabled a previously planned low carbon HN project to progress at this time': *WHERE* the proposed heat network was already low carbon and no other commercialisation funding was available within 12 months (context), *THEN* the opportunity to obtain GHNF Transition Scheme commercialisation support, with the possibility of future capital funding under GHNF Main Scheme support (resource), *LED TO* project teams making a Transition Scheme application (outcome) *BECAUSE* the GHNF Transition Scheme grant terms and conditions were acceptable to them and, if they were successful in getting GHNF Transition Scheme funding, this would enable them to progress their low carbon heat network development at this time in line with their operational/strategic imperatives and might ultimately help them to secure GHNF capital funding (reasoning).

A2: 'Let's go green': This CMO was excluded from revised theory – all project teams were already proposing a low carbon heat network project prior to considering a Transition Scheme application.

A3: 'This planned low carbon HN project could probably have been progressed in a different way, but GHNF Transition Scheme funding conferred advantages over other sources of commercialisation funding': *WHERE* the proposed heat network was already low carbon and other commercialisation funding was potentially available, within the same year as Transition Scheme (context), *THEN* the opportunity to obtain GHNF Transition Scheme commercialisation support, with the possibility of future capital funding under GHNF Main Scheme support (resource), *LED TO* project teams making a Transition Scheme application (outcome) *BECAUSE* they saw **GHNF Transition Scheme funding as preferable,** both because it was grant funding (seen as 'free money') and (where internal stakeholders were cautious) because getting Government funding would help to build support for the scheme amongst senior management. The GHNF Transition Scheme grant terms and conditions were acceptable to them and, if they were successful in getting GHNF Transition Scheme funding, this would enable them to progress their development in line with their operational/strategic imperatives and might ultimately help them to secure GHNF capital funding (reasoning).

CMOs for **participant theory:**

B1: 'GHNF Transition Scheme funding enabled us to undertake commercialisation activities': *WHERE* there was a need for commercialisation activity and Transition Scheme funding was available at approximately the right time in the project life cycle (contexts), *THEN* full or partial GHNF funding for commercialisation activities (resource) *LED TO* progress towards a final investment decision (although further work was or will be required to reach a

final decision) (outcome) *BECAUSE* the funding enabled the project team to undertake commercialisation activity that was necessary to clarify project risks and uncertainties, allowing more informed decisions to be made about the approach to development of the proposed scheme (reasoning).

B2: 'Winning GHNF Transition Scheme funding helped to increase the credibility of this low carbon heat network project in the eyes of senior management (and/or other senior stakeholders/funders)*: WHERE* senior management in the sponsor organisation were cautious but had confidence in critical assessment of Transition Scheme projects by Government (context), *THEN* the success of the low carbon heat network project in obtaining Transition Scheme funding (resource), *LED TO* increased credibility of the low carbon heat network project in the eyes of senior management (and/or other stakeholders/funders) thereby increasing their support for the project (outcome) *BECAUSE* it reassured senior management (and other stakeholders/funders) that a low carbon heat network solution was appropriate. (reasoning).

B3: 'We already had a good level of capability on low carbon heat networks but participating in the GHNF Transition Scheme helped to build our knowledge and capability further': *WHERE* the project team had a good level of capability on low carbon heat networks but still had potential to increase their capability and knowledge, and where their experience of the Transition Scheme was broadly positive (contexts), *THEN* participating in the GHNF Transition Scheme *and receiving guidance/signposting from BEIS and from external consultants* (resource), *LED TO* increased capacity and knowledge, improving their ability to commercialise this project or other heat networks (particularly low carbon heat networks) in future (outcome), *BECAUSE* the project teams learnt from interactions with expert advisers who undertook commercialisation activities, and with project coordinators in BEIS who provided 'signposting' to relevant contacts or information (reasoning).

New CMO B4: 'Applying for the GHNF Transition Scheme has given us a better understanding of what was/will be required for a successful GHNF Main Scheme application'*: WHERE* project teams planned to apply to the GHNF Main Scheme, and particularly where BEIS had imposed grant conditions before a Main Scheme application could be made (contexts), *THEN* pulling together Transition Scheme information that would also be useful for the Main Scheme application (AND – where relevant – being made aware of Transition Scheme grant conditions imposed by BEIS) (resource) *LED TO* an easier Main Scheme application process (and possibly improved prospects of success in winning Main Scheme funding) *BECAUSE* going through the process of applying for the Transition Scheme gave the project team a better understanding of what was (or will be) required for a successful Main Scheme application (reasoning).

Next Steps

This Chapter summarises the next step of the evaluation of the GHNF, setting this report in its wider context.

This Evaluation Report represents the second phase of evaluation of the Green Heat Network Fund.

The next phase of the evaluation will run from April 2023 to February 2024 and will be an interim impact, process, and economic (value for money) evaluation of GHNF Main Scheme. This phase will build on learnings from the evaluation of the Transition Scheme and will focus on early impacts of the GHNF Main Scheme and Market Transformation Commitments on projects, the market and the supply chain, and provide insights on what works well and less well with the Main Scheme. We will introduce more technical analytical elements and expand primary research activities, to include larger samples of respondents and focus on wider stakeholder groups. As in the evaluation of the Transition Scheme, the next phase of the evaluation will further test the ToC and realist assumptions.

Where Transition Scheme participants have successfully applied to the GHNF Main Scheme, they may be followed up in future evaluation research waves to provide insight into the longer-term impacts of the Transition Scheme.

Annex 1: Evaluation Questions

The following questions have been agreed with DESNZ for the Transition Scheme at the evaluation planning stage, following a rationalisation process of a full list of questions for the GHNF Evaluation overall.

Process Evaluation Questions

1. What works and what does not, for whom, when, how, and in what context – for the different types of applicants throughout the Transition Scheme's stages, and during commercialisation?

2. How effective has the communications, support and guidance been in supporting projects progress in all stages of the Transition Scheme project cycle (pre-application, application, post-award)?

3. How is the Transition Scheme being delivered and what improvements can be made? What should be done differently in the main scheme?

4. How are projects interacting with and navigating the supply chain to deliver the market transformation commitments (MTCs)?

5. What lessons can be learned from other heat network capital schemes in terms of barriers and enabling forces / trends, and how they interact with other policies?

6. To what extent have projects changed their initial design to integrate a zero/low carbon heat source as a result of GHNF Transition Scheme funding?

7. Which parts of the design and delivery of the Transition Scheme enabled or frustrated the desired impact of the projects? How, why, and in what ways?

8. What is the experience of the overall application process, and how does this vary by applicant or project type and why?

9. Are the eligibility and scoring criteria suitable, is there any gaming, and if so, how does this impact the delivery of GHNF?

10. What types of projects are successful/unsuccessful at the application stage, and why? At what points are applicants dropping out and why?

11. What happens between application success and initiation and are there any recurrent procedural blocks?

12. What has prevented potential applicants from applying?

13. How has the low-carbon requirement impacted the types of projects that are successfully applying?

14. What are the barriers to applying for the Transition Scheme?

15. How well was the Transition Scheme communicated to potential applicants, and to what extent is this cutting through?

16. What has the overall experience been for project types and different stakeholders?

17. What types of projects are successful/unsuccessful at the commercialisation stage and why?

18. How do outcomes differ between projects and why? In particular, how does this vary across different contexts?

20. Is the guidance and support available meeting the needs of projects?

21. Has the low-carbon requirement created any difficulties for projects during the application and commercialisation phase?

23. Are projects on track to deliver on time and budget? If not, what barriers have influenced this?

24. Will annual funding allocations be spent? If not, why? What bottlenecks have been identified?

25. Do particular types of projects experience delays or unexpected costs, and could these be identified earlier at application stage? In particular, what has been the role of the wider context?

26. What has the experience been like with projects providing timely and/or accurate application and monitoring data? What further support could be offered by BEIS to improve those projects with a poor record of reporting?

27. What have been the benefits/challenges of delivering the Transition Scheme in-house?

Impact Evaluation

1. What are the emerging impacts of the Transition Scheme and how these were achieved, for whom, when, and what contextual factors applied context?

3. How much, and in what ways, is the Transition Scheme enabling and unlocking the value of the main scheme?

4. What impact did projects' Market Transformation Commitments have (and how were these perceived) by projects/applicants?

6. What effect is the Transition Scheme having on sponsors/projects' capability and capacity, and how has this been achieved?

8. Is there a sense that consumers are willing to connect to heat networks? Have there been any differences in willingness to connect between different consumer groups? Have projects faced any difficulties in convincing consumers of the benefits of connecting? How did they do this? What strategies did they use? What effect had the Transition Scheme on consumer awareness, attitudes, needs and behaviours?

10. What effect is the Transition Scheme having on the heat networks investment and what are the mechanisms involved?

14. What effect did the Transition Scheme have on projects engagement with the supply chain and market? Have they seen any new market entrants?

15. Have projects experienced any barriers or constraints that have impacted on their ability to access low carbon heat?

22. Has delivering the Transition Scheme in-house had an impact on BEIS capacity to deliver such schemes or provided key learnings to BEIS?

Annex 2: Transition Scheme Theory of Change

This Annex provides narrative detail on the original Transition Scheme Theory of Change (ToC) that was tested as part of this evaluation.

Theory of Change Narrative

The initial ToC produced for the Transition Scheme is presented in Figure 1. The text below gives a narrative overview of this ToC. Through the Evaluation of the Transition Scheme, this ToC has been tested and updated to reflect findings and is presented in 'implications' chapter of the Evaluation Report.

Inputs

Inputs are divided by government inputs and applicant inputs:

- As **government** inputs, the ToC captures the financial investment into the Transition Scheme, the existing knowledge and expertise (i.e., acquired by BEIS from HNIP) and the inputs into designing the policy, encompassing the wider policy context.
- As **applicants** inputs, there is a recognition that a significant amount of pre-application work (e.g., feasibility studies) is required. This requires financial and people input on behalf of the applicant organisation, as well as internal influencing and approvals.

Activities

Activities have been divided by stakeholder group and by type of activity:

- For **BEIS**, the project delivery element of their role is highlighted, capturing their support during pre-application (marketing, pipeline development, supporting projects), application (reviewing applications and making decisions) and post-application (supporting projects and ongoing monitoring).
- For **applicants**, the activities relate to the work to complete their application and the project delivery work. Project delivery activities include commercialisation (project development, project permissions and licenses and project procurement), and activities related to market transformation commitments (open engagement and knowledge sharing, and open procurement). In practice, activities relating to market transparency were limited, and therefore have been removed from the updated ToC.

Outputs

Outputs relate to the direct results of Transition Scheme activities, and we have identified outputs relating to the following activities:

- Outputs of **commercialisation activities** were expected to include complete designs for Heat Networks, procurement of contractors for construction, agreements with investors and consumers, and completion of necessary licencing and permissions.
- On the **outputs for applicants**, these relate to the experience that applicants will have of the process of commercialising a Heat Network project, and the experience of participating in the Transition Scheme, feeding through to improving capacity and capability, and providing feedback on the scheme.
- Outputs of **market transformation activities** are focused on the engagement elements, including market transparency and sharing of lessons learned. In practice, activities relating to market transparency were limited, and therefore have been removed from the updated ToC.

Outcomes

Outcomes have been divided into intermediate and longer term and segmented by stakeholder type:

- **Outcomes for investors, the supply chain and consumers** relate to the expectation of the Transition Scheme to drive projects to completing commercialisation activities, assuming all contracts and agreements are in place for investment, construction, and connections. These all feed into the long-term project outcome of being ready for construction to begin.
- **Outcomes for applicants** relate to capacity building in developing heat network applications and projects, and the influence of the Transition Scheme on intentions to apply for the Main Scheme. These outcomes feed through towards improving the GHNF Main Scheme pipeline. Applicant outcomes also include the learnings that they can feed back on scheme design and delivery.
- **Market Transformation Commitment outcomes** were linked to the engagement that the Transition Scheme would give between projects and the wider sector. These included the demonstration of best practice business models and approaches to procurement, as well as better identification that market engagement would provide on the barriers and enablers for project progress. These all feed into the longer-term outcome of learnings on scheme design and delivery.

Impacts

Three core impacts of the Transition Scheme were identified at the outset, aligning with the aims of the Scheme. These were:

- Providing a **pipeline of projects ready to apply for Main Scheme construction funding** in round one, assuming that the Transition Scheme funding would enable projects to complete all necessary commercialisation work at a sufficient pace that they would be ‘shovel ready’ projects for round one of the Main Scheme.
- Providing a **demonstration effect to other potential projects** to raise the profile of GHNF funding and build the pipeline of Main Scheme projects more. This assumes that the project activities undertaken by Transition Scheme projects would be visible to the wider market.

- **Improving Main Scheme design and delivery** through the learnings that the Transition Scheme would provide on what worked well and what worked less well. This assumes that BEIS would use the Transition Scheme as a pilot for the Main Scheme.

Annex 3: Quantitative Analysis

This Annex presents the quantitative analysis of application and monitoring data for the Transition Scheme, presenting data tables, statistical analysis, data visualisation and some narrative around the analysis.

Data for this section has been sourced from Application Forms and Completed Monitoring Reports. It should be noted that in some cases, due to project delays and/or non-submission of Project Monitoring Reports, the data is incomplete, and as such a number of planned elements of analysis have not occurred.

Analysis of Transition Scheme Application Data

Table 3: Applicant Type

Applicant Type	No. of Applications[39]	No. of Successful Projects	% of Successful Applications
Local Authority	4	3	75%
University	2	2	100%
Public Sector (other)	0	0	NA
Private Sector	4	2	50%
Third Sector	0	0	0%
Total	**10**	**7**	**70%**

[39] There were seven successful applicants to the scheme, and two unsuccessful. One additional applicant withdrew their application.

Figure 8: Applicant Type

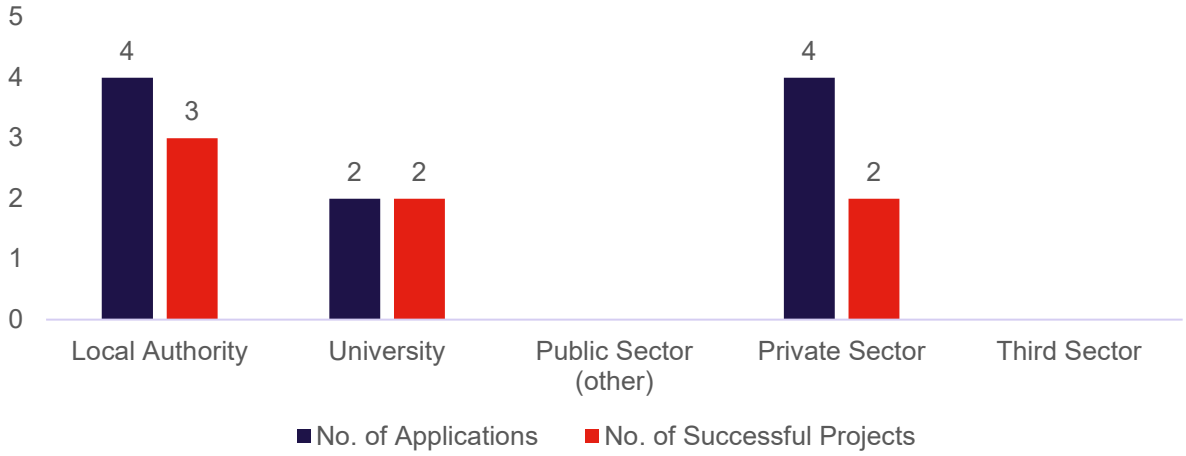


Table 4: Grant Funding Awarded vs. Available

£	Grant Available	Grant Awarded	% of Available grant Awarded
Total	£10m	£4.74m	47%

Table 5: Type of Heat Network

Type of Network	Total Number (%)
New Network Construction	5 (71%)
Decarbonisation/Expansion of Existing Network	2 (29%)

Table 6: Project Heat Source

Primary Heating Technology	No. of Applications	No. (%) of Successful Projects
Heat Pump	7	6 (86%)
Industrial Heat (EfW)	3	1 (33%)

Figure 9: Applicant Locations (percentage)

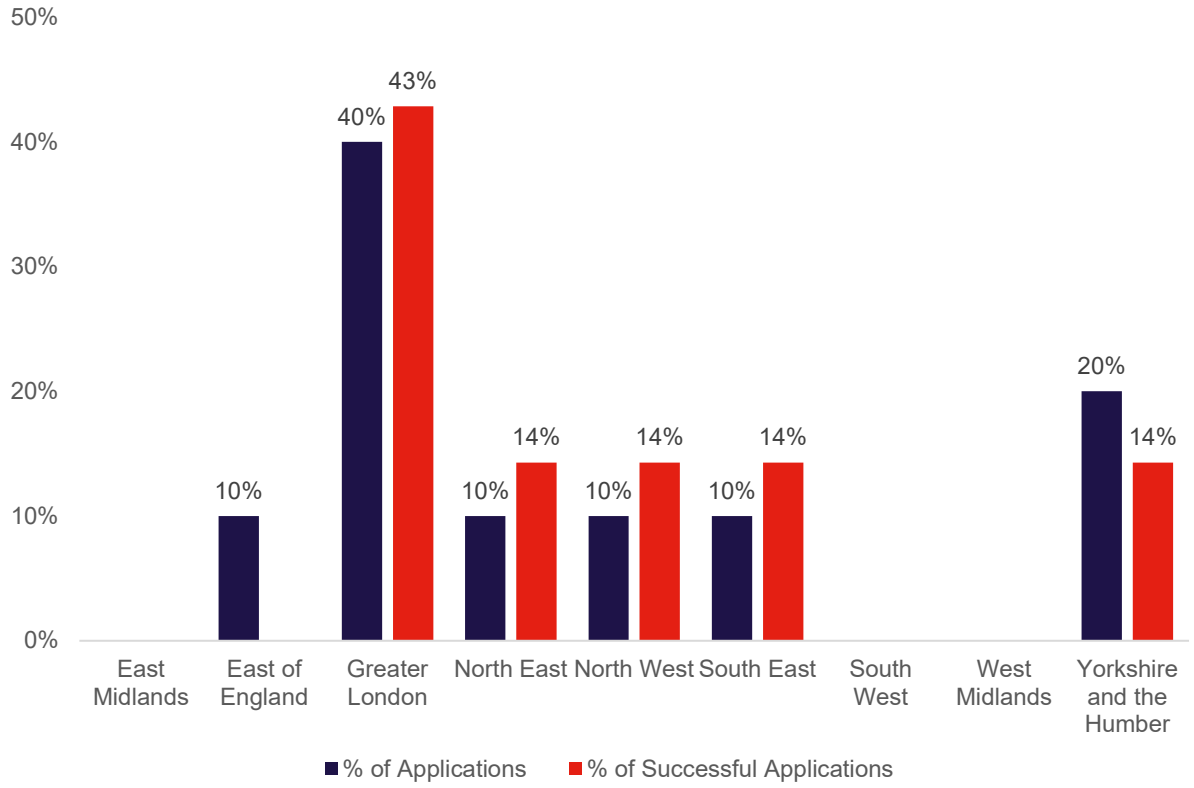


Table 7: Applicant Locations (number)

Region	No. of Applications	No. of successful Projects
East Midlands	0	0
East of England	1	0
Greater London	4	3
North East	1	1
North West	1	1
South East	1	1
South West	0	0
West Midlands	0	0
Yorkshire and the Humber	2	1

Table 8: Expected Network Heat Demand[40]

Annual Heat Demand	Successful Projects (n=5)	Unsuccessful Applications (n=2)
Total	123.3 GWh	82.6 GWh
Average per project	17.6 GWh	41.3 GWh

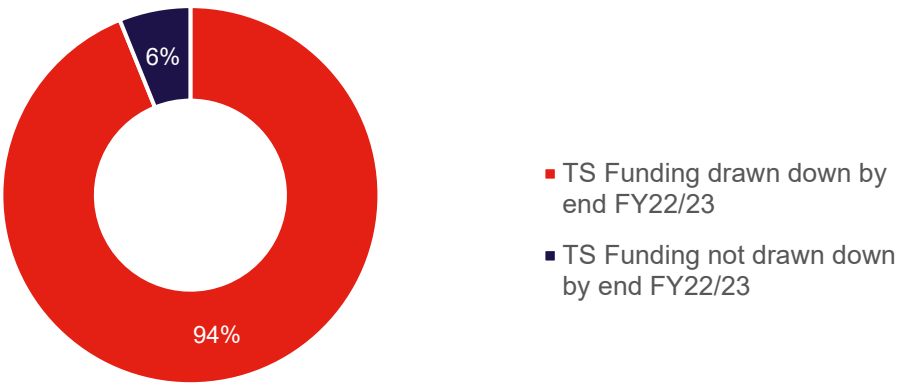
N.B. As the above difference in network size is not statistically significant at a 5% confidence level, we should not infer that the Transition Scheme was less attractive or less accessible for larger schemes. This is something that should be explored further in the evaluation of the Main Scheme, where more projects will engage.

Table 9: Heat Network Function

Function	No. of Projects
Heating only	5
Heating and Cooling	2

Analysis of Transition Scheme Monitoring Data

Figure 10: Project funding drawn down (% of awarded grant) as per most up to date monitoring (as of January 2023)



* Figures based on analysis from BEIS Delivery Team

Table 10: Project Spend by Organisation Type

[40] One applicant that withdrew their application was not included in this analysis.

Organisation Type	% of budget drawn down per project by end FY21/22*	% of budget drawn down per project by end FY22/23**
Local Authority (3 projects)	1%	92%
University (2 projects)	61%	94%
Private Sector (2 projects)	94%	99%

**Spend figure based on most up to date monitoring data and does not necessarily reflect actual project spend that may have occurred in this time period*

***Final figures provided by BEIS delivery team and not part of monitoring data analysis*

Figure 11: Project funding drawn down (% of awarded grant) by applicant type

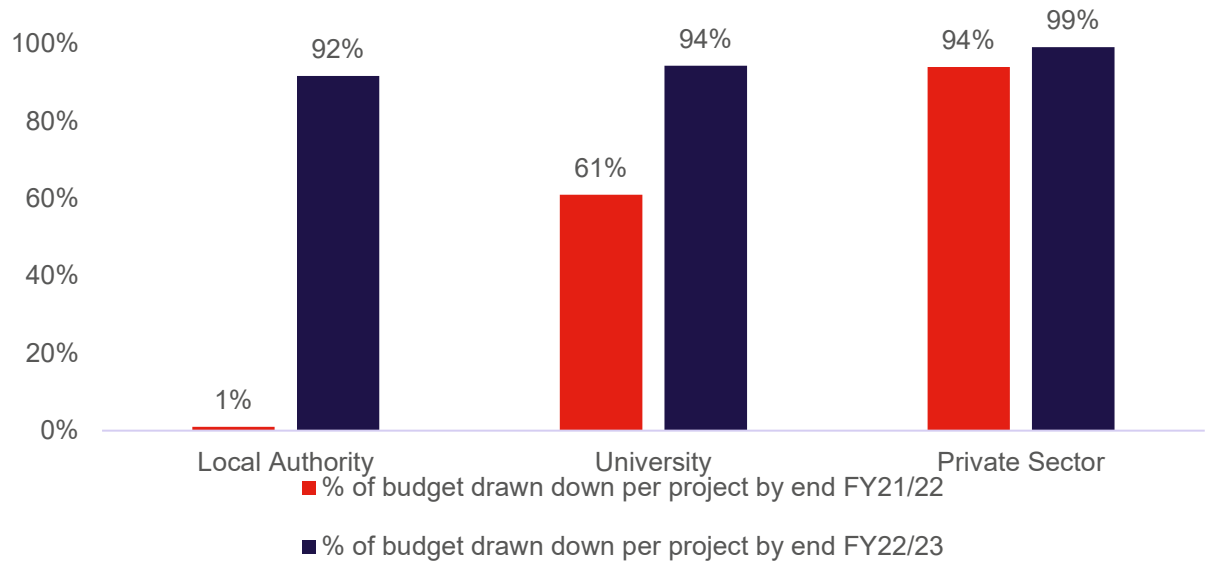
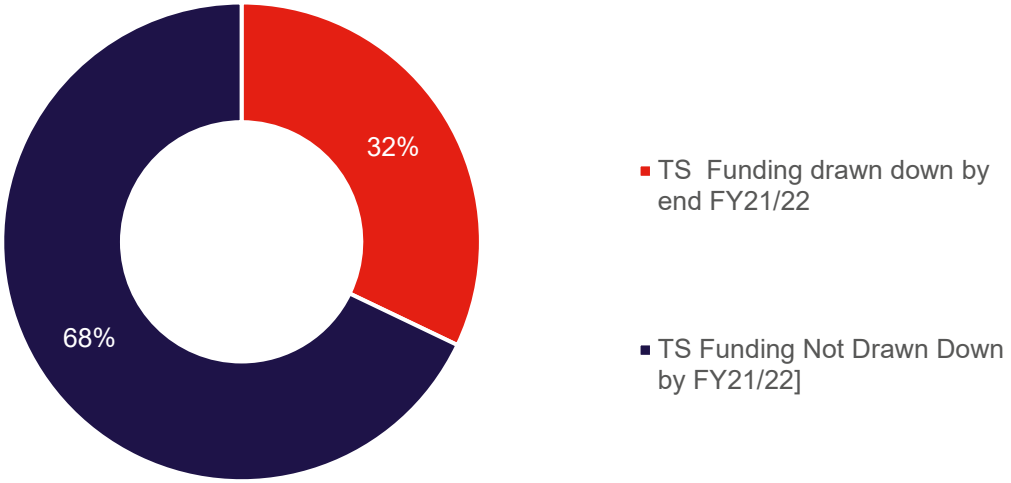


Table 11: Project Spend by end of Financial Year 21/22

£	Project Budget	Project funding drawn down by end of March 22*	% Project funding drawn down by end of March 22*
All Projects	£4.735m	£1.518m	32.1%

**Spend figure based on most up to date monitoring data and does not necessarily reflect actual project spend that may have occurred in this time period*

Figure 12: Project Funding drawn down (% of awarded grant) at end of Financial Year 2021/22



* Spend figures based on most up to date monitoring data

Analysis of Data from Other Sources

Table 12: Reasons for not applying to GHNF Transition Scheme?

Reason for not Applying	No. of Respondents*	% of Respondents
Project not Ready	6	38%
Project not Suitable	4	25%
Insufficient Time	2	13%
Submitted HNIP Bid Instead	1	6%
Application Submitted by Others	3	19%
Total	**16**	**100%**

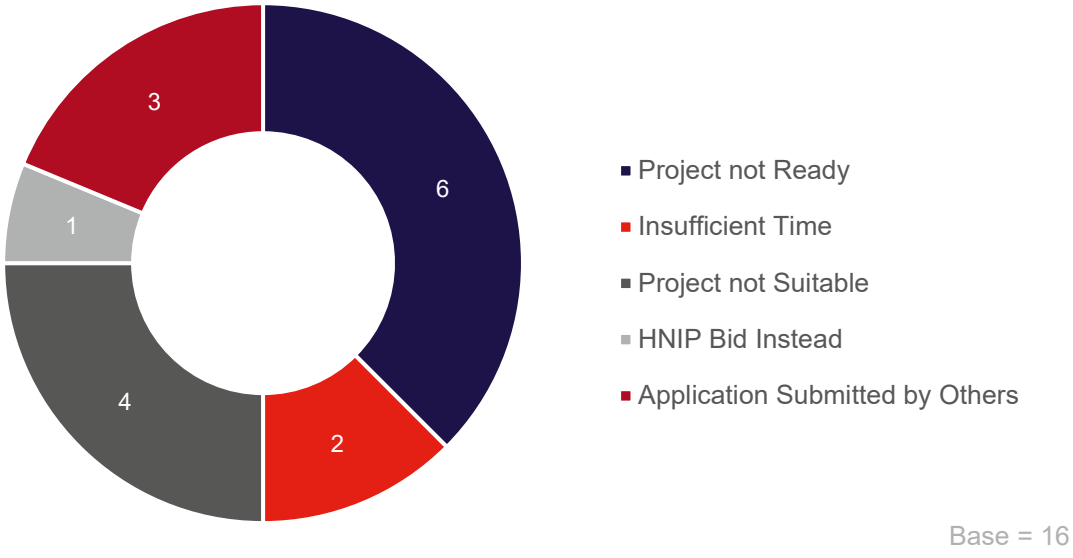
**Data from BEIS feedback survey from non-applicants (those who expressed interest or attended initial comms events but didn't apply)*

Table 13: Main Scheme Application

Main Scheme Applications	No. of Projects*
Have Applied to the Main Scheme	3
Planning an Application to the Main Scheme	2
Project Not Ready for Main Scheme Application	2

**Data from interview conversations with projects*

Figure 13: Reasons for not applying



Annex 4: Qualitative Thematic Analysis

This annex summarises the thematic analysis conducted on interviews with applicants (unsuccessful and successful), non-applicants (those who expressed interest or attended initial comms events but didn't apply) and BEIS teams (five group interviews with policy, delivery, grants and loans, investment committee and contingent labour consultant teams).

Methodology

Full interview transcripts were inputted into an excel-based analysis grid, reviewed, interpreted and coded inductively. Similar codes were then grouped to draw out themes in the data, which were in turn then linked to relevant evaluation questions and written up, using illustrative quotations (where non-disclosive) and summary narrative.

Process Evaluation Questions

1. What works and what does not, for whom, when, how, and in what context – for the different types of applicants throughout the scheme's stages, for commercialisation?

Question treated, in the main, using realist analysis.

2. How effective have the communications, support and guidance been in supporting projects progress in all stages of the Transition Scheme project cycle (pre-application, application, post-award)?

Theme: Communication was effective

For some applicants, particularly projects with more experience in developing Heat Networks and/or more straightforward projects, feedback on communication timing was good, highlighting quick response times and good access:

> *"Generally, when I sent questions across, [BEIS] responded to in a couple of days" (Transition Scheme Participant)*

> *"We did have a fair few queries [for the BEIS and Triple Point team] but were available to speak to for any queries that we had and could answer quite quickly" (Transition Scheme Participant)*

Theme: Communication was delayed

A number of applicants highlighted that, particularly for specific queries, there were delays in receiving responses from the project delivery team. Three projects talked about having project-specific queries, either during application or project delivery which took a more significant

amount of time to receive a response. These queries were more fundamental questions on technical elements and eligibility, or project change.

Theme: Guidance Materials were helpful

Most applicants found that the guidance materials worked well and were fit for purpose to guide through the application, acknowledging that they were to some extent, necessarily "high level" to be able to apply across project types, and that specific queries relating to projects (e.g., eligibility of specific technical elements) are best treated in workshops or bespoke queries. One respondent also highlighted that the FAQs are helpful, particularly to *"see what other projects have been asking".*

3. How is the Transition Scheme being delivered and what improvements can be made? What should be done differently in the main scheme?

Theme: Experience of delivery was positive

For the majority of projects, when considering their experiences of delivery processes (e.g., requirements, payments, support) the feedback was positive, with most respondents identifying no specific challenges to delivery.

> *"Ongoing requirements are clear and ongoing support is there, the team are responsive. They'll always answer questions or will defer to those who do. We work well with the team" (Transition Scheme Participant)*

> *"For the Transition Scheme, there haven't been challenges" (Transition Scheme Participant)*

Theme: Delivery lacked clarity

For one applicant, however, there was more of a sense that process for the Transition Scheme were not fully defined and, therefore, were not fully effective in providing project support.

> *"It was quite fluid support – they were developing the process themselves. We were guinea pigs". (Transition Scheme Participant)*

Theme: Payments were not straightforward

In a small number of cases, experiences relating to payments were identified as a challenge. Two projects highlighted that it was not clear to their organisation how to report project financial information in the monitoring reports, and that it was more suited to a private sector organisation. It was also suggested that the term 'defrayal'[41] was not understood by at least one applicant, which made understanding requirements relating to payment processes and invoices more challenging. In two cases, projects were also unclear about when they could draw down (in instances of project extension).

[41] Defrayal refers to expenditure that has been incurred and is subsequently paid.

Theme: Unmet expectations of ongoing support

A small number of projects did highlight some challenges in the support they received from BEIS on an ongoing basis following the opening of the Main Scheme. This was particularly around clarity in relation to who the project's point of contact was at the Department, as monthly catch ups had dropped out of diaries for some and no "formal handover" from BEIS to Triple Point was felt to have occurred. Some highlighted that as BEIS was busy launching the Main Scheme, they found it more difficult to "get answers from the right people" on the Transition Scheme.

Theme: Competing priorities of those delivering the scheme

Across the majority of BEIS respondents, it was acknowledged that the level of effort required to administer and deliver the scheme was underestimated, and as such, the lack of a full-time dedicated team to deliver the scheme was a challenge. Four of the five respondent groups described the undertaking of in-house delivery as being on top of normal responsibilities and "day jobs". One respondent remarked, *"the amount of time and effort we could dedicate to it was not sufficient"* and others described it as a second or third priority. BEIS respondents described the requirements on them to be a couple of days of work each week and felt that the engagement required with projects was *"quite time intensive"*, reflecting that they did not have dedicated resource to meet this greater than expected need. The impression across respondents in the main was that this impact more on adding additional stress and pressure to the BEIS teams involved, but a number reflected that the lack of dedicated resource may have *"hindered"* elements of the delivery of the scheme.

> *"We were trying to run it on a bit of a shoestring, and it showed a times" (BEIS Group Interview)*

4. How are projects interacting with and navigating the supply chain to deliver the market transformation commitments (MTCs)?

Theme: Already on the agenda

For most respondents, the market transformation commitments (particularly those in relation to local procurement, jobs creation, education and skills and low carbon) align well with their social value commitments and organisational ambitions, and aspects of the MTCs were already part of project plans for engaging with supply chains.

> *"A lot of it was already on our mind anyway, it embodies a lot of [the market transformation] commitments anyway" (Transition Scheme Participant)*

> *"[The MTCs] align with our social value commitments that we're trying to do as a region". (Transition Scheme Participant)*

Theme: More significant come construction

For most projects, interactions with the Heat Network supply chain have been limited in the Transition Scheme stage, to mainly design consultancies, and most respondents explained

that, whilst some interaction with the supply chain had occurred, the role of MTCs in supply chain interactions would come more in the construction stage of the project.

> *"Will take [the MTCs] into account when it comes to procurement, but for commercialisation it was more about developing a viable scheme" (Transition Scheme Participant)*

> *"I think that [interaction with the MTCs] will happen more at the construction stage". (Transition Scheme Participant)*

> *"[the MTCs will be] more apparent moving into the construction phase of the application". (Transition Scheme Participant)*

> *"We've not got to that point yet because we've not gone out tender" (Transition Scheme Participant)*

Theme: Still too soon

Across BEIS respondents it was acknowledged that it was too early to make a judgement on the MTCs, particularly given the fact that the Transition Scheme involved only commercialisation activity, smaller grants and smaller procurement levels, and so the market transformational potential was much less. It was also noted that for the Transition Scheme MTCs were intentionally more light touch on the requirements, as guidance was still being agreed. One piece of positive feedback on the role of the Market Transformation Commitments was the willingness to engage and lack of push-back that BEIS saw from projects, providing confidence to make more concrete asks in the Main Scheme.

Theme: Commitments not always understood

For one project, guidance around expectations and requirements relating to the MTCs was a challenge, and more clarity would have been beneficial, particularly in relation to requirements not necessarily applicable for certain project types.

> *"It wasn't really clear what it was all about, and it was quite difficult to know how to respond to some of the questions" (Transition Scheme Participant)*

5. What lessons can be learned from other Heat Network capital schemes in terms of barriers and enabling forces / trends, and how they interact with other policies?

No thematic data from qualitative interviews on this question. We will look to Literature and Context review findings and findings from the HNIP evaluation.

6. To what extent have projects changed their initial design to integrate a zero/low carbon heat source as a result of GHNF funding?

Theme: Decarbonisation is the driver

All applicants expressed the view that decarbonising heat, whatever their motivation for this (e.g., climate emergency or remaining competitive), was the main factor in them opting to

develop a heat network, and as such, the low-carbon requirement did not impact on their designs, which were generally well progressed prior to GHNF announcement. Only one applicant suggested "the CHP route" might have been an option for them but that early in the concept stage they dismissed this potential approach given wider organisational low-carbon intentions.

> *"Well, why are we going to go down the CHP route when we could start now, looking at the low-carbon process?" (Transition Scheme Participant)*

> *"Heat decarbonisation is core." "Energy centre decarbonisation is [the] single biggest opportunity to decarbonise our heating" (Transition Scheme Participant)*

> *"A key driver for the Borough is decarbonisation" (Transition Scheme Participant)*

7. Which parts of the design and delivery of the Transition Scheme enabled or frustrated the desired impact of the projects? How, why, and in what ways?

Theme: Timing

The key difficulty highlighted by all BEIS respondents was the short timescales in which the Transition Scheme provided projects to deliver within. One commented, *"Realistically, we needed a year for the transition scheme, and we had less than six months".* This was a key factor in projects not being able to spend their full allocations within timeframes.

> *"I think some of the projects didn't achieve full drawdown. Quite a few of them didn't because of the timescales. I think the time scales were the killer really." (BEIS Group Interview)*

> *"[The Transition Scheme was] unrealistically too short, and there was never going to be enough time to disperse the money and get the spend and within the financial year, as we were technically required." (BEIS Group Interview)*

In addition, a key piece of feedback from a majority of projects was that the Transition Scheme was just too short a delivery timeframe.

> *"[The] window to progress everything is quite tight". (Transition Scheme Participant)*

> *"[We had a] very short amount of time to spend the money in" (Transition Scheme Participant)*

For some projects, this meant compressing what they planned to do at the application stage, and for others, it meant some elements of their project commercialisation had to be funded by themselves or needed an extension from BEIS. For a number of public-sector organisations, the key challenge with the timelines was the requirement to do a tender process (as they are required to) and then have the work completed and delivered.

> *"It was incredibly challenging to get a tender done and on board and get them to do the work by March 31st" (Transition Scheme Participant)*

An applicant also pointed out that the scheme design contracted timescales even more, because work had to be invoiced and paid, which effectively takes a month to complete, and therefore to meet the financial year deadline, all work had to be completed by the start of March, further constraining projects.

> *"Two months effectively from mobilising to tendering, to getting the study done, and we didn't manage to do it… [it was an] unrealistic expectation and request" (Transition Scheme Participant)*

8. What is the experience of the overall application process, and how does this vary by applicant or project type and why?

Theme: A challenging process

For all applicants, the process was described as challenging, requiring specialist knowledge, detailed documentation and in nearly all cases, external consultant support.

> *"It was quite demanding. A lot of information is required, and a lot of work needs to go into developing that kind of information" (Transition Scheme Participant)*

> *"The application process is not easy without consultancy support… a lot of the application was done by consultants" (Transition Scheme Participant)*

All public sector (i.e., Local Authority and University) applicants to the Transition Scheme drew on consultant support for the application, highlighting a lack of skillset present in their own organisations, making the application process more expensive to undertake.

> *"Couldn't have done it without consultant support… wasn't an obvious skillset to enable this" (Transition Scheme Participant)*

> *"Even for a large organisation like a local authority with thousands of people working in the organisation, we couldn't identify in-house specialists to do [the application] (Transition Scheme Participant)*

Theme: A smooth and proportional process

Despite the challenge of providing the information, most considered the process *"smooth"* and *"not overly arduous"*, with evidence suggesting that most felt the application was proportional to the overall grant, when the potential future construction funding was also considered.

> *"The end product is us applying for a grant of £[x]million, so you would expect that level of demand [in the application]" (Transition Scheme Participant)*

> *"It was all necessary – it's a lot of money that is being applied for, so [the challenging application process] was justifiable" (Transition Scheme Participant)*

> *"Overall, it's clear and robust, and you could see the logic of what is being asked for" (Non-applicant respondent)*

A number of non-applicants also commented that their impression of the application was that it was *"logical to understand"* and *"transparent"* as one could see how the figures were worked out.

Theme: An improvement on HNIP

For applicants and non-applicants that had also been through the HNIP application process, they felt that the GHNF Transition Scheme application was more straightforward than with HNIP. Specifically, they found application templates *"more user friendly*" and *"flows through much better"* and that the process as a whole was more *"streamlined"* with the gated metrics a welcome replacement to the pre-application stage of HNIP.

Theme: A large overhead

Two applicants highlighted the need to spend significant sums of money on consultancy support for an application for, in some cases, relatively small amounts of grant for commercialisation activities, was something that could have been off-putting for the Transition Scheme.

> *"We weren't sure that we had capacity [to complete the application] but didn't want to end up in a situation to spend tens of thousands of pounds [on consultants] to get a bid of [removed as disclosive – a relatively small amount of money]" (Transition Scheme Participant)*

> *"There is an overhead in terms of making the application" (Transition Scheme Participant)*

Theme: One size fit all

A number of projects highlighted that challenges lay mostly in the "one size fits all approach", acknowledging that this is the way it had to be for application to apply across the board. Specific challenges were raised in relation to projects that where the sole recipients of heat or had other elements to their wider project beyond just a heat network. In these cases, it wasn't clear how to fill in the application form and provide necessary evidence when it didn't fit exactly with the project itself.

9. Are the eligibility and scoring criteria suitable, is there any gaming, and if so, how does this impact the delivery of GHNF?

Theme: Hard to 'game' the application

The majority of BEIS respondent groups felt that the risk of 'gaming' the Transition Scheme application as very minimal, if there at all. It was felt that the level of project maturity required to apply meant that only those involved in developing Heat Network projects with credible plans to deliver could successfully apply. The criteria and gated elements of the application were described as fair, rigorous and very specific, all of which were cited by a number of respondents as key to ensuring that the projects that came through were most appropriate.

> *"I think we removed the potential for gaming as much as possible." (BEIS Group Interview)*

The realist analysis annex provides insight into the rationale for seeking Transition Scheme funding, providing insight into how projects planned before the announcement of the GHNF would require GHNF funding to be deliverable.

Theme: Duplicate funding

The potential for duplicate funding was raised by two of the BEIS stakeholder groups. This is where applicants may have been offered funding elsewhere but had applied to see where they would be able to get the best funding offer. This risk, one respondent explained, has been ironed out already for the Main Scheme.

> *"…because [the Transition Scheme] was still running at the same time of HNIP, there was the issue of people wanting to apply to both to see [which scheme] would offer the most money so not exactly gaming but playing the field." (BEIS group interview)*

Theme: Testing the eligibility criteria

A number of respondents saw the Transition Scheme as being useful in testing out the eligibility criteria ahead of the Main Scheme and explained that they had been open to adjusting the criteria based on applicant experience, using initial applications as a sounding board.

> *"We could test what we were doing and make sure that we weren't being ridiculous [with] questions and requirements" (BEIS group interview)*

> *"And we did quite a lot of tweaking and redrafting of things based on feedback from actual applicants, which then went into the main scheme rollout". (BEIS group interview)*

One respondent described specifically the compelling case of one project that submitted a non-compliant application, with evidence showing that the 3.33 pence of grant per kWh of heat delivered was unfeasible for their type of heat source, and that for government to unlock this heat, the metrics would need to change. This had been anecdotal feedback to scheme designers, but it was only through this non-complaint application that they received detailed evidence for this, and the team were able to change the criteria accordingly.

> *"Only [this project] provided [BEIS] supporting data through their application form to evidence why that was, and we were able to use that to revise the scheme rules" (BEIS group interview)*

Theme: Challenges meeting eligibility criteria

One BEIS respondent group did raise a concern that the deliverability assessment had an impact on the scale of schemes applying to the Transition Scheme. A respondent described the schemes applying as having a *"pioneer network mindset"* and *"not a zonal level"* and suggested that this may have been a result of the fact that schemes had to be deliverable and deliver heat in the first five years. Schemes that may have considered larger (e.g., 100 GWh) may have been put off by the fact that applications may have been rejected based on the assessment of deliverability.

> *"That's always the challenge with these kind of capital schemes is that you want big aspiration, but it's what you actually build in the first five years. That tends to be what constrains it down to a 20 GWh to 30 GWh project rather than the kind of town / city scale that that we'd want" (BEIS group interview)*

A number of non-applicants explained that their attempt, or intention to apply for the GHNF was deterred by not being able to meet the criteria. One explained that, for the higher risk and costly projects, the amount of funding that these projects in their portfolio could receive (while meeting the pence per kWh) would be too low to be able to fully progress the project to the next stage, given more challenging commercialisation activities. Another non-applicant found the social IRR too high a hurdle for their project model. Both suggested that more flexibility in the criteria, allowing an initially lower IRR to increase as the project demonstrates feasibility, or allowing exceptions to other metrics for higher risk schemes.

> *"Unless the gated metrics are adjusted to accommodate the different business model that we have and some acceptance of uplift for innovative measures [we will struggle to apply]" (Non-applicant respondent)*

Theme: Eligibility criteria not a problem

Only one GHNF Participant highlighted a specific challenge with meeting any of the criteria for the Transition Scheme, and beyond "*minor clarifications*" and "*slight tweaks to meet the metrics",* others did not identify issues. One GHNF Participant did highlight that they felt the IRR metric was not as helpful as it isn't how their organisation makes financial decisions, but ultimately was able to meet the requirements.

Theme: Concerns for Main Scheme Application

Whilst most of the applicants had little issue with the criteria for the Transition Scheme, more concerns were raised in relation to future application to the Main Scheme. Concerns ranged from more trivial matters of not fully understanding the 'supplier of last resort' condition to more significant challenges with meeting gated metrics going forward. One project explained that although their scheme is technically viable, because of delays in wider capital development, the loads that the network are able to pick up in the short- to medium-term are reduced, meaning the grant available under the current metrics is significantly smaller than required for construction, leaving the project in limbo to by picked up down the line.

Another project suggested that with the economic context of inflation and capital capex cost increases, the upper capex percentage limited for the Main Scheme application also posed a challenge as, given cost uplifts, there was now a bigger gap to fill on the applicant side.

10. What types of projects are successful/unsuccessful at the application stage, and why? At what points are applicants dropping out and why?

Theme: Experience with Heat Networks

A number of successful projects who had been through the HNIP application process (either successfully or unsuccessfully) explained that having this experience helped with their GHNF application, including by giving them an "*understanding of what was needed*".

Theme: Strength of feasibility work

One project, reapplying to the GHNF Transition Scheme after an unsuccessful application to the Transition Scheme, explained that getting to a more progressed stage of DPD work in the interim period was hugely significant in aiding their second application as some of the areas of less clarity in their design could be ironed out and documentation made ready. Their original sense of the Transition Scheme was that it was for projects at a slightly less advanced development stage, but reflected that it was, in the same way as the Main Scheme, designed for projects ready to progress commercialisation.

One non-applicant highlighted that, for private sector companies, the lack of earlier stage funding for feasibility was a challenge to be able to get projects to application stage. They explained that *"for a private business, it [preparing a Heat Network] is a bit of a punt"* and as earlier stage funding wasn't accessible, they struggled to get to application stage. This was contrasted with Local Authorities receiving HNDU support.

11. What happens between application success and initiation and are there any recurrent procedural blocks?

Theme: Less easy for the public sector

BEIS respondents felt that Local Authority applicants in particular, as well as the wider public sector, found it more challenging to get projects mobilised quickly, compared to the private sector. This was explained as a consequence of the processes required in the public sector to get approvals and be able to spend. Both in terms of signing up to the funding agreements and then moving through procurement, a number of BEIS respondents felt that the public sector were not as nimble as required for effective project commercialisation.

> *"The private sector had the nimbleness to start when we needed them to start." (BEIS group interview)*

Other key enablers of quick mobilisation suggested by respondents include a dedicated in-house team to deliver the project and also teams with minimal staff turnover, to ensure that both knowledge and momentum is not lost.

Theme: Procurement takes the time

Another factor explaining slower than hoped for mobilisation in some cases was the time required to undertake procurement. For those applicants that had already procured, they were much quicker to set-up projects and begin delivering, compared to those who needed to bring

in procurement expertise, which may have taken two months out of the already short delivery window. BEIS respondents highlighted that although slow procurement within organisations may have contributed, it was also the case that the price increases and the wider economic context meant that procurement based on original plans and budgets was much more challenging and so meant projects struggled to procure before first addressing the more fundamental challenges to the project.

Theme: No obvious blocks

The majority of projects did not identify specific procedural hurdles to mobilising projects. Particularly for round one applicants, there was a sense that money was awarded *"fairly quickly".* One applicant did highlight legal issues in getting funding agreement in place, acknowledging that these often take time.

Theme: Too close to Christmas

For applicants that cited more acute challenges in mobilisation, these were not related to procedural blocks, but timing. Three respondents specifically highlighted that offers came very close to Christmas holidays, which made it challenging for organisations to get documentation in place and sign off from senior individuals, which contracted timelines overall, giving less time to spend money.

> *"It was quite challenging because the offer came through not long before Christmas. We close over Christmas for ten days so effectively couldn't get anything done before Christmas. So, we actually had quite a slow mobilisation" (Transition Scheme Participant)*

12. What has prevented potential applicants from applying?

Theme: Tight timescales

The main barrier to application identified by non-applicants was the tight timescales of the Transition Scheme, with some suggesting that they had not received enough notice to be able to mobilise a team to apply. For some, there was not the internal resource available to mobilise quickly enough to develop a competitive application. For others, it was simply that the projects within their portfolio of potential projects were not at a far enough advanced stage to make a Transition Scheme application.

> *"A challenge is a number of support schemes that turn up on short notice and they are all different to each other, preparing ourselves for the complexities and challenge." (Non-applicant respondent)*

> *"Heat Networks don't happen quickly, and they take time to evolve. When you have a limited time to do something it can be very difficult" (Non-applicant respondent)*

Theme: No construction funding

There was one example of an applicant choosing to apply for the final round of HNIP, rather than the Transition Scheme. When this was probed, it was explained that the project opted for

an HNIP application because it funded both commercialisation and construction, and so minimised the need for a second application.

Theme: Projects stuck in feasibility stage

One non-applicant explained that, for the Heat Networks they represent, they have been unable to apply for the GHNF because these projects are stuck in feasibility stage. All of these projects rely on higher-risk heat sources and require a significant amount of funding to be able to complete exploratory work and also develop contingency plans for heat sourcing, if exploratory works are unsuccessful. Because these projects are exploratory in nature, there are specific challenges in demonstrating financial feasibility and as such, getting sign off from senior leaders to progress is a challenge and held back applications.

Theme: Length of the Main Scheme

A number of non-applicants suggested the biggest barrier to application would be the closing date of the Main Scheme. Their concern was that projects that could be viable but are at an early stage of development or rely on wider capital developments that will be slower to come online, may not be ready to spend funds in the last two years of the scheme and therefore will miss out on the support.

> *"The government offers three-year schemes, but this is not how business works… new builds take over five to ten years" (Non-applicant respondent)*

13. How has the low-carbon requirement impacted the types of projects that are successfully applying?

Theme: No impact on type of applicant

A number of BEIS teams felt that the low carbon requirement had not particularly influenced the type of organisation that applied, beyond the wide group of organisations who already have Net Zero targets or emissions reduction targets; rather it was just the technology chosen (mainly heat pumps) that was influenced. The benefit of the requirement was to catch the imaginations of organisations with decarbonisation targets who had not engaged with HNIP. It was felt by BEIS respondents that the carbon intensity gated metric had been well scoped and discussed, based on strong analysis of what was achievable and sensible, in close communication with stakeholders.

Theme: Decarbonisation a driver across organisations

Across all respondents, there was a drive to decarbonise the heat that they were providing. Public sector organisations cited climate targets as key and private sector applicants highlighted that, in addition to sustainability goals, low-carbon heat had commercial benefits as a selling point for wider developments.

Also, non-applicants suggested that the low-carbon requirement did not fundamentally challenge their ability to apply because decarbonisation was a driver for them as well.

"We have realised that the heat network is a foundational step to getting to net zero targets set by the university which has declared a climate emergency." (Non-applicant respondent)

"The NHS, as you probably know, has a very, very ambitious carbon targets, particularly around scope one. It's no surprise that, like most public bodies, they're obsessed with heat decarbonisation." (Non-applicant respondent)

14. What are the barriers to applying for the transition scheme?

Themes: Timings are tight

It was felt by a number of BEIS respondents that in addition to the Transition Scheme being challenging for successful projects from a timing perspective, the tight timings to spend money may have been a deterrent to applications. The original comms indicated there would only be one round of funding and the money had to spent within the 2021/2022-time window. The time between offer and completing delivery was only six months. Both BEIS policy and delivery team colleagues commented that they imagined the short time frames in which money needed to be spent was a deterrent for organisations who recognised they didn't have the capability and capacity to deliver within this timeframe, and who opted instead to apply for the main scheme. One noted that the Transition Scheme didn't get too many applications as projects didn't have enough time to pull together a good application. Another BEIS respondent highlighted that the time for internal approvals within some organisations was a barrier to them mobilising a fast application to be able to get onto the Transition Scheme.

"There wasn't enough run up to get as many projects as we wanted" (BEIS Group Interview)

This point was followed up by another BEIS respondent who explained that the fact that more information about the Main Scheme had been announced whist the Transition Scheme was in place meant that there wasn't the impetus for projects to pull out the stops to apply for the Transition Scheme within the timeframe, as there was assurance that more funding would be coming. They commented, that had information about the Main Scheme not been announced at the same time, the Transition Scheme may have got twice as many applicants.

Theme: Project not fully prepared

A number of BEIS respondents highlighted that, given the fact heat network infrastructure is complicated and expensive to develop, projects need to do quite a lot of groundwork (e.g., techno economic feasibility studies and commercial arrangement planning, legal planning and financial planning) which has a significant cost and time burden. It was estimated by respondents that projects will take six months to a year to get into a position to apply for the scheme with estimated costs of £200,000 to prepare. There was a sense that the projects not able to apply to the scheme were simply the ones that weren't yet in a position to apply, with any of the required elements to prepare the application not yet in place.

> *"If you're sufficiently experienced and get all your paperwork in a row, you can apply relatively quickly. But if your project is not at that stage, then you've got months and months of work to get to that stage". (BEIS Group Interview)*

> *"Main failures were where planning permission wasn't in place. Well, the application just wasn't ready to come in." (BEIS Group Interview)*

Theme: Financial bar to apply

A number of GHNF Participants did raise a concern that the cost of application relative to the funding on offer was a consideration when they were making a decision to apply, as any application would require input from consultants. Although both in the end did apply, they cited the ability of their organisations to bare this cost, as well as the greater 'carrot' of potential construction funding down the line as factors for their application.

Theme: Specific Technologies

One BEIS respondent acknowledge that shared ground loop systems was one type of project that fell *"between two stools"* as *"sort of"* a heat network, but not in the sense of an ambient loop, and nor is it a domestic solution. Provision was made to try and enable schemes taking this approach to come forward, but it was not an easy route to apply.

> *"I think we did well to kind of carve something out that didn't make it impossible for those kinds of stakeholders to find a home with [the GHNF]." (BEIS Group Interview)*

Themes: Can't meet the metrics

A key piece of learning from the Transition Scheme was the change in metrics of pence per kWh threshold, as something that was demonstrably excluding certain types of applicants and was therefore changed to enable such project types to come forward. Evidence from a non-applicant respondent also backed up this view.

Theme: NHS applications

One respondent did highlight that NHS Trusts were potentially being left behind by Heat Networks, and given the large potential for NHS trusts, as some of the largest and most centralised users of energy in any given local authority, more should be done to engage and promote heat networks within these organisations.

> *"[having been involved in many HNS decarbonisation strategies] not a single one of them actively considering the heat network as a result and it's not because they don't want to. You see, it's because there isn't this engagement. They're not being engaged." (Non-applicant respondent)*

The respondent explained a number of barriers that the NHS faced specially preventing application, but the fundamental point was that a lack of engagement and joined up thinking between NHS Trusts and local authorities, and the DHSC and BEIS. The applicant explained that because heat networks were a more 'foreign' concept to NHS trusts, without this higher-level discussion, influencing, and handholding, trusts would opt for the simpler heat pump

option to serve the energy needs within their distinct footprint, rather than take advantage of being able to supply heat more widely in the locality.

> *"I can't think of a single productive conversation between the local authority and a hospital and a heat network". (Non-applicant respondent)*

A second barrier was the Capital Departmental Expenditure Limits (CDEL) in the NHS capital development, where a limit is put on the amount of public money allocated to hospitals to ensure parity. Given that decarbonisation investments are included in these calculations, *"this is a huge barrier"* and changing this would unlock a lot more NHS action.

> *"Hospitals have said to me, 'sorry, but we've reached our CDEL envelope for the year, so we're going to have to put in gas here because we can't spend any more money'. And that's like a hard stop" (Non-applicant respondent)*

15. How well was the Transition Scheme communicated to potential applicants, and to what extent is this cutting through?

Theme: Comms generated lots of interest

Across BEIS respondents there was feedback that the scheme received more expressions of interest and requests for application forms than was expected on the back of comms and workshops to promote the Transition Scheme, and much fewer translated to applications to the scheme. It was explained by respondents that many had used Transition Scheme comms and workshops to gain insight ahead of the Main Scheme, with a view to apply at this stage for both commercialisation and construction funding, rather than just commercialisation.

> "*We were expecting a few expressions of interest to come in, but with communications and workshops we we're sort of inundated" (BEIS Group Interview)*

> *"I suppose that communication and preparation did allow people to make good quality applications for the first three rounds [of the Main Scheme]." (BEIS Group Interview)*

> *"We did all the hard work early so that then everyone could use the Transition Scheme to familiarise themselves with what we're trying to do, how it differs from HNIP and then prepare themselves to make a main scheme application in the knowledge that it won't have materially changed." (BEIS Group Interview)*

Theme: Finding the right projects

Specific efforts were made to find the *"right applicants".* A number of BEIS respondents described activities including market intelligence workshops and seminars. There were also activities to work out the potential pipeline of Transition Scheme applicants, this was based on coordination with market and local authorities and *"warming them up"* to make an application or *"cooling them down"* if they were clearly not ready. A priority ranking exercise was established where top projects were invited to apply. One respondent did question the extent to which the Transition Scheme had reached as many of the good applicants as it could have done, noting that there maybe could have been more (bespoke) promotion, but in the main, BEIS

respondents were positive at the extent to which the mechanisms to identify the right projects had worked.

Theme: Industry knowledge

Applicants found it difficult to respond to this question, as for most, they had been actively involved with their Heat Network or Heat Network projects for a significant amount of time prior to GHNF Transition Scheme coming online, including engaging with consultants and interacting with BEIS. Multiple projects cited technical / design consultants at early stages as a key driver for a GHNF application, and others who had previously received HNDU funding said that because of this, and interaction with the HNDU team, they were very aware of the GHNF. Similar feedback came from a number of non-applicants, struggling to pinpoint the exact comms received, but that it was likely through multiple sources including consultants, HNDU and mailing lists.

> *"[the design consultant] keeps an eye on things as well and he approached this and said, 'the Transition Scheme is starting to open; we should put an application in." (Transition Scheme Participant)*

> *"We were obviously speaking to [BEIS] relatively frequently because of the HNDU process" (Transition Scheme Participant)*

Theme: Misunderstandings

In a few cases, there was evidence of misunderstanding of the scheme. One applicant explained they applied even though the project was still at an early stage (although progressed enough to enable application) because they believed the Main Scheme would fund *"only construction costs"* which then had a knock-on effect on intention to apply for the Transition Scheme.

16. What has the overall experience been for project types and different stakeholders?

This question will be answered, in the main, by realist analysis.

17. What types of projects are successful/unsuccessful at the commercialisation stage and why?

Theme: Private sector more nimble

Multiple BEIS stakeholders commented that the process of commercialisation on the Transition Scheme was much easier for private sector organisations, particularly given short delivery timescales. This was attributed to less complex approval processes (than the public sector) and more dedicated resource. One respondent commented that it was only private sector organisations who even tried to deliver in full within the financial year timeframe and the majority of other projects asked for extensions.

Theme: Project feasibility work

A key point in terms of success factors identified by the majority of BEIS respondents was the quality of work done prior to application. Where projects had detailed feasibility work – one respondent specified adhering to HNDU techno-economic feasibility study specification – they were much more likely to succeed in commercialisation.

18. How do outcomes differ between projects and why? In particular, how does this vary across different contexts?

This question will be answered, in the main, by realist analysis.

20. Is the guidance and support available meeting the needs of projects?

Theme: Guidance is good

Most applicants found that the guidance materials worked well and were fit for purpose to guide through the application, acknowledging that they were to some extent, necessarily "high level" to be able to apply across project types, and that specific queries relating to projects (e.g., eligibility of specific technical elements) are best treated in workshops or bespoke queries. One respondent also highlighted that the FAQs are helpful, particularly to *"see what other projects have been asking".* One non-applicant specifically commended the personal guidance and support provided by BEIS.

> *"there was a rep [representative] from BEIS that was really hands on and would meet with us and provide technical knowledge and expertise and previous successes and failures" (Non-applicant respondent)*

Theme: Certainty is a challenge

A number of projects that had a more challenging experience of commercialisation suggested that in some cases, a lack of clarity or certainty on specific requests to change approaches to the project or extend deadlines was a challenge for the project, and although there may have been discussions regarding issues, approvals of changes in writing were sometimes not forthcoming which added pressure and uncertainty to projects.

Theme: Bid feedback well delivered

An unsuccessful applicant was particularly complimentary of the manner and content of the feedback received on being informed of the application failure. They described the feedback as *"concise", "actionable"* and *"well-delivered"* and was helpful to enable a future successful application.

Theme: Sharing ideas

A number of projects highlighted the benefit of more active knowledge sharing between projects, or specifically suggested that this approach should be adopted in the Main Scheme. For some, Triple Point was providing this sort of intelligence, but it was commented that there is little communication across schemes, which applicants think may be helpful to get ideas on how to bridge challenges.

> *"[The organisation] saw a scheme in London that we think it would be useful to copy" (Transition Scheme Participant)*

21. Has the low-carbon requirement created any difficulties for projects during the application and commercialisation phase?

Theme: Decarbonisation a driver across organisations

As described previously, all applicant respondents described goals of decarbonisation as central to their Heat Network project ambitions.

Theme: Heat source availability a challenge for non-applicants

A number of non-applicants highlighted that, for the organisations they represent (both represent a larger group of public sector bodies) either accessing or securing low-carbon heat source was a key challenge that halted applications from organisations they represent. In both cases, there was a desire to decarbonise heat, but the practicalities of doing so were a challenge that prevented application. Two non-applicant respondents highlighted electricity constraints as a key barrier to heat access, meaning that heat pumps were not viable within the GHNF timeframe. One explained that with regard to one decarbonisation plan that considered a heat network, the grid constraints meant that they would not be able to get sufficient electricity connection until 2031, meaning that instead of a low carbon option, the pressure to solve heat inefficiencies and challenges in the short term will lead to this organisation opting to install building-level gas boilers, as they're left with no other choice. Another non-applicant highlighted that uncertainty regarding heat source access meant that projects struggled to progress past the feasibility stage of designing their project. One respondent suggested that, given constraints in low-carbon heat, there may have been value in getting "pipes in the ground" [i.e., heat network constructed] and decarbonising the energy centre when this became possible in relation to external constraints.

> *"the heat pumps problem is just so complicated at the moment, mainly because of the electricity supply question. This is the biggest barrier for my [potential applicants] with their enormous amounts of demand."*

> *"How do we link heat pumps into the electricity grid; how do we link them into the overall electricity system so that when the wind blows, we power the heat pump? We need to have significant storage in order for that to happen and at the minute we don't have a mechanism that supports that."*

Theme: Heat sources cause problems in commercialisation

The specific low-carbon requirement wasn't a challenge across the board, but the barriers that projects faced often were in relation to the heat source their scheme was based on, or wider factors related to accessing this type of low carbon heat. Where technology is more novel (e.g., deep mine water) or projects have to agree heat prices with other bodies, costs can be significant and make the project very difficult to get to commercial viability. A number of projects also highlighted electricity grid constraints as a challenge for making heat pumps viable to meet the heat demand planned for.

23. Are projects on track to deliver on time and budget? If not, what barriers have influenced this?

Theme: Project Over Optimism

A number of BEIS respondents highlighted an issue of applicant over-optimism with regard to the budgets and timescales they had outlined at application stage, with an expectation of "top up" of budgets as needed, which was described as frustrating.

> *"There were some projects – I won't name names – who really promised the world. And then once they've got the award and throughout the program, they sort of just made it up, so that was quite frustrating." (BEIS Group Interview)*

> *"There was pretty huge optimism bias around spend profiles and none of the projects were able to actually achieve the amount of spend that we wanted within the time" (BEIS Group Interview)*

Theme: Public sector slow to spend

Long and complex approval processes within public sector organisations, particularly Local Authority projects, were identified by a majority of BEIS respondent groups as a key challenge for these projects from being able to deliver to time.

Theme: Evidencing spending

One BEIS respondent group highlighted a challenge within the Transition Scheme processes that impacted on timelines for projects, particularly within the private sector. Because BEIS dictated when claims had to be submitted, and, especially for private sector organisations there may be significant delay between buying something and paying for it (maybe thirty or sixty days), there was a significant knock-on impact on the way in which projects could evidence spend incurred, causing a delay in claims being submitted.

> *"in terms of our being able to manage it [grant management of projects] effectively I think we caused an issue, and you know obviously for them and in terms of [project] planning as well" (BEIS Group Interview)*

> *"I think because of that, it did cause a delay in some of the claims coming in" (BEIS Group Interview)*

Theme: Risk aversion

A number of projects have suggested that slower progress is as a result of, amongst other challenges, wanting to mitigate the risk of spending money when the project is not yet progressed to a stage that it is definitely viable. For one, the internal processes to access funding are much more challenging to navigate because the project, even after more commitment of funding has a lot more hoops to jump through the commercialise and is currently paused because funding is not available. Another project commented that they want to spend money responsibly and slower to make sure that the theory and plans can work in reality, rather than just making progress with expensive exploratory work.

Theme: Relying on external activities

A number of projects described delays were often a result of external activities on the critical path for the project. One project explained that where commercialisation was focused on legal activities and external design, the project found it difficult to progress the project as the timescales were out of the control of the project.

> *"[the work is] tied to third party programmes and when they can actually do the work and they'll only work as fast as they can" (Transition Scheme Participant)*

Two projects cited delays in wider capital developments (e.g., planning decisions and lengthening development timescales) for which the proposed heat network planned to service, as a significant challenge for the project to effectively commercialise. The delays in the loads that the project will pick up have meant these projects have had to pause progress.

24. Will annual funding allocations be spent? If not, why? What bottlenecks have been identified?

Theme: Too short a window

[See theme on timing]

Theme: Timescales too Tight

The key barrier highlighted by all BEIS respondents was also the short timescales in which the Transition Scheme provided projects to deliver within. One commented, *"Realistically, we needed a year for the transition scheme, and we had less than six months".* This was a key factor in projects not being able to spend their full allocations within timeframes.

> *"I think some of the projects didn't achieve full drawdown. Quite a few of them didn't because of the timescales. I think the time scales were the killer really." (BEIS Group Respondent)*

> *"[The Transition Scheme was] unrealistically too short, and there was never going to be enough time to disperse the money and get the spend and within the financial year, as we were technically required." (BEIS Group Respondent)*

Theme: Spending on the right things

One applicant explained that slow spending is also a result of trying to spend wisely and ensure logical steps are taken to best commercialise the heat network. This project suggested that they would have been able to get money out the door, but they want to make sure they spend on the 'right' thing and not just want to "look like they're making progress"

> *"Basically, we didn't want to just spend the money for spending-sake. We wanted to spend it wisely" (Transition Scheme Participant)*

25. Do particular types of projects experience delays or unexpected costs, and could these be identified earlier at application stage? In particular, what has been the role of the wider context?

Theme: More Challenging for larger schemes

A number of BEIS respondents commented that larger schemes will have more challenges because of a larger number of stakeholders to coordinate and more technical elements to deal with within the project, adding additional layers of complexity to navigate and, in the end, delays to project timing.

Theme: Other characteristics

BEIS Respondents described projects being more likely to incur delays with the following conditions:

- When projects need to differ from the feasibility work, because either the work was flawed or the plan was unable to be worked out in practice (e.g., heat sources not working out).
- When there is a requirement to pause for decision making processes (i.e., within a local authority)
- Those without dedicated team.
- Those without internal sign off.
- Those who needed to procure expertise.
- Those who had high staff turnover
- Those who did not have a dedicated project manager
- Traditionally public sector.
- Those who did not have planning permission

26. What has the experience been like with projects providing timely and/or accurate application and monitoring data? What further support could be offered by BEIS to improve those projects with a poor record of reporting?

Theme: Light touch reporting

A majority of projects appreciated that the reporting required was *"relatively light touch"* and therefore didn't pose a particular challenge to the project to deliver it.

Theme: Lack of clarity

A few organisations, although acknowledging that the actual ask was fairly limited, described there being a lack of clarity on what information was actually being looked for, how to fill out the templates and how often to do it. There was a sense that the reporting requirements could have been communicated more clearly.

Theme: Cashflows a challenge for public sector

Two public sector organisations found the financial cash flow element of the reporting to be a challenge, suggesting that the reporting structure is not set up as well for a public sector organisation.

> "*The reporting structure is set up as if a private entity is drawing down funding month by month. Not set up for public sector" (Transition Scheme respondent)*

27. What have been the benefits/challenges of delivering the Transition Scheme in-house?

Theme: Benefit – Testing with the schemes

A key benefit described by a number of BEIS respondents was the ability for BEIS to test the Green Heat Network Fund ahead of the Main Scheme. One respondent explained, *"[the Transition Scheme] tested what we were planning was on the right track. So that was a real advantage of delivering it [in-house]".* Another highlighted that by delivering the scheme in-house, BEIS were much more able to understand the exact asks they were placing on the Delivery Partner for the main scheme. This deep understanding wouldn't have been achieved had BEIS not delivered themselves, and they would have been very reliant on the delivery partner to guide them. Through in-house delivery, in conversations with the delivery partner, BEIS were able to more actively steer how they would deliver.

> *"So as a training module for an intelligent client function, it was absolutely invaluable." (BEIS Group Interview)*

Theme: Challenge – limited capacity within the team

A challenge highlighted by all BEIS respondent groups was the lack of dedicated resource for the Transition Scheme delivery within the BEIS teams involved, given (as previously described) the large undertaking the scheme ended up being and the additional ask it placed on teams with already lots of other responsibilities. As well as lack of enough dedicated resource to devote to delivery, a number of respondent groups suggested that in some cases, the skills required (e.g., legal expertise) was lacking and felt that, rather than to pull the required skills from across BEIS, an external delivery partner was the easier solution.

> *"I think hiring Triple Point is a better longer-term solution because they can pull into Triple Point the capabilities and it can be their complete focus; their number one priority, whereas in-house, there are competing priorities." (BEIS Group Interview)*

Theme: Challenge – overly complex design

Across some BEIS respondents, there was a sense that the Transition Scheme, in how its processes were set up were overly complex, which may have been a result of in-house design not having the full experience of some of the processes to simplify the scheme.

> *"It was just so many different spreadsheets". "I just think it could have been done more efficiently". (BEIS Group Interview)*

"[claim submission on a quarterly basis] would make life a hell of a lot easier and a lot less administratively burdensome" (BEIS Group Interview)

Impact Evaluation

1. What are the emerging impacts of the Transition Scheme and how these were achieved, for whom, when, and what contextual factors applied context?

Theme: Not as much progress as desired

Across all project respondents, there was progress towards commercialisation, either in progressing projects towards construction or identifying challenges or flaws in the design to be redressed to enable progress with the project. However, as a result of slower progress and tight timescales, the impact of the Transition Scheme on individual project progress is likely less than intended, with most projects requiring additional commercialisation work as part of the Main Scheme (if they are successful with an application) and a number of project have had to cover additional works that weren't able to be completed within the scheme timeframes themselves.

"[The Transition Scheme has] done what it needed to, to get [organisational] investment in place to make the commitment to fund construction if the GHNF main scheme application is successful" (Transition Scheme Participant)

"[The Transition Scheme] didn't get the project all the way there" and there are a few additional things to iron out before sign off. (Transition Scheme Participant)

"[We will] need to apply for a significant amount of additional commercialisation funding on the Main Scheme – will need to apply for the maximum commercialisation funding available in the Main Scheme and that still won't be enough" (Transition Scheme Participant)

3. How much, and in what ways is the Transition Scheme enabling and unlocking the value of the main scheme?

Theme: Building Momentum for the Main Scheme

The key impact of the scheme, described by the majority of BEIS respondents was the role that the Transition Scheme had to build the pipeline for the main scheme and set the footing for successful early Main Scheme applications, of which one applicant explained that more applications than expected had come through for the Main Scheme. This was explained by a number of BEIS respondents as a result of the role of the Transition Scheme building and maintaining the momentum from HNIP and raising awareness of the Main Scheme earlier to give projects the required lead in time to be ready for a Main Scheme application. As one respondent explained, "*it's really important to maintain that momentum. And I guess that's what it did".* And so, the full funding allocation for the Transition Scheme wasn't spent, *"in terms of what [BEIS] are trying to achieve long term it [the Transition Scheme] worked."*

BEIS Respondents felt that the challenges that the Transition Scheme experienced, have set up the Main Scheme for a stronger start in its first year, than had the Transition scheme not taken place.

> *"If we hadn't done the Transition Scheme, I suspect the picture for year one of [the Main Scheme] would have been worse… I think in the round we probably didn't hit the ambition, but actually not doing it would have been worse for GHNF than doing it". (BEIS Group interview)*

Benefits contributing to the Main Scheme success include the socialising the scheme widely and market confidence that the Transition Scheme was able to instil; the testing and tweaking of elements *"that didn't quite work and need to be improved"* and improving the guidance for projects based on Transition Scheme experience.

Theme: Prepared projects to apply for the Main Scheme

Policy Team: BEIS team tried to elicit feedback about whether people were intending to apply. Noted that there was a lot of interest but then didn't apply in the first few rounds of GHNF.

A number of projects engaged with the communications around the Transition Scheme and signalled to some extent an intention to apply (e.g., requesting application form) but did not apply. For these organisations, it was felt that, by socialising the scheme and showing application forms and guidance at this early stage, these organisations would be better prepared to apply for the GHNF Main Scheme.

> *"I suppose that communication and preparation did allow people to make good quality applications for the first three rounds*." *(BEIS Group interview)*

Theme: Refining the Main Scheme

The majority of BEIS respondents highlighted the ability to refine elements of the Main Scheme as a hugely significant impact of the Transition Scheme. One described it as immensely successful at lessons learned before the Main Scheme to improve the pipeline (e.g., by identifying the Pence per kWh issue), reduce gaming of applications (e.g., by identifying the challenge of duplicate funding), by improving the guidance and support for projects (e.g., by providing best practice examples for the Main Scheme) and by helping develop the MTCs through experience with actual projects.

Theme: The Transition Scheme has led to Main Scheme applications

A number of projects have applied for the Main Scheme and another few are anticipating applications shortly as other elements fall into place, building a pipeline of more progressed projects.

> *"[The Transition Scheme has] done what it needed to, to get [organisational] investment in place to make the commitment to fund construction if the GHNF main scheme application is successful" (Transition Scheme Participant)*

> *"[The Transition Scheme] didn't get the project all the way there" and there are a few additional things to iron out before sign-off. (Transition Scheme Participant)*

Theme: The Transition Scheme has not led to Main Scheme applications

A number of projects have not been able to get their Heat Network to a place where an application is commercially viable and find themselves in a limbo where progressing the project requires funding, but it is not immediately accessible, and as such are not necessarily anticipating being ready to apply for the Main Scheme before it concludes (although some remain optimistic). A range of issues have contributed to this including poor feasibility work from partners previously, difficulties with heat sources, and delays in wider construction.

Theme: Transition Scheme has improved the quality of Main Scheme applications

A benefit highlighted by a number of projects was the experience and knowledge from the Transition Scheme application, to make a main scheme application more straightforward.

> *"you've done a lot of the hard work [for the Main Scheme application]" (Transition Scheme Participant)*

Theme: Strategically significant for the scheme

With the timing of the Transition Scheme to bridge the gap between HNIP and GHNF Main Scheme, projects were able to continue at pace and not wait for the Main Scheme. For one scheme, the fact that they were able to get the project onto the Transition Scheme and not wait has had an impact on their network growing in scale, as their commercialisation occurred soon enough for another local heat network to engage in conversations and plan a joined-up network. Had the project waited, the benefits of this larger joined up network can be realised.

4. What impact did projects' Market Transformation Commitments have (and how were these perceived) by projects/applicants?

Theme: Demonstrating new approaches

One BEIS respondent highlighted that one of the (secondary) goals of the Transition Scheme was to encourage disruptors and more SME developers to come forward using the Transition Scheme. One Transition Scheme project was able to demonstrate this, as an *"effectively abandoned"* scheme that had been looked at by HNDU two or three times previously, was picked up by a private sector organisation who ran with it and have been successful, *"far exceeding the original study ambition."* This respondent suggested that this example was one of the *"biggest positives of the Transition Scheme"* because of what it demonstrated to the market.

> *"We can't just have incumbents doing the same old same old. We need people be hungrily looking for projects and scouring the old HNDU projects that have been shelved, reinventing them, looking at them afresh" (BEIS Group Interview)*

Theme: Too small to make a difference

A number of BEIS respondents concurred that the scheme was too small and at too early a stage to have significant impacts to transform the market. One specified that that the Transition Scheme hadn't changed the supply chain or changed the actors in the Heat Network landscape.

> *"In terms of changing the market, I think probably just the project and the transition scheme are just too small to have much of an impact" (BEIS Group Interview)*

> *"I think the biggest impact of the MTCs is probably the procurement side of things – open procurement advertising - but given that the majority of projects were local or public sector already it's much easier for them to comply as they're doing it anyway" (BEIS Group Interview)*

Theme: We're not the only answer

One participant explained that the Market Transformation Commitments might need to be augmented with other Government support if there is a desire to transform the market. The respondent highlighted that "civils are happy to invest in an area but need a pipeline" that is beyond a piecemeal one or two projects, requiring a pipeline to build confidence. The respondent felt that leaving this only up to those applying to the GHNF would miss a more strategic approach to building a pipeline of projects (i.e., by funding some exploratory work centrally).

Theme: Impacts are limited

For the majority, the relatively small amounts of money, short timeframes and nature of the work mean that most sensed the impact of the Market Transformation Commitments as limited. One respondent felt that for the commercialisation stage, the MTCs felt more *"tick box"* in nature, and as most did suggest that these would be more significant come construction.

> *"[They will be] More significant given the multi-million-pound investment in the next phase" (Transition Scheme Participant)*

6. What effect is Transition Scheme having on sponsors/projects' capability and capacity, and how has this been achieved?

Theme: Built skills in application

A number of projects reflected that they were now upskilled in developing applications, particularly with regard the Main Scheme application. One described helping another council team in developing their own application to the Main Scheme as a result of the skills they developed and another highlighted that the *"very obvious"* advantage of the Transition Scheme was to gain experience for the Main Scheme application.

Theme: Little impact from the Transition Scheme

Most applicants commented that they didn't feel there had been significant direct upskilling as a result of the scheme, to develop heat networks. For some, this was because the skills were

either in the team (private sector) or the HNDU work previously undertaken was more significant for this (public sector). One local authority respondent explained that addressing the skills gap within local authorities was a significant challenge and they were unconvinced that the Transition Scheme had affected this. One respondent did have a more positive view on upskilling, suggesting that the Transition Scheme has provided incremental improvements in skills, bringing *"the whole team a rung up the ladder"* and although they'd still rely on consultants, they were now able to ask the right questions sooner.

8. Is there a sense that consumers are willing to connect to heat networks? Have there been any differences in willingness to connect between different consumer groups? Have projects faced any difficulties in convincing consumers of the benefits of connecting? How did they do this? What strategies did they use? What effect had the Transition Scheme on consumer awareness, attitudes, needs and behaviours.

Theme: Too early to say

For many projects, conversations with consumers have been limited, and it is too early to say with regard this.

Theme: Cost is key

For those that have completed even light touch engagement with consumers, the feedback, in the context of the energy bill crisis was that cost is key for consumer willingness. Respondents presented a mixed picture, with some willing and some more wary, however the common thread for domestic consumers was how much was it going to cost. It was also highlighted that domestic consumers are more wary of private sector-led heat networks given that the private sector would control prices.

> *"the major issue for consumers is price" (Transition Scheme Participant)*

For non-domestic use, one respondent highlighted that schools and businesses are actively interested in connecting to heat networks. The appetite for this was contextualised within the tripling of one prospective consumers energy bills, and a desire for any alternative.

Theme: Commercial concerns

One project described their engagement with developers who they hope to agree concession agreements with. For these consumers, issues identified are more in relation to how low carbon a network is and concerns around the timing of implementation.

10. What effect is GHNF having on the heat networks investment and what are the mechanisms involved?

Theme: Too early to say but the appetite is there

For most projects, they explained that it was too early to make a comment on investment, as they were still only in more exploratory conversations with investors. However, this element of commercialisation was not felt to be something that was particularly challenging for projects as

"appetite to invest in Heat networks is growing in general". For a number of projects, investors have reached out to express interest, with one specifically suggesting that the BEIS pipeline database has given visibility to the project to be able to attract investment and another described utilising the BHIVE system.

> *"We've probably had approaches from 5 or 6 investors shall we call them. Some of them are just looking for an investment opportunity to build and sell on. They would need build and construction partner. Probably have three that it feels on the face of it with a similar vision for the city and would be looking at this as a long-term option" (Transition Scheme Participant)*

> *"The project in a BEIS database that has meant private investors have reached out" (Transition Scheme Participant)*

There was some evidence of variation in the types of investors that were starting to engage with projects, including traditional investment houses, pension schemes and those who would develop a funder-operator model.

14. What effect did the Transition Scheme have on projects engagement with the supply chain and market. Have they seen any new market entrants?

Theme: All the same names

Across a number of BEIS respondents, it was felt that the Transition Scheme didn't have any large impact on supply chains, with two explaining that it's generally always the same twenty companies who keep cropping up, and the scheme didn't give rise to new consultancies or new jobs. Something that would be more likely to come through in the Main Scheme. Another BEIS respondent felt that because timeframes were short and the vast majority of projects already had a framework or consultant incumbent lined up to do the work, the potential for the scheme to encourage new entrants was limited.

15. Have projects experienced any barriers or constraints that have impacted on their ability to access low carbon heat?

Across all projects, the challenges reported most often related to accessing low carbon heat.

Theme: Electricity constraints

One project described the challenges that they faced in accessing low carbon heat being in getting the required electricity to run heat pumps. This echoed the comments of a number of non-applicants who also cited electricity constraints as reducing the options they have for heat sources.

> *"[The area is] very electrically constrained, which is probably one of the biggest challenges on the project to be honest… if there's no electrical capacity, then there's no scheme" (Transition Scheme Participant)*

Theme: High costs

For two projects that relied on accessing waste heat from others, challenges related to negotiating prices for heat. In one case a project *"couldn't reach suitable commercial terms"* and has had to find an alternative heat source option, and in another, because of capital cost increases, EfW suppliers have sought to negotiate tariffs to account for their rising costs, which has challenged the projects' ability to successfully get agreements in place.

Theme: Supply chain challenges

Two projects utilising heat pumps reported close and regular engagement with heat pump suppliers given the likely long timescales to mobilise this supply chain, and in turn the supply chain have kept projects updated on progress. It was acknowledged that although experience was limited at this point in the development, the heat pump supply chain would be a challenge for the project going forward.

> *"[It was] clear there are supply chain issues with heat pumps" (Transition Scheme Participant)*

Theme: Technical Challenges

Finally, one project seeking to use mine water explained that the key challenge was the exploratory nature of this heat source, that projects need to do expensive drilling to see if it is viable, and also that the technology is still in its infancy and there are questions as to the theory of this approach that still need resolved. These both contribute to it being an expensive, and therefore hard to commercialise heat source. One project and one non-applicant, both attempting to develop mine water projects suggested that additional government funded research would help take some of the risk away from specific projects, and thereby unlock a larger pipeline of suitable mine water schemes.

22. Has delivering the Transition Scheme in-house had an impact on BEIS capacity to deliver such schemes or provided key learnings to BEIS?

Theme: Built BEIS capabilities

BEIS respondents have all highlighted the significance of the experience in building knowledge, skills, relationships and tools for delivering such schemes. One respondent noted that the team had to develop whole systems to manage the process of assessment [of applications] providing significant learning. A number of BEIS respondents highlighted the benefits to BEIS included building *"good relationships"* across the department to enable this sort of delivery. Some nuanced their response on building skills to refer more to demonstrating that the skills already existed in the team. All noted the resource challenges with delivery given no dedicated resource.

> *"I think that all worked pretty well actually, and I think it demonstrated that when we want to, we can absolutely deliver the main scheme, it's just it would be resource intensive". (BEIS Group Interview)*

Annex 5: Realist Analysis

Introduction

This annex presents the consortium's findings from an analysis of a series of interviews conducted with applicants to, and participants in, the Green Heat Networks Fund (GHNF) Transition Scheme. A 'realist evaluation'[42] approach was used. This allowed the evaluation team to analyse in depth the impacts on thinking and behaviour that the scheme had on applicants and participants in different contexts. The findings generated through this analysis have been summarised within the synthesised findings in the main report.

Methodology

Introduction to realist evaluation

Realist evaluation is a theory-based approach involving the development, testing and refinement of detailed theories about what works, in what circumstances, for whom and why. Realist theories are generally set out in the form of 'Context-Mechanism-Outcome' (CMO) configurations. In this instance, the CMOs were designed to explore a set of behaviours, (anticipated and described in an overall Theory of Change) identified as being of particular interest to BEIS. The CMO configurations provide a lens through which we considered how different types of actors (in this case applicant organisations and participant organisations) responded to the resources provided by the Transition Scheme, leading to different outcomes in different circumstances.

The table below sets out key 'realist' terms that are used in this annex.

Table 14: Glossary of realist terms

Term	Explanation
Realist evaluation	A realist approach to evaluation emphasises the importance of understanding not only whether a policy contributes to outcomes and impacts (which may be intended or unintended) but how, for whom and in what circumstances it contributes to these outcomes. It does this through exploring the factors that influence the generative 'mechanisms' (see definition below) that lead to outcomes of interest.

[42] R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.

Term	Explanation
CMOs	Context-Mechanism-Outcome configurations. These are realist hypotheses about how the policy is expected to work, which are tested during the evaluation. See 'realist evaluation'.
Context	The circumstances which affect whether a policy 'works' and for whom. Consideration of 'context' forms an important part of realist approaches to evaluation.
Mechanism	A change in people's 'reasoning', brought about through the 'resources' provided, or actions taken by a policy, which leads to a policy outcome. Identification of causal 'mechanisms', which operate in particular 'contexts', forms an important part of realist approaches to evaluation.
Outcome	A change in the state of the world, brought about as a result of a policy or other influences. Realist approaches to evaluation attempt to identify the 'contexts' and 'mechanisms' that lead to a particular 'outcome'.

Development of candidate CMOs

'Candidate' or initial CMOs were developed prior to the interviews with Transition Scheme applicants and participants. These CMOs built on two prior stages of theory development (see below) that were undertaken with BEIS and GHNF delivery stakeholders, through a series of participative workshops:

- Firstly, the overall Theory of Change developed for the evaluation of the GHNF, which summarises how the scheme is intended to achieve its objectives.
- Secondly, a set of more detailed 'stakeholder theories' (available upon request) which set out how the GHNF is expected to influence the following types of stakeholders:
    - Applicants to the scheme (both successful and unsuccessful)
    - Participants within the scheme (i.e., successful applicants who participate in it)
    - Supply chain organisations that supply goods or services to heat networks
    - Investors in heat networks.
    - Customers of heat networks.

For the GHNF Transition Scheme evaluation, the realist research was confined to the behaviour and reasoning of Transition Scheme applicants (whether or not they were successful) and participants (i.e., successful applicants who participated in the scheme). This was because the Transition Scheme focused solely on the commercialisation stage, and it was

considered too early to undertake research with potential investors, supply chain organisations and potential customers of Transition Scheme projects.

The 'candidate' CMOs were informed by a literature review undertaken in the scoping stage of the evaluation, and by relevant work previously undertaken by CAG most notably the evaluation of the Heat Network Development Unit (HNDU), as well as early findings from the Risk Solutions led evaluation of the Heat Networks Improvement Programme (HNIP)[43]. The CMOs set out a number of 'CMO hypotheses' as to why each applicant might have made the decision to apply to the GHNF Transition Scheme (i.e., applicant theory) and how the GHNF Transition Scheme might have been expected to benefit each participant (i.e., participant theory).

The candidate CMOs were shared and agreed with BEIS in advance of the research period. They are set out in the next section.

Research

The fieldwork comprised a set of 'realist interviews' in parallel with a set of 'process interviews'. Topic guides for the realist interviews were developed, and agreed with BEIS, in advance of the fieldwork. The topic guide for 'successful applicants' was designed to test the CMOs in both applicant theory and participant theory, while the topic guide for 'unsuccessful applicants' was designed to test applicant theory CMOs only. These topic guides are presented in Attachment 1.

There was a total of 9 applicants[44] to the GHNF Transition Scheme: 7 successful and 2 unsuccessful. With the exception of one unsuccessful applicant, for whom BEIS advised that an interview was inappropriate at the time of the research, all the applicants were invited to participate in realist interviews. These lasted 60 minutes for successful applicants and 45 minutes for the unsuccessful applicant. One successful applicant did not respond to the invitation, so realist interviews were undertaken with 6 successful and 1 unsuccessful applicant.

The realist interviews were undertaken online, via Microsoft Teams, led by an experienced realist interviewer. With the permission of the interviewees, interviews were recorded and transcribed on Teams.

Analysis

A spreadsheet was created to code and analyse the evidence against the candidate CMOs for the two theories being tested. Excerpts from the transcript from each realist interview were coded as 'case-specific' contexts, mechanisms and outcomes relevant to the applicant and participant theory, respectively. These comprised not only the contexts, mechanisms and outcomes specified in the relevant theory but also unanticipated contexts, mechanisms and outcomes that were observed in the interview evidence.

[43] Evaluation of the Heat Networks Investment Project (HNIP) pilot scheme https://www.gov.uk/government/publications/evaluation-of-the-heat-networks-investment-project-hnip-pilot-scheme

[44] Nine applicants, not including one applicant that subsequently withdrew

For each case, tailored 'case-specific' CMOs were created, relating to the reasons why the organisation applied to the Transition Scheme (applicant CMOs) and – for successful applicants - to the reasons why Transition Scheme participation influenced outcomes for their project (participant CMOs). These 'case-specific' CMOs aimed to capture the researchers' understanding, based on in-depth analysis of interview evidence, of the actual outcome and causal mechanisms observed for each case, and the contexts that appeared to trigger each mechanism in that case.

The 'case-specific' CMOs were then reviewed across the sample, and compared to the initial theory, to find patterns and similarities between cases, with the aim of developing a revised set of final CMOs. The revised CMOs include generalised versions of causal configurations (C to M and M to O linkages) that were well-evidenced in the 'case-specific CMOs'. However, they also include CMOs that clearly involved different causal mechanisms, even where only one or two cases were observed. The revised theory aimed to identify which contexts were important in triggering specific causal mechanisms, leading to different outcomes.

The coding and analysis was undertaken by two researchers, with the revised CMOs being developed in an iterative way through a series of collaborative meetings between the researchers. These meetings were used to explore differences and similarities between the causality observed across the cases and to identify key contexts that were observed to trigger different causal mechanisms. The revised CMOs are reported in a later section of this annex.

Limitations

There were two main limitations associated with this realist analysis.

- Firstly, interviews were only undertaken with GHNF Transition Scheme applicants and participants, as there was no scope to interview non-applicants for the GHNF Transition Scheme. This means that application theory has not been tested against the behaviour and reasoning of non-applicants.
- Secondly, the sample of GHNF Transition Scheme applicants and participants was small, with 6 successful applicants (i.e., participants) and 1 unsuccessful applicant. One of the successful applicants did not respond to invitations to interview, so it has not been possible to incorporate their perspectives into the revised theory.

Despite these limitations, the evidence from the GHNF Transition Scheme provides some insights that are considered likely to be useful when developing theory for the evaluation of the GHNF Main Scheme.

Candidate theory

Candidate CMOs for applicant theory

The candidate CMOs for applicant theory are set out in Table 15 below. These presented the research team's initial hypotheses about why, and in what circumstances, organisations applied to the GHNF Transition Scheme. These CMOs potentially applied to both successful

and unsuccessful applicants. (There was no need to distinguish between successful and unsuccessful applicants for this set of CMOs, because the 'outcome' of submitting a GHNF Transition Scheme application was the same in both cases.) The applicant CMOs were mutually exclusive (i.e., each case was expected to fit one of the three candidate CMOs), as summarised here:

- A1 – the Transition Scheme enabled the progression of this planned low carbon heat network project[45] that would not otherwise have been commercialised.
- A2 – 'let's go green' – the Transition Scheme influenced the applicant organisation to progress a low carbon heat network project instead of a gas CHP project.
- A3 – 'funding opportunism' – this low carbon heat network project would probably have been commercialised anyway, but the applicant organisation wanted to take advantage of funding offered by the Transition Scheme.

[45] The term 'project' was used to denote a new network, expansion of an existing network or a green retrofit to an existing network.

Table 15: Candidate CMOs – applicant theory

Nickname for CMO	Contexts (key contexts marked in bold)	Mechanism – resources	Mechanism – reasoning	Outcome
A1: 'Enables the progression of a planned low carbon HN project' (counterfactual – project not commercialised, or delayed until emplacement of GHNF)	Applicant has an eligible HN project (could be a new network, expansion of an existing network or a green retrofit) • In most cases applicant will have completed a techno-economic study but need to undertake additional work before being able to make a final investment decision. • Organisation has sufficient time and access to the necessary expertise to prepare a bid. • Proposed HN development is supported by internal (and where relevant) external stakeholders as it complements their strategic objectives (e.g., HN fits with Net Zero/jobs/regeneration/Levelling up strategy or similar). • Applicant anticipates the prospect of future support via main GHNF scheme. Other likely contexts: • Application is driven by local champion(s) • Belief that Transition Scheme projects will have increased chance of getting GHNF (main	Opportunity to obtain GHNF Transition Scheme commercialisation support, with possibility of future capital funding under GHNC Main Scheme support	The GHNF Transition Scheme grant terms and conditions are acceptable to us and, if we're successful in getting GHNF Transition Scheme funding, this will enable us to progress our development in line with our operational/ strategic imperatives and may ultimately help us to secure GHNF capital funding.	GHNF Transition Scheme application submitted

Nickname for CMO	Contexts (key contexts marked in bold)	Mechanism – resources	Mechanism – reasoning	Outcome
	scheme) funding as a result of receiving support via Transition Scheme. • Urgency to progress commercialisation of HN within Transition Scheme timeframe (could be for a range of reasons) • Other local or national policies provide carrots/sticks which support/enable low carbon HN developments. • Access to alternative sources of commercialisation support either don't exist or are limited.			
A2: **'Let's go green'** (counterfactual – commercialise or retain Gas CHP development as opposed to low carbon network)	Applicant has an eligible HN project (could be a new network, expansion of an existing network or a green retrofit). • Applicant already progressing with a gas CHP based scheme and had access to commercialisation funding, but was motivated by the GHNF, in tandem with the emerging policy environment, to develop a low carbon scheme. • In most cases applicant will have completed a techno-economic study but need to undertake	Opportunity to obtain GHNF Transition Scheme commercialisation support, with possibility of future capital funding under GHNF Main Scheme support	We had planned to develop an HN scheme but are now considering a low carbon development in recognition of the evolving regulatory environment and/or a growth in customer interest in the Net Zero agenda. The GHNF Transition Scheme grant terms and conditions are	GHNF Transition Scheme application submitted

Nickname for CMO	Contexts (key contexts marked in bold)	Mechanism – resources	Mechanism – reasoning	Outcome
	additional work before being able to make a final investment decision. • Organisation has sufficient time and access to the necessary expertise to prepare a bid. • Proposed HN development is supported by internal (and where relevant) external stakeholders as it complements their strategic objectives (e.g., HN fits with Net Zero/jobs/regeneration/Levelling up strategy or similar). • Applicant anticipates the prospect of future support via main GHNF scheme. Other likely contexts: • Application is driven by local champion(s) • Belief that Transition Scheme projects will have increased chance of getting GHNF (Main Scheme) funding as a result of receiving support via Transition Scheme. • Urgency to progress commercialisation of HN within Transition Scheme timeframe (could be for a range of reasons)		acceptable to us and, if our bid is successful, GHNF Transition Scheme will fund commercialisation activities that, with further potential capital funding from GHNF Main Scheme, would enable us to develop a low carbon heat network where we might otherwise have used (or continued to use) Gas CHP.	

Nickname for CMO	Contexts (key contexts marked in bold)	Mechanism – resources	Mechanism – reasoning	Outcome
A3: 'Funding opportunism' (counterfactual – network would probably have been commercialised differently or more slowly)	Applicant has an eligible HN project (could be a new network, expansion of an existing network or a green retrofit). • Applicant intended to pursue a low carbon heat network development and had access to commercialisation funding but was attracted to apply by the prospect of reducing their in-house costs. Applicant has an eligible HN project (could be a new network, expansion of an existing network or a green retrofit) • In most cases applicant will have completed a techno-economic study but need to undertake additional work before being able to make a final investment decision. • Organisation has sufficient time and access to the necessary expertise to prepare a bid. • Proposed HN development is supported by internal (and where relevant) external stakeholders as it complements their strategic objectives (e.g., HN fits with Net Zero/jobs/regeneration/Levelling up strategy or similar).	Opportunity to obtain GHNF Transition Scheme commercialisation support, with possibility of future capital funding under GHNC Main Scheme support	We are looking to take advantage of GHNF Transition Scheme funding.	GHNF Transition Scheme application submitted

Nickname for CMO	Contexts (key contexts marked in bold)	Mechanism – resources	Mechanism – reasoning	Outcome
	• Applicant anticipates the prospect of future support via main GHNF scheme. Other likely contexts: • Belief that Transition Scheme projects will have increased chance of getting GHNF (main scheme) funding as a result of receiving support via Transition Scheme.			

Candidate CMOs for participant theory

The candidate CMOs for participant theory are set out in Table 16 below. These present the evaluation team's initial hypotheses about how the GHNF Transition Scheme might improve outcomes for projects supported by the GHNF Transition Scheme. These CMOs presented hypotheses about how the GHNF Transition Scheme could potentially benefit participants and were expected to apply only to successful applicants. The participant CMOs were not mutually exclusive because the GHNF Transition Scheme could generate multiple benefits in individual cases:

- B1 – GHNF Transition Scheme funding supports commercialisation activities (i.e., the project progresses towards an investment decision because necessary commercialisation tasks are undertaken, funded by the GHNF Transition Scheme)
- B2 – the GHNF Transition Scheme act as a 'quality badge' that supports commercialisation (i.e., internal or external stakeholder support is strengthened because the project wins GHNF Transition Scheme funding)
- B3 – participation in the GHNF Transition Scheme improves the capability of the HN project development team within the sponsor organisation

Table 16: Candidate CMOs – participant theory

Nickname for CMO	Contexts (key contexts marked in bold)	Mechanism – resources	Mechanism – reasoning	Outcome
B1: 'Funding supports commercialisation activities'	• Successful GHNF Transition Scheme application • Commercialisation activities needed to clarify project uncertainties and risks; process enables a final investment decision to be made. • Cost of commercialisation activities was previously a constraint	GHNF Transition Scheme provides funding for commercialisation activities	GHNF Transition Scheme funding enables us to undertake commercialisation activities. This is necessary to clarify project risks and uncertainties and enable a final investment decision to be made.	Commercialisation work enables a final investment decision to be made. A decision to proceed would potentially lead to a GHNF Main Scheme application.
B2: 'GHNF Transition Scheme quality badge supports commercialisation'	• Internal/external stakeholders are cautious about investing time and funding in HN developments. • Government support provides reassurance to internal and external stakeholders (assessment process is seen as providing an external sense/quality check of the project and the investment of funding provides tangible evidence that BEIS feel that the	GHNF Transition Scheme approval process acts as 'quality badge'	GHNF Transition Scheme funding helps to reassure internal and external stakeholders that there is a genuine chance of the project being brought to a	Participation in GHNF Transition Scheme helps to ensure continued internal/external stakeholder support for this HN scheme.

Nickname for CMO	Contexts (key contexts marked in bold)	Mechanism – resources	Mechanism – reasoning	Outcome
	project has a genuine chance of being successful and attracting external investment).		successful conclusion.	
B3: 'Participation in GHNF Transition Scheme improves the capability of the HN project development team (sponsor organisation)'	**Project development team within sponsor organisation have scope to develop further capability, particularly around low carbon HNs**	**Interaction with expert advisers who undertake commercialisation activities**	**GHNF Transition Scheme funding helps to increase our capability and our ability to commercialise HN developments, particularly low carbon HNs**	**Participation in GHNF Transition Scheme helps to grow the sponsor organisation's capabilities in relation to low carbon HNs**

Summary of findings and revised theory

The tables below summarise findings against each element of the candidate theory and present a set of revised CMOs. For ease of understanding, the revised CMOs are set out in 'sentence' format:

Where C (i.e., contexts X and Y applies), then R1 (the resource(s) provided by the GHNF Transition Scheme) led to O (observed outcome) because of R2 (reasoning on the part of the applicant or participant organisation).

The causal mechanism in the revised CMOs is the combination of the resource (R1) and the reasoning (R2).

Application theory findings

As noted above, the CMOs in the application theory were defined to be mutually exclusive. The analysis found several cases that exhibited a version of CMO A1 while several other cases exhibited a version of CMO A3. No cases were found that exhibited CMO A2, for reasons explained in the table below.

Table 17: Applicant theory findings

Nickname for refined CMO	Summary of evidence	Refined version of CMO
A1: 'GHNF Transition Scheme commercialisation funding enabled a planned low carbon HN project to progress at this time' (counterfactual – project not	CMO A1 was observed in multiple cases, in contexts where: • No other commercialisation funding was available within 12 months • The proposed heat network was already low carbon Other contexts were also observed to be necessary for an application to be made (e.g., techno-economic study completed; strong	WHERE the proposed heat network was already low carbon and no other commercialisation funding was available within 12 months (context), THEN the opportunity to obtain GHNF Transition Scheme commercialisation support, with the possibility of future capital funding under GHNF Main Scheme support (resource), LED TO project teams making a GHNF Transition Scheme application (outcome)

Nickname for refined CMO	Summary of evidence	Refined version of CMO
commercialised, or delayed for 12 months or more)	strategic support for decarbonisation within the sponsor organisation) but these did not help to determine which mechanism was observed. The timing of GHNF Transition Scheme funding was critical. While this is consistent with the rationale for the Transition Scheme being established, ahead of the GHNF Main Scheme, this was not explicit in the candidate theory. In some, but not all, of the cases where this CMO was observed, the project team had specific reasons to want to progress their scheme urgently (e.g., because they had a good project team that they wanted to retain in place; or because they wanted to retain potential external customers who might otherwise take different decisions about heat decarbonisation, other than by joining the heat network).	BECAUSE the GHNF Transition Scheme grant terms and conditions were acceptable to them and, if they were successful in getting GHNF Transition Scheme funding, this would enable them to progress their low carbon heat network development at this time in line with their operational/strategic imperatives and might ultimately help them to secure GHNF Main Scheme capital funding (reasoning).
A2: **'Let's go green'** (counterfactual – commercialise or retain Gas CHP	This CMO was not observed. The interview evidence indicated that, in all cases, the project teams were already proposing a low carbon network before they considered a GHNF Transition Scheme application. The decision to adopt a low carbon system was typically reported to have been made a few years previously (e.g.,	Excluded from revised theory – all project teams were already proposing a low carbon heat network project prior to considering a GHNF Transition Scheme application.

Nickname for refined CMO	Summary of evidence	Refined version of CMO
development as opposed to low carbon network)	2-4 years ago). Although this type of decision was largely reported as being driven by internal net zero plans and commitments, there was some indication of influence from Government policy, pre-dating GHNF Transition Scheme. For example, one interviewee reported that their decision to 'go green' was influenced by the HNIP requirement that heat network (HN) projects had to demonstrate a pathway to low carbon. However, other interviewees referred to the influence of their organisation's commitment to decarbonisation and Net Zero.	
A3: 'This planned low carbon HN project could probably have been progressed in a different way, but Transition Scheme funding conferred advantages over other sources of commercialisation funding'	This was observed in multiple cases, in contexts where: • Other commercialisation funding was potentially available, within the same year as Transition Scheme (e.g., GLA funding, BHIVE funding, internal funding) • The proposed heat network was already low carbon • Other necessary contexts applied (as for A1)	WHERE the proposed heat network was already low carbon and other commercialisation funding was potentially available, within the same year as GHNF Transition Scheme (context), THEN the opportunity to obtain GHNF Transition Scheme commercialisation support, with the possibility of future capital funding under GHNF Main Scheme support (resource), LED TO project teams making a GHNF Transition Scheme application (outcome) BECAUSE they saw GHNF Transition Scheme funding as preferable both because it was grant funding (seen as 'free money') and (where internal stakeholders were cautious)

Nickname for refined CMO	Summary of evidence	Refined version of CMO
(counterfactual – commercialisation would probably have been progressed using other funding, within the current year, but this would have been sub-optimal for the project in some way)	GHNF Transition Scheme funding was seen as having advantages over other sources of funding because it was a grant and (in some cases) because it brought wider benefits (e.g., in terms of strengthening support from senior management). Applicants still perceived some additionality around Transition Scheme funding, even if they could if necessary have progressed some of the commercialisation work using an alternative funding source. There was less evidence of urgency in the cases where this CMO was observed.	because getting Government funding would help to build support for the scheme amongst senior management. The GHNF Transition Scheme grant terms and conditions were acceptable to them and, if they were successful in getting GHNF Transition Scheme funding, this would enable them to progress their development in line with their operational/strategic imperatives and might ultimately help them to secure GHNF Main Scheme capital funding (reasoning).

Findings on participant theory

The CMOs set out in participant theory were observed in parallel. Multiple benefits of commercialisation support were observed in each case. There was some evidence for all of the CMOs in the candidate theory, plus evidence of additional CMOs operating, as set out in the table below.

Table 18: Participant theory findings

Nickname for CMO	Observed?	Refined CMO
B1: 'GHNF Transition Scheme funding enabled us to undertake commercialisation activities'	This CMO was observed in all participant cases. Key contexts were that: • There was a need for commercialisation activities • Transition Scheme funding was available at approximately the right time in the project development cycle However, in several cases, the timing of the GHNF Transition Scheme meant that projects were unable to use their full allocation of GHNF Transition Scheme funds, so there was partial rather than full GHNF Transition Scheme funding. And, in all cases, at least some further commercialisation work was required before a final investment decision could be reached.	WHERE there was a need for commercialisation activity and GHNF Transition Scheme funding was available at approximately the right time in the project life cycle (contexts) THEN full or partial GHNF Transition Scheme funding for commercialisation activities (resource) LED TO progress towards a final investment decision (although further work was or will be required to reach a final decision) (outcome) BECAUSE the funding enabled the project team to undertake commercialisation activity that was necessary to clarify project risks and uncertainties, allowing more informed decisions to be made about the approach to development of the proposed scheme. (reasoning)

Nickname for CMO	Observed?	Refined CMO
B2: 'Winning GHNF Transition Scheme funding helped to increase the credibility of this low carbon heat network project in the eyes of senior management (and/or other stakeholders/funders)'	This CMO was observed in multiple cases where: • There was broad strategic support for decarbonisation but senior management in the sponsor organisation (or other stakeholders/potential funders) were cautious about investing time and funding in HN developments. • GHNF Transition Scheme projects were subject to critical assessment by Government • Senior management in the sponsor organisation (or other stakeholders) had confidence in Government assessment of GHNF Transition Scheme projects	WHERE senior management in the sponsor organisation (or other stakeholders/funders) were cautious but had confidence in critical assessment of GHNF Transition Scheme projects by Government (context) THEN the success of the low carbon HN project in obtaining GHNF Transition Scheme funding (resource) LED TO increased credibility of the low carbon heat network project in the eyes of senior management (and/or other stakeholders/funders) thereby increasing their support for the project (outcome) BECAUSE it reassured senior management (and other stakeholders/funders) that a low carbon heat network solution was appropriate. (reasoning)
B3: 'We already had a good level of capability on low carbon heat networks but participating in the GHNF Transition	This CMOs was observed in all cases where: • Project teams had a good level of capability on low carbon heat networks but still had potential to	WHERE the project team had a good level of capability on low carbon heat networks but still had potential to increase their capability and knowledge, and where their experience of the GHNF Transition Scheme projects was broadly positive (contexts)

Nickname for CMO	Observed?	Refined CMO
Scheme helped to build our knowledge and capability further'	increase their capability and knowledge • They had a broadly positive experience of the GHNF Transition Scheme • BEIS was supportive to GHNF Transition Scheme Participant, offering ancillary benefits (formally and informally) as well as funding Even where project teams had very high levels of knowledge and capability, they reported positive outcomes from their interaction with BEIS. The only cases where this CMO was not observed was where projects had found the GHNF Transition Scheme frustrating, possibly because the frustrations outweighed their sense of benefit from interaction with the scheme.	THEN participating in the GHNF Transition Scheme and receiving guidance/signposting from BEIS and from external consultants (resource) LED TO increased capacity and knowledge, improving their ability to commercialise this project or other heat networks (particularly low carbon heat networks) in future (outcome) BECAUSE the project teams learnt from interactions with expert advisers who undertook commercialisation activities, and with project coordinators in BEIS who provided 'signposting' to relevant contacts or information. (reasoning)
New CMO B4: 'Applying for the GHNF Transition Scheme has given us a better	Observed in multiple cases where: • Project teams planned to apply to the GHNF Main Scheme.	WHERE project teams planned to apply to the GHNF Main Scheme, and particularly where BEIS had imposed grant conditions before a Main Scheme application could be made (contexts)

Nickname for CMO	Observed?	Refined CMO
understanding of what was/will be required for a successful Main Scheme application to the GHNF'	This mechanism was observed not only for successful applicants but also for the unsuccessful applicant. This mechanism was particularly strong in cases where BEIS had imposed Grant Conditions which had to be met in advance of any application for GHNF Main Scheme funding. In one case, learning from the Transition Scheme application process had already helped a project team to be successful in winning GHNF Main Scheme funding.	THEN pulling together GHNF Transition Scheme information that would also be useful for the GHNF Main Scheme application (AND – where relevant – being made aware of GHNF Transition Scheme grant conditions imposed by BEIS) (resource) LED TO an easier GHNF Main Scheme application process (and possibly improved prospects of success in winning GHNF Main Scheme funding) BECAUSE going through the process of applying for the GHNF Transition Scheme gave the project team a better understanding of what was (or will be) required for a successful GHNF Main Scheme application. (reasoning)

Detailed findings

This section sets out detailed findings for applicant theory and then for participant theory, setting out the evidence underpinning the revised CMOs shown in Table 4 and Table 5.

Applicant theory findings

CMOs A1, A2 and A3 were presented as alternatives in the candidate theory. Evidence was found to support refined versions of:

- CMO A1: 'GHNF Transition Scheme commercialisation funding enabled a planned low carbon HN project to progress at this time'
- CMO A3: 'This planned low carbon HN project could probably have been progressed in a different way, but GHNF Transition Scheme funding conferred advantages over other sources of commercialisation funding'

However, no evidence was found to support CMO A2 ('Let's go green' – the Transition Scheme influenced the applicant organisation to progress a low carbon heat network project instead of a gas CHP project). The evidence supporting the revised theory is set out below, as is the observed evidence against CMO A2.

Observed outcomes for applicants

By definition, all the applicant cases shared a common outcome: the project team made an application to the GHNF Transition Scheme. The applicant theory did not consider whether the application was successful. It focused instead on why project teams applied to the GHNF Transition Scheme.

There was no evidence from non-applicants to the GHNF Transition Scheme, so the analysis below considers the contexts and mechanisms observed amongst different groups of GHNF Transition Scheme applicants.

Common contexts

All applicants demonstrated a number of common contexts, irrespective of why they applied to the GHNF Transition Scheme. From the evidence available to date, these appear to be necessary contexts for GHNF Transition Scheme applications. Many of these are also considered likely to apply to GHNF Main Scheme applications.

- A techno-economic study had been completed.
- There were outstanding commercialisation tasks that need to be completed before a final investment decision could be made.

  "When the opportunity came up, we thought we should go for it, because it said we can use that grant to support the design, that's the opportunity we're looking forward to. We need to do a lot of detailed design and survey, so we went for this bid." (Transition Scheme Participant)

- Transition Scheme funding was available at approximately the right time in the project development cycle.
- The project team had time to prepare an application within GHNF Transition Scheme timescales.
- The project team had access to the necessary expertise to prepare an application (normally via external consultants, but in some cases in-house).

  "We'd engaged with good consultants. [Organisation] had been working with us very closely to do this kind of commercialisation work and to produce business cases and so on because they've got a lot of experience in doing this kind of work. So, we needed that expertise to help us through." (Transition Scheme applicant)

- There was a level of strategic support within the sponsor organisation for heat decarbonisation (the drivers for this are discussed further under A2 below).
- A low-carbon heat network was already being considered (see A2 below).
- The project would need to seek external and/or internal capital funds for eventual HN construction work.
- The project team thought that success in obtaining GHNF Transition Scheme funding would increase the chance of obtaining eventual Main Scheme construction funding.

  "Partly it's a step towards, you know, the potential sort of larger scheme, but also it's a good opportunity to get in at an early stage and understand the grant funding scheme and how it works." (Transition Scheme applicant)

Other characteristics varied between the GHNF Transition Scheme applicants. For example, they represented a mix of public and private sectors schemes and a range of low carbon technologies (including water-sourced heat pumps, mine energy and energy from waste schemes); some involved multiple external stakeholders while others largely involved internal stakeholders; some had a clear local champion while others did not show evidence of this; some had supportive planning contexts while others did not; and some were close to reaching a final investment decision while others would require considerable further work to reach this stage.

The analysis below focuses on differences between cases which influenced why project teams applied to the GHNF Transition Scheme. In realist terminology, these contexts 'triggered' a mechanism (A1 or A3) which resulted in the application. The contexts that were common across applicant cases, or that did appear to influence the application decision, are not explored further here.

Evidence for refined CMO A1: 'GHNF Transition Scheme commercialisation funding enabled a planned low carbon HN project to progress at this time'

This mechanism shows clear additionality for GHNF Transition Scheme funding, in that the sponsor organisation would not have progressed the HN project at this time without GHNF Transition Scheme commercialisation funding. It applied to multiple cases within the cohort of scheme applicants. The timing of GHNF Transition Scheme funding was the key attraction in these cases. The refined version of CMO A1 is set out in sentence form here:

WHERE the proposed heat network was already low carbon and no other commercialisation funding was available within 12 months (context),

THEN the opportunity to obtain GHNF Transition Scheme commercialisation support, with the possibility of future capital funding under GHNF Main Scheme support (resource),

LED TO project teams making a GHNF Transition Scheme application (outcome)

BECAUSE the GHNF Transition Scheme grant terms and conditions were acceptable to them and, if they were successful in getting GHNF Transition Scheme funding, this would enable them to progress their low carbon heat network development at this time in line with their operational/strategic imperatives and might ultimately help them to secure GHNF capital funding (reasoning).[46]

The counterfactual to A1 was that, without GHNF Transition Scheme funding, commercialisation of the project would have been delayed by 12 months or more. The threshold of 12 months delay was chosen in this analysis because it was cited by participants as being a considerable delay that would make a difference to their project.

The key context that distinguished A1 cases from other cases was that project teams were not aware of any other sources of commercialisation funding, other than GHNF Transition Scheme funding, which would realistically be available within the next 12 months. While other sources of potential funding were mentioned, they would likely have involved delay.

"Without it [GHNF Transition Scheme funding] we have another funding resource, but it's very restrictive. That means we probably won't progress through this stage without the Transition Fund so the project can be delayed and deferred." (Transition Scheme applicant)

"The bottom line is, we would have needed the funding to be able to progress. As I say, it was excellent news that BEIS introduced the Transition Scheme, and we were able to apply for that, at that particular time. [..] if we would've had to have gone back to council to try and borrow that money, I don't believe that we would have been able to secure the funding at the same time as what we did with the Transition Scheme. I think that would have knocked on at least, possibly,12 months, maybe even longer." (Transition Scheme applicant)

"We would have had to seek [..] additional funding internally through [internal board]. [..] I don't think that would have been awarded until after the wider development scheme had got full planning permission, so essentially it would have put us in delay for maybe a year." (Transition Scheme applicant)

Most, but not all, of these cases had specific reasons for urgency. The types of reasons given for urgency included:

[46] The 'resources' provided by the Transition Scheme, combined with the applicants' 'reasoning', together make up the 'mechanism' for this CMO.

- Having an internal target for completion of the heat network.

  "We want to finish completion by 2025, so that's our kind of promise. Not the official promise, but we have been engaged with the local communities, the residents, and also the connection clients. That's our agenda." (Transition Scheme applicant)

- The project seeking to bring in existing loads involving potential external customers, as well as new housing developments, where these customers could choose to pursue other decarbonisation options if the project was overly delayed.

  "It puts us in a position where [we're] ready to pick up the existing loads and we can meet the 'heat on' dates for the new development essentially. [..] we know some of their boilers are getting towards end of life. We know that they have an ambition to decarbonize. So, as well as picking up the new developments such as [name], it's also key that we get to them [existing loads] in time [..] to connect those buildings, because otherwise they might replace their kit or look at their own decarb [decarbonisation] options essentially." (Transition Scheme applicant)

- The project team involving a good team of individuals, both public and private sector, and there being a risk that the team could disperse if there was a significant gap in project development.

  "We were concerned at that point that if we didn't secure funding for the next stage, that the momentum of the project would be lost. So, a lot of that work [..] would have kind of gone off into different directions and obviously because it was a consortium approach as well with private [..] and individuals. [..] they then go back to their day jobs or their next jobs and whilst we're still in contact with them, obviously there isn't that kind of relationship where you work together to try and achieve something. So, I think that was really the driver for applying for the Transition Scheme." (Transition Scheme applicant)

While the timing of GHNF Transition Scheme funding was cited as the main reason for application in these cases, there was also evidence that interviewees associated other advantages with GHNF Transition Scheme funding. For example, some noted that it was seen as attractive and low risk because it was grant rather than loan funding.

> *"I suppose because there was no risk. Well, I don't like to use the word free money, but there was grant funding, there was Government grant funding money that became available... [..] the fact that there was grant funding available for us, to help us to support and try and move forward with the expansion, that was a great attraction to us." (Transition Scheme applicant)*

This final point suggests that an element of CMO A3 (see below for details) operated alongside CMO A1 i.e., GHNF Transition Scheme funding was preferable to other funding streams, as well as being available at the right time.

No evidence for CMO A2: 'Let's go green'

In the candidate theory, it was anticipated that the GHNF Transition Scheme might trigger applicants to propose a low carbon heat network project as opposed to a gas CHP heat network project. However, the interviews provided no evidence to support this CMO. In all of

the cases studied, the sponsor organisation reported that they had decided to progress a low carbon network well in advance of deciding to apply for the GHNF Transition Scheme.

Those projects that planned to use energy from waste as the heat source had always been low carbon by design, for example having identified when building an energy from waste plant that an associated low-carbon heat network would also be built in due course.

For projects where gas CHP systems had previously been considered, the decision to proceed with a low carbon solution was typically reported to have been made several years prior to the release of the GHNF Transition Scheme. One driver for progressing low carbon heat networks was reported to be grid decarbonisation: this was reported to have reduced the carbon benefits of gas CHP systems, because the electricity generated by CHP plants was now replacing relatively low carbon grid electricity. Another driver was that net zero carbon had become more of a priority for organisations in the last 2-3 years.

> *"Grid electricity has decarbonized quicker and so actually you know what we're doing at the moment has become not that attractive from a carbon point of view quicker than we expected. So, we have a CHP engine that burns gas and generates electricity and heat. That's not actually particularly so low carbon thing to be doing anymore, but it was when we built it in 2015. So that's changed really rapidly. But also [..] the whole sort of conversation [..] has moved much more to net zero carbon in the last sort of two to three years in a way that it just wasn't on people's radar in 2015." (Transition Scheme applicant)*

A further driver for the move towards low carbon heat sources, for sources which might not otherwise have been commercially cost-effective, was reported to be the rising price of gas, combined with strategic decarbonisation and regeneration objectives.

> *"I think the strategic objectives, and there is the political will to be part of that, and forward thinking. The current financial arrangements have put on different pressures, although the energy crisis has helped. I mean, to that degree, where previously we were sort of looking at things, and we couldn't compete with the energy prices people were paying, because it was the price of gas. [..] if we come back to [the low-carbon technology concerned] to provide energy again, it looks really good on paper, so it's been an easy sell, to be honest." (Transition Scheme applicant)*

The contexts that led to strategic support for decarbonisation in general, and low carbon heat networks in particular, varied slightly between the types of organisations.

- For local authorities, the drivers for low carbon heat networks were reported to be net zero, fuel poverty and – in the case of more deprived areas – economic regeneration.

  "The main two drivers are the council has declared net zero carbon 2030. The second one is tackling the fuel poverty is our top target to benefit our local communities. The council has been investing a lot and put that in our agenda for a long time already." (Transition Scheme applicant – local authority)

- For organisations based in London, in addition to other contexts, a supportive local policy environment, combined with zero carbon ambitions, were reported to be an important driver of low carbon heat networks.

  "I think we're very lucky in the London area because we have full backing of the Mayor, the London Mayor, and this is all in line with the energy security bill. So, the GLA have also recently published an update of the energy assessment guidance, which clearly states that if a heat network is installed, and a new development is enabled or is able to connect to that heat network, then the heat network will be a heat network priority area. So that means that we would become the very top of the energy hierarchy." (Transition Scheme applicant)

- For universities, the reputation of the university in the eyes of students was reported to be an important driver for decarbonisation and low carbon heat networks, with a number of league tables reported to publish rankings of universities in terms of sustainability metrics.

  "It is certainly reputational. [..] obviously part of that is how it looks to students [..] you will increasingly find that universities are selling themselves on their sustainability credentials." (Transition Scheme applicant – university)

- For private developers, the drivers were reported to be a combination of Government policy (including planning policy and building regulations) and the added value to consumers of selling low or zero carbon homes.

  "It was a combination of interest from wider parties such as the Council, the need to decarbonize our own developments to meet SAP2 and new building regulations, [and] to increase the sell of those. [..] [Organisation] has an ambition to make [..] all of the buildings that it's connected to, low to zero carbon anyway. [..] It's an added selling point essentially. They want to do [..] over and above what's required by planning." (Transition Scheme applicant)

There was some limited evidence of Government policy influencing sponsor organisations' movement towards a low carbon approach to their heat network project, alongside their own net zero ambitions. For example, some influence was attributed to the HNIP requirement that applicants put forward a decarbonisation pathway, rather than to GHNF Transition Scheme itself. It is possible that GHNF Transition Scheme influence was too short term to trigger a major shift in projects that took several years to plan, and that more evidence about this may emerge for the GHNF Main Scheme.

> *"So, at the same time that we declared the climate emergency was pretty much at the exact same time they started to change their funding through HNIP, whereby you needed a decarbonisation pathway for future schemes. So, it was all in and around the same time, that was kind of a, "Well, why are we going to go down the CHP route when we could start now, looking at the low-carbon process? Because it's not as if we're starting with an existing scheme." So, it did, but it definitely wasn't the primary driver. But [..] the fact that there was only going to be funding available for the low-carbon approach definitely has an influence."* (Transition Scheme applicant)

Even where the sponsor organisation and its partners were reported as offering broad strategic support for decarbonisation and for the heat network project, there was some evidence of the need for ongoing activity to maintain and reinforce such support, both within the sponsor organisation itself and within other consortium member organisations (e.g., when personnel changed).

> *"So yes, I think there has been quite a lot of persuasion required in every institution and at different times. [..] When [organisation] changed a lot of their estate staff, they all started saying, "Why are you doing this?" So, we all went along as a group and said, "Well, this is why we're all doing it, and this is why we're doing it as a group." They then did the same with us when our [senior management team] changed. So, it has been a genuine group effort eventually, but again, I continually say, "This is the right choice.""* (Transition Scheme applicant)

Evidence for refined CMO A3: 'This planned low carbon HN project could probably have been progressed in a different way, but GHNF Transition Scheme funding conferred advantages over other sources of commercialisation funding'

This mechanism showed some additionality for GHNF Transition Scheme funding, but additionality was less clear cut than for CMO A1. In these cases, other sources of commercialisation funding could have been used to progress the project to a similar timetable, but GHNF Transition Scheme funding offered advantages to the sponsor organisation compared to other funding sources. This CMO applied to multiple cases within the cohort of GHNF Transition Scheme applicants. The Government grant nature of GHNF Transition Scheme funding was the key attraction for applications in these cases. The refined version of CMO A3 is set out in sentence form here:

> *WHERE the proposed heat network was already low carbon and other commercialisation funding was potentially available, within the same year as GHNF Transition Scheme (context),*
>
> *THEN the opportunity to obtain GHNF Transition Scheme commercialisation support, with the possibility of future capital funding under GHNF Main Scheme support (resource),*
>
> *LED TO project teams making a GHNF Transition Scheme application (outcome)*
>
> *BECAUSE they saw GHNF Transition Scheme funding as preferable both because it was grant funding (seen as 'free money') and (where internal stakeholders were cautious) because getting Government funding would help to build support for the scheme amongst senior management. The GHNF Transition Scheme grant terms and conditions were acceptable to them and, if they were successful in getting GHNF Transition Scheme funding, this would enable them to progress their development in line with their operational/strategic imperatives and might ultimately help them to secure GHNF Main Scheme capital funding. (reasoning).*[47]

[47] The 'resources' provided by the Transition Scheme, combined with the applicants' 'reasoning', together make up the 'mechanism' for this CMO.

The counterfactual to A3 was that, without GHNF Transition Scheme funding, commercialisation of the project could probably have been progressed using other funding, within the current year, but this would have been sub-optimal for the project in some way. For example, the project might have had to take on more loan financing rather than being funded by a grant, or internal stakeholder support might not have been built to the same degree.

The key context that distinguished A3 cases from other cases was that they had access to other funding sources that could have been used to progress commercialisation, without undue delay to the project. Commercialisation might have been less well-resourced than it was through the GHNF Transition Scheme, but progress would have been made. The sources of funding potentially available were mainly internal funding:

> *"I think [without Transition Scheme funding] we would've had to pause and seek other funding sources. Now, I'm at a bit of a loss as what [other Government sources were there]. It probably would've been internal funding to try and continue some of the commercialisation. So, we did have a bit of a thought process as to how that would be, and to what point we could take the project." (Transition Scheme applicant)*

In these cases, GHNF Transition Scheme funding was seen as helpful, but some progress would have been made on commercialisation even if the application had not been successful.

> *"So, we could have still looked at that, [..] maybe would have done the work ourselves and still gone through that, but I think. Ultimately, I think it helped. [But] it probably wouldn't have been a show stopper [..] if we hadn't been able to have that funding." (Transition Scheme applicant)*

However, in one London-based case, the applicant explained that external funding for commercialisation might have been available from other sources (e.g., the GLA and BHIVE).

> *"It wasn't the only funding we were looking at because there was GLA funding available, and we were also looking at BHIVE funding and that kind of thing at the same time. So, we had a plan for what would happen if we were successful with GHNF, which we were, but also, we had a plan if we weren't." (Transition Scheme applicant)*

There was less evidence of urgency in the contexts for the A3 cases. In one case, the existing energy centre on the heat network was old and needed replacement, but there was no specific time by which replacement needed to be achieved. In other cases, where the projects involved considerable technical uncertainty, the applicant might ideally have preferred a longer timeframe for commercialisation, but their commercialisation timescale was strongly influenced by the opportunity to access GHNF Transition Scheme funding.

> *"In some ways it (Transition Scheme funding) probably came a bit sooner than we may have liked and we probably didn't have as much time as we would have liked. [..] the consequence has been that it's taken us longer than we perhaps anticipated to then get to the point of actually that [Main Scheme] application." (Transition Scheme applicant)*

> *"Timescales that are dictated by Treasury to get money out of the door [..] make it look as if we're making progress on schemes. We're almost setting us up for failure by*

> *rushing. [..] We need to try and hit the funding streams and GHNF is quite a short window for large capital programmes." (Transition Scheme applicant)*

The preference for GHNF Transition Scheme funding over other funding sources arose primarily from the fact that it (and the Main Scheme) offered grant funding or 'free money', rather than loan funding.

> *"When we applied for the Transition funding, we were definitely applying for that with a view that we wanted to move on to apply to the main grant because it felt to us slightly mad not to, to be honest. If you're successful, it's a very good source of funding, and all the other funding sources that we were uncovering, attractive though they may have been, were all various forms of debt, whereas the GHNF is not that." (Transition Scheme applicant)*

An additional context here, in certain cases, was that complex heat network schemes in more deprived areas had marginal businesses cases and were not viable without grant support.

> *"District heating schemes per se, certainly in areas like [DISTRICT], where we're having to prioritise economic development – aren't really viable without grant support yet." (Transition Scheme applicant)*

Another advantage of applying for GHNF Transition Scheme funding in these cases was that winning Government grant funding would strengthen senior management support for the low carbon heat network project. This was cited both as a positive point and as the converse – i.e., that internal support might have been damaged if the project was unsuccessful in bidding for Transition Scheme funding.

> *"I think it would have been a lot harder because I think if it had been unsuccessful. It probably would have rung alarm bells internally about, you know, here's a scheme that's there to fund decarbonization of heat networks, and this hasn't been viewed as a viable scheme worth funding. I don't think it would have been impossible, but it would have made life more difficult." (Transition Scheme applicant)*

It is not clear from interview evidence how far the role of GHNF Transition Scheme success in building internal support was really anticipated at the application stage or whether interviewees were simply reporting a benefit of participating in the GHNF Transition Scheme that they had become aware of retrospectively. This point links to CMO B2 below in participation theory.

Participant theory findings

The three candidate CMOs, B1, B2 and B3 were expected to act in parallel, being non-exclusive. Evidence was found to support all three participant CMOs, with slight revisions to the original theory.

- CMO B1: GHNF Transition Scheme funding enabled us to undertake commercialisation activities.

- CMO B2: winning GHNF Transition Scheme funding helped to increase the credibility of this low carbon heat network project in the eyes of senior management (and/or other stakeholders/funders).
- CMO B3: we already had a good level of capability on low carbon heat networks but participating in the GHNF Transition Scheme helped to build our knowledge and capability further.

There was also evidence of a further CMO B4, which applied to both successful and unsuccessful applicants.

- CMO B4: applying for the GHNF Transition Scheme has given us a better understanding of what was/will be required for a successful GHNF Main Scheme application.

The outcomes and contexts differed between these CMOs and are described alongside the observed mechanisms below.

Evidence for refined CMO B1: GHNF Transition Scheme funding enabled us to undertake commercialisation activities

This CMO was observed in all participant cases. It represented the most obvious benefit of GHNF Transition Scheme funding, in that funding was used to progress activities that were necessary to progress the low carbon heat network projects. The CMO is set out in sentence format below, with the 'resources' and 'reasoning' together making up the 'mechanism in this CMO.

> *WHERE there was a need for commercialisation activity and Transition Scheme funding was available at approximately the right time in the project life cycle (contexts)*
>
> *THEN full or partial GHNF Transition Scheme funding for commercialisation activities (resource)*
>
> *LED TO progress towards a final investment decision (although further work was or will be required to reach a final decision) (outcome)*
>
> *BECAUSE the funding enabled the project team to undertake commercialisation activity that was necessary to clarify project risks and uncertainties, allowing more informed decisions to be made about the approach to development of the proposed scheme. (reasoning)*

Evidence supporting the mechanism, outcome and contexts in this CMO, and the causal linkages between them, is set out below.

Mechanism

The mechanism for this CMO was straightforward, in that GHNF Transition Scheme funding enabled project teams to commission or undertake commercialisation tasks, leading to clarification of project risks and uncertainties. Examples of tasks funded by the scheme

included detailed design and planning, testing and research work, and adaptation of BEIS approved template agreements[48]:

> *"So, you know from [..] schematic diagrams that would go to [..] Maintenance and Estates to[..] review and accept [..] The scheme looks sort of technically viable [..] in terms of where you're [..] physically looking at putting things [..] out and about around the [site]." (Transition Scheme participant)*

> *"So, in a nutshell, the commercialization funding was to complete a RIBA three design, so just take the design up to the point where we can submit a planning application essentially. And kick off the procurement process for the scheme. It was also to pull together a suite of legal templates that we could use for connections and customers going forward. So, a template concession agreement; a lease for the Energy Centre, easements, etcetera. Connection supply agreements – [a] full suite of 'legals' has been produced. They're ready to go." (Transition Scheme participant)*

In several cases, GHNF Transition Scheme participants were not able to spend the full GHNF Transition Scheme grant within the scheme timescales. This meant that the scale of 'resources' provided by the GHNF Transition Scheme were smaller than originally intended and that the GHNF Transition Scheme funded only a proportion of intended commercialisation activities. This had implications for observed outcomes in such cases, as explained below.

Outcome

The outcome from the CMO was more limited than proposed in the candidate theory. There were no cases in which the commercialisation activities funded by the GHNF Transition Scheme were sufficient, on their own, to enable a final investment decision to be reached. In cases where a final investment decision had since been made, this was informed by additional self-funded commercialisation work beyond the end of the GHNF Transition Scheme. The outcome for this CMO is therefore described as 'progress towards a final investment Decision' rather than 'reaching a final investment decision'.

> *"There's quite a lot of work that has gone on subsequent to what we had funding through the Transition Scheme for to get us to that point, really it certainly, you know, took us a long way down there, but ultimately this there was still quite a bit more work to do to them. [..] Now we've got to do a bunch more work to really develop something up to be ready for a full application. So, there is [..] an in-between bit of work that was largely independent of the Transition Fund but informed by it." (Transition Scheme participant)*

For some of the more complex schemes, participants planned to seek further commercialisation support from the GHNF Main Scheme, prior to obtaining internal approval for the construction phase.

[48] These templates were developed by Lux Nova, during the HNIP programme. The use of BEIS approved templates was reported by this participant to give potential heat network customers confidence in connection and supply agreements.

> *"Our next phase will be to get Board sign off to connect X number of units. So, some form of [..] concession agreement. [..] We would then go in for a further Green Heat Network Funding and if successful, after the remainder of the commercialisation, it would then be brought approval to go in for construction. So, it would be a phased sign off." (Transition Scheme participant)*

As noted above, this limitation to the GHNF Transition Scheme outcome was exacerbated by the short window for Transition Scheme expenditure which meant that several projects were not able to spend their full GHNF Transition Scheme grant.

> *"We had to reduce that down to £Yk because we wouldn't have the time to do all of the commercialisation works that we needed. [..] we had to undertake some of the commercialisation works [..] using our own funding essentially. So, if it had been relaxed a little bit then [..] we would have been able to get grant funding for the wider works." (Transition Scheme participant)*

Nevertheless, GHNF Transition Scheme funding was reported to have helped all the GHNF Transition Scheme participants on their journey towards an investment decision.

> *"I think all of those things ultimately feed into [internal stakeholders being able to] to give a sort of yes/no decision on the project."* (Transition Scheme participant)

> *"Now with that progression over the last year the council has agreed we can go ahead with the further activity [..]"* (Transition Scheme participant)

> *"So that's what the funding has allowed us to do: to get us a framework between ourselves that we can operate and to get us a scheme that we are confident that we can stand behind and say, "Right, put £Xm down [..] and get on with it. If we get some funding from government to help us do that, that would be brilliant, but actually, we've proved it to ourselves successfully enough that we'd probably do it anyway." That Transition funding has helped a lot with that because finding £Yk to spend on consultants to talk about heating is quite a tall order in some institutions' cases."* (Transition Scheme participant)

Contexts

Key contexts in which CMO B1 was observed were that:

- The GHNF Transition Scheme participant received full or partial scheme funding (i.e., they were a successful applicant).
- There was a need for commercialisation activities.

  > *"With the external funding [from the] Transition Scheme [..] we can progress the design further, we can progress the financial and legal implications, so we can present initial assessment to the project board to convince [them]." (Transition Scheme participant)*

CMO B1 was observed in combination with several other CMOs, as described below.

Evidence for refined CMO B2: winning GHNF Transition Scheme funding helped to increase the credibility of this low carbon heat network project in the eyes of senior management (and/or other stakeholders/funders)

This CMO was observed in all participant cases. Where senior management were already highly confident about low carbon heat network investments, this mechanism was reported as applying to potential external funders or investors. The CMO is set out in sentence format below, with the 'resources' and 'reasoning' together making up the 'mechanism in this CMO.

> *WHERE senior management in the sponsor organisation (and/or other stakeholders/funders) were cautious but had confidence in critical assessment of Transition Scheme projects by Government (context)*
>
> *THEN the success of the low carbon HN project in obtaining Transition Scheme funding (resource)*
>
> *LED TO increased credibility of the low carbon heat network project in the eyes of senior management (and/or other stakeholders/funders), increasing their support for the project (outcome)*
>
> *BECAUSE it reassured senior management (and/or other stakeholders/funders) that a low carbon heat network solution was appropriate. (reasoning)*

Evidence supporting the mechanism, outcome and contexts in this CMO, and the causal linkages between them, is set out below.

Mechanism

The main mechanism observed in this CMO was that the project's success in obtaining GHNF Transition Scheme funding, in a competitive process that involved careful assessment by Government, increased the credibility of the low carbon heat network project in the eyes of some stakeholders.

> *"For [..] a project like this with assurance from BEIS, because for the Transition Scheme they will look at the technique or concept, they will look at a financial assessment and our engagement. Also, a lot of [..] what we promise to do after the completion of the project. That covers a wider range of the general [working] of the project to give confidence of how reliable the [scheme] can be. That makes our application to other funding schemes easier, so they understand the project is also being monitored by BEIS, a more professional and more capable organisation, who can help us and monitor the project over the long term." (Transition Scheme participant)*
>
> *"Anything where the government have bought into your proposals gives maybe a slight degree more of confidence, at least that an independent party has looked at it and also agreed it's worth pursuing to that extent. So, it could've been kicked out at any stage. It hasn't been, so at least there's maybe a little bit of degree of confidence there. It depends possibly who you're talking to as well." (Transition Scheme applicants)*

This mechanism was reported, in some cases, to apply not only to the sponsor organisation's senior management team but to other stakeholders and potential funders.

> *"Financially, a successful bid in the Transition Scheme actually gives a lot of confidence to our stakeholders. That means we passed initial approval from BEIS, so we can try to go ahead with the project. Also, that gives confidence to other funders who were very hesitant for the project because it's a highly innovative concept. It's a complicated project. Being successful with the scheme gives confidence to the market. They will approach us; they will support the project development." (Transition Scheme participant)*

For local authorities, the fact that GHNF Transition Scheme was Government funding and involved Government assessment was also important, helping to give senior management confidence that the proposed low carbon heat network project would comply with legislation.

> *"I think the fact that it's a government scheme is quite critical to all of this, because, particularly with us being a local authority and also the fact that the council fully recognises that it has to adhere to legislation also, I think the two things go hand in hand there." (Transition Scheme participant)*

There was also mention that the existence of the GHNF programme as a whole, beyond the project funding offered by the GHNF Transition Scheme, helped to boost the credibility of heat networks in general in the eyes of industry stakeholders and senior management. The implication was that this general credibility boost helped to build support for their specific project.

> *"I think what it shows to us in the industry is that the government clearly recognises that heat networks are a fundamental part of the decarbonisation strategy. The fact that we are being told, and it's all there, it's all out in the public domain, the fact that they are clearly looking to grow heat networks from 3% up to, circa, 18%, that shows that there's a lot of credibility, and there's a lot of weight being put behind this. And that's good news for us." (Transition Scheme participant)*

Outcome

The main outcome for this CMO was that, where senior management were cautious about the low carbon heat network project, the credibility created by GHNF Transition Scheme success helped to build internal management support. The boost to credibility came both from success in the GHNF Transition Scheme competition and from the offer of Government funding.

> *"By having a scheme, by having a government drive to say, "Here's some funding to do a thing that we know is a better thing to do," encourages you to do the better thing. It also gives you the leverage internally to say, "Yes, I know it might look like in five years' time it's better to do this thing, but in 25 years' time, the people that come after us are going to say, 'Thank you very much for doing this bigger thing.'" That argument stacks up if you can say, "And there's also funding attached"." (Transition Scheme participant)*

There were also a number of subsidiary outcomes, linked to the main outcome. For instance, where project teams needed to raise further funding, either internally or externally, they

predicted an increased likelihood of obtaining 'match funding' because of the credibility gained by the project receiving Government funding. Effectively, the suggestion was that other funders would see the low carbon heat network project as lower risk because it had been successful in obtaining GHNF Transition Scheme funding.

> *"[We are looking at other funding sources too], and the way that they seem to operate is they don't like being the first funder. They like to finish the funding off, if that makes sense. So having GHNF on board and them being the first funder, for example, would very much improve our chances of [securing further funding from other parties]." (Transition Scheme participant)*

Those project teams who were more experienced, and who already had experience of raising finance for HN, predicted that GHNF Transition Scheme (and potentially Main Scheme) funding would also give the project more credibility with external investors. This expectation was based on their experience with other low carbon heat networks.

> *"To be honest, it definitely helps when looking for other external funding. [..] We found that on our other schemes." (Transition Scheme participant)*

Also, where there were a range of options for future development of the low carbon heat network, increased support from senior stakeholders as a result of the GHNF Transition Scheme was also reported to allow local authority participants to pursue a more communal approach to their low carbon heat network projects, which would bring wider benefits for their local area.

> *"I think it also made it much easier for us to win the internal arguments about taking a low-carbon route, [..] and taking a communal route that would allow us to provide low-carbon heating to other institutions that are not yet on the scheme. I think it gave us enough leverage to build something that will be good for us but also good for the area in the future. It allowed us to think longer term." (Transition Scheme participant)*

Contexts

Key contexts in which CMO B2 was observed were that:

- There was broad strategic support for decarbonisation but senior management in the sponsor organisation (or other stakeholders/funders) were cautious about investing time and funding in HN developments.

  "The council won't just release the funds to something we don't really understand" (Transition Scheme Participant)

- Transition Scheme projects were subject to critical assessment by Government.
- Senior management in the sponsor organisation (and/or other stakeholders/funders) had confidence in Government assessment of GHNF Transition Scheme projects.

  "It does give other investors the confidence that it's already been assessed [..] via BEIS and the Triple Point team [sic] and it's been awarded funding. So, it does [..] tick that

box [and] gives [..] the scheme a bit of clout and people confidence that it's the right thing to invest in." (Transition Scheme participant)

Evidence for refined CMO B3: we already had a good level of capability on low carbon heat networks but participating in the GHNF Transition Scheme helped to build our knowledge and capability further

This CMO was observed in all participant cases, except where participants had a negative experience of the Transition Scheme and also believed they could have funded at least some of the commercialisation work in other ways. The CMO is set out in sentence format below, with the 'resources' and 'reasoning' together making up the 'mechanism in this CMO.

WHERE the project team had a good level of capability on low carbon heat networks but still had potential to increase their capability and knowledge, and where their experience of the Transition Scheme was broadly positive (contexts)

THEN participating in the GHNG Transition Scheme and receiving guidance/signposting from BEIS and from external consultants (resource)

LED TO increased capacity and knowledge, improving their ability to commercialise this project or other heat networks (particularly low carbon heat networks) in future (outcome)

BECAUSE the project teams learnt from expert advisers who undertook commercialisation activities, and with project coordinators in BEIS who provided 'signposting' to relevant contacts or information. (reasoning)

Evidence supporting the mechanism, outcome and contexts in this CMO, and the causal linkages between them, is set out below.

Mechanism

The GHNF Transition Scheme helped to develop participants' capability and knowledge in two ways:

- Firstly, for those participants with less in-house expertise and experience in delivering low carbon heat networks, by giving them exposure to techno-economic consultants who supported the preparation of GHNF Transition Scheme bids and to design consultants (e.g., mechanical and electrical consultants) who implemented commercialisation activities funded by the GHNF Transition Scheme. This contributed to their capability and knowledge about low carbon heat networks.

  "As I said, we've used [organisation] to be our main consultant in terms of making the bid. I mean, we've had some technical consultants around the actual scheme itself. It's not just that they've helped us construct the application and so on but also that they've been through similar situations multiple times, so they know the pitfalls. They also know the alternative routes that you might take, so they've been able to explain all the different things that we might do. [..] That kind of depth of knowledge has been really, really useful, I think, and again puts you in a good position because they understand the

metrics. They've seen the application form multiple times, so they know what's needed and how to get there." (Transition Scheme participant)

- Secondly, for participants including those already highly specialised in low carbon heat networks, by giving them access to signposting by BEIS project staff. This gave them useful information for commercialisation of their current or future low carbon heat networks.

  "They [BEIS] did…act as a bridge between us and [other parties locally] at first, [which] … assisted us with the commercialisation. So, they acted as an enabler as well as a funder, so it was good." (Transition Scheme participant)

Outcome

Where project teams had less in-house expertise and experience in delivering low carbon heat networks, the mechanisms above led to an increase in their capability and knowledge about low carbon heat networks in general. This arose from the application process as well as the commercialisation activity.

> *"I know a lot more about decarbonization of buildings than I did eighteen months ago. But also, I suppose [..] [I've] developed a better understanding of the technoeconomic modelling that's needed to feed into the application because [..] what I haven't particularly wanted is every time Triple Point [sic] come back with a question on application that I need to get back to our consultants. [..] I want to be able to answer the questions myself as much as possible so [the] natural development has been actually that [I'm] understanding [..] some of the many, many different sorts of technical considerations that go into [it]." (Transition Scheme participant)*

Even where project teams had very high levels of knowledge and capability and had been supported by HNDU or HNIP in the past, they reported positive outcomes from their interaction with BEIS. In the example cited above, the signposting provided by BEIS staff enabled two adjacent heat network teams to coordinate the design of their networks. This increased the likelihood that they would be able to connect the networks in future, which would enable more extensive decarbonisation.

Outcomes of this nature were not reported where GHNF Transition Scheme participants had a negative experience of the scheme process (e.g., because of timing issues) and also believed they could have funded at least some of the commercialisation work in other ways.

Contexts

CMO B3 was observed in cases where:

- Project teams had a good level of capability on low carbon heat networks but still had potential to increase their capability and knowledge:

  "I suppose the capability and the resourcing is always an issue within local authorities, and my background, I'm a civil engineer in highways by trade, and have transitioned into

this. And then now, I'm the local authority's [primary contact] on all things to do with heat networks." (Transition Scheme participants)

- They had a broadly positive experience of the Transition Scheme.
- BEIS was supportive to Transition Scheme participants, offering ancillary benefits (formally and informally) as well as funding:

  "I would say, because of the fact that we've been able to apply, and we received grant funding from BEIS, it's also naturally brought us closer to BEIS, in being able to utilise their experience as well, and also the industry knowledge. In addition to that, I've noted that there are other local authorities that are ploughing forward with the same aspirations as [council]. So, off the back of that, I've had many introductions to other local authorities, and so I find that there's quite a bit of information sharing that happens now, off the back of that, which is good. I find that beneficial." (Transition Scheme Participant)

The only cases where the participant did not ascribe benefits to the GHNF Transition Scheme per se were those where the projects had found the GHNF Transition Scheme frustrating, possibly because the frustrations outweighed their sense of benefit from interaction with the scheme. However, they still reported benefits from undertaking commercialisation work, in terms of linkages with local consultants engaged to deliver the work. They did not attribute this benefit to the GHNF Transition Scheme because they could – if necessary – have funded at least some of the work internally.

"I think we've definitely benefited going through the project, maybe not directly linked because of going through the heating networks one or the Transition Scheme. I think that in itself hasn't taught us anything with that, and there are probably more linkages with the consultants that we've been able to appoint, and learn from them, and use our own expertise and relationships within the [local area]. [..] But, I don't think necessarily the Transition Scheme has helped us in any of that." (Transition Scheme participant)

Evidence for new CMO B4: applying for the GHNF Transition Scheme has given us a better understanding of what was/will be required for a successful application to the GHNF Main Scheme

This CMO was an extension of CMO B3 that was observed in multiple cases where the applicant intended to apply to the GHNF Main Scheme. This included the unsuccessful applicant case. The mechanism was particularly important in cases where grant conditions were applied by BEIS. The CMO is set out in sentence format below, with the 'resources' and 'reasoning' together making up the 'mechanism in this CMO.

WHERE project teams planned to apply to the GHNF Main Scheme, and particularly where BEIS had imposed grant conditions before a Main Scheme application could be made (contexts)

THEN pulling together Transition Scheme information that would also be useful for the Main Scheme application (AND – where relevant – being made aware of Transition Scheme grant conditions imposed by BEIS) (resource)

LED TO an easier Main Scheme application process (and possibly improved prospects of success in winning Main Scheme funding)

BECAUSE going through the process of applying for the Transition Scheme gave the project team a better understanding of what was (or will be) required for a successful Main Scheme application. (reasoning)

Evidence supporting the mechanism, outcome and contexts in this CMO, and the causal linkages between them, is set out below.

Mechanism

GHNF Transition Scheme applicants expected the GHNF Main Scheme application process to be similar to the GHNF Transition Scheme application process, with some improvements. They therefore expected the process of preparing their GHNF Transition Scheme application to make an eventual GHNF Main Scheme application easier. This was reported even by those who had applied for HNDU or HNIP funding in the past.

"It helps, as experience in anything helps. And we've submitted other HNDU applications. [..] so, it always helps to experience the process, and it assists you going forward for any future schemes they [BEIS] will do." (Transition Scheme applicant)

Where applicants had been required to clarify elements of their GHNF Transition Scheme bid, the application process also gave them a clearer understanding of what would be required for a successful Main Scheme bid.

"I think it was useful having [..] a trial run almost or if you view it in that way because we were asked a hell of a lot of questions. [..] I think it's about 100 and something different questions that came through or something. [..] One of the things we did, I mean with the transition scheme though, because [..] we did have so many clarification questions come through. We did actually [..] take those [..] forward [into] the full scheme application and we did look at them and think right, OK, this is what our application was missing last time, and we can make sure that they were included." (Transition Scheme applicant)

Similarly, where BEIS had set grant conditions associated with the GHNF Transition Scheme grant or a future GHNF Main Scheme application, this gave the applicants a clear understanding of conditions that must be fulfilled before they could obtain GHNF Main Scheme funding.

"Once we've got planning permission, we will then be waiting for the rest of the site to get full planning permission, so that's the residential units which is the main anchor load for the scheme as soon as they have got full planning permission, we will be seeking a concession agreement for those for those plots. And then likely going in for [..] Green Heat network fund main scheme funding for construction funding for the wider scheme. And those were actually conditions of reapplying for future funding. So, we would need a planning permission and a concession agreement before we reapply to the Green Heat Network Fund." (Transition Scheme applicant)

The inclusion of grant conditions was not always welcomed by applicants, particularly where conditions required expenditure by projects that was outside the works to be funded by the GHNF Transition Scheme grant or which reduced flexibility around how they carried out work.

> *"We have to fund that ourselves. So, it was a condition of the grant that we pay for it basically. [..] Which was a shame because it's really expensive." (Transition Scheme applicant)*

Outcome

Applicants reported that going through the GHNF Transition Scheme application process meant that the eventual GHNF Main Scheme application would be easier, because most of the information had already been assembled.

> *"I suppose the reality is that the full application, you know the actual physical application is very similar to the to the transition application and so we've done a lot of the work. And a lot of the evidence that we provided for this transition application which felt like a lot of paperwork to provide for £Yk of grant funding, actually [was] still relevant for the subsequence scheme or if not relevant, we could just update it. And so [..] relatively speaking that that sort of subsequent phase of work was then quite straightforward and it would have been a much more daunting prospect to have come at this sort of completely afresh." (Transition Scheme applicant)*

One GHNF Transition Scheme applicant was subsequently successful in applying for a GHNF Main Scheme grant, and another was awaiting the outcome of a bid. The successful applicant attributed their success partly to their project having reached the appropriate stage for GHNF Main Scheme support and partly to their learning from the GHNF Transition Scheme application process.

Contexts

CMOB 4 was observed in multiple cases, for both successful and unsuccessful applicants to the Transition Scheme, where:

- Project teams planned to apply to the GHNF Main Scheme in addition to the GHNF Transition Scheme.

This mechanism was particularly strong in cases where BEIS had imposed Grant Conditions which had to be met in advance of any application for GHNF Main Scheme funding, or where BEIS had asked clarification questions about the initial GHNF Transition Scheme application.

Conclusion

Key findings from realist analysis about **reasons for applications** being made to the GHNF Transition Scheme were that:

- The GHNF Transition Scheme did not, in itself cause applicants to switch from proposing a fossil-fuel-powered heat network scheme to a low carbon heat network

scheme. Applicants had made the decision to progress a low carbon heat network scheme at an earlier stage, driven by a number of factors including their organisation's Net Zero ambitions and supportive planning policies. There was some limited evidence that HNIP rules about pathways to decarbonisation, and the general availability of future funding for low carbon heat networks, had contributed to these earlier decisions.

- The GHNF Transition Scheme led to a number of projects applying to undertake commercialisation work earlier than they otherwise would, where they would not have had access to other commercialisation funding within the next 12 months.
- For GHNF Transition Scheme projects where other commercialisation funding might have been available (from internal or external sources), there were still advantages to Government grant funding that motivated project teams to apply.

Key findings from realist analysis of **the benefits of commercialisation activity and scheme participation** for GHNF Transition Scheme participants were that:

- All GHNF Transition Scheme participants were able to progress their commercialisation work, to some degree, through GHNF Transition Scheme-funded activities. This reduced project uncertainties and helped them to progress towards a final investment decision. However, further commercialisation work was needed in all cases to reach a final decision. This was particularly marked in those cases where GHNF Transition Scheme funds were only part-spent because of timing constraints.
- All GHNF Transition Scheme participants reported that being successful in winning funding had, or would, play a role in building the credibility of their scheme with project stakeholders (internal or external). This was because the stakeholders trusted that the scheme had been thoroughly assessed by BEIS.

  GHNF Transition Scheme participants also reported that they developed capability and knowledge about low carbon heat networks through their involvement in the scheme (except in cases where participants had a negative perception of the scheme and believed they could have funded at least some of the commercialisation works by another route). Where GHNF TS participants had less in-house expertise and experience in delivering low carbon heat networks, this was achieved primarily through learning from external consultants involved in the application or commercialisation process. In the case of those with high levels of in-house expertise and experience in this field, and also in other cases, it was achieved through signposting and networking provided by BEIS project staff.

In addition to these benefits for GHNF Transition Scheme participants, there was evidence of the application process helping applicants (whether successful or not) to gain experience and gather information that would support an eventual GHNF Main Scheme application. Where BEIS had issued clarification questions on a GHNF Transition Scheme bid, or imposed conditions on a grant, meeting these requirements was expected to help applicants make successful applications to the GHNF Main Scheme. One GHNF Transition Scheme applicant had already been successful in obtaining GHNF Main Scheme funding at the time of the research.

This publication is available from: www.gov.uk/government/publications/evaluation-of-the-green-heat-network-fund-ghnf-transition-scheme

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