



Department for
Business, Energy
& Industrial Strategy

EVALUATION OF THE HEAT NETWORKS DELIVERY UNIT

Wave 2: Final Report

April 2018

Contents

Executive Summary	2
Research questions and rationale	2
Research methodology	3
Summary of key findings	4
1. Introduction	9
Background to the Heat Networks Delivery Unit (HNDU)	9
Aims of the research	11
2. Methodology and Sample	14
Research methodology	14
Limitations of the research design	18
3. Findings	20
RA1: How, in what circumstances and to what extent does HNDU guidance impact on local authorities?	20
RA2: How are local authorities evaluating potential funding sources and commercial structures?	35
RA3 How can local authorities best engage with stakeholders to support the development of the heat network scheme?	42
Appendices	55
Appendix A: Example Topic Guides	55
Appendix B: Approach to sampling	68
Appendix C. Research Area 1: CMO Framework	72
Appendix D: Review of HNDU supported and non-HNDU supported feasibility studies	78

Executive Summary

This executive summary describes the key findings from a second and final wave of research undertaken by CAG Consultants to evaluate the Heat Networks Delivery Unit (HNDU).

The Heat Networks Delivery Unit (HNDU) was established in 2013 to support local authorities in England and Wales in the development of heat networks¹. The overarching aim of the HNDU is to facilitate and accelerate the development of new schemes and the extension of existing networks. HNDU supported authorities have access to a range of guidance that includes: one-to-one support (delivered face-to-face and remotely via email, telephone) provided by an HNDU lead project officer; written guidance; events; and the provision of a dedicated online sharing platform (Huddle)², through which HNDU-supported authorities and HNDU can exchange information and advice.

Research questions and rationale

The research was commissioned to provide an independent evaluation of the scheme and to inform the ongoing development of the HNDU. The Wave 2 evaluation was developed to extend and deepen the insight generated in Wave 1³; below are the three main research areas (RA) explored through this research and the rationale for each.

1. RA1: How, in what circumstances and to what extent does HNDU guidance impact on local authorities?

The Wave 1 evaluation concluded that HNDU guidance was effective in helping local authorities to take forward their work on heat networks. RA1 was designed to gain a better understanding of how different elements of the HNDU guidance were working by exploring how the HNDU guidance is working, for which local authorities and under what circumstances. By interviewing a range of stakeholders, the findings provide a useful insight into a diverse range of views and experiences of those engaging with the HNDU, and will be of value in the future development of the HNDU and related policies, and in

¹ A heat network is a set of pipes that take thermal energy in the form of steam, hot water or chilled liquids from a central source to supply heating, cooling or hot water to a number of domestic or non-domestic buildings.

² <https://www.huddle.com>

³ Evaluation of the Heat Networks Delivery Unit (2015) DECC

identifying and refining future research activity. The findings have and will continue to inform the HNDU team with on-going guidance offer and future decisions regarding targeting policy.

2. RA2: How are local authorities evaluating potential funding sources and commercial structures?

RA2 was designed to develop a richer understanding of local authority decision-making processes regarding funding and the choice of commercial structure, and the key factors that inform their choice. The findings from RA2 have provided an insight into the types of projects that may engage with the Heat Networks Investment Programme (HNIP) pilot⁴ or main scheme.

3. RA3: How can local authorities best engage with stakeholders to support the development of the heat network scheme?

RA3 was designed to develop a richer understanding of the types of stakeholders that local authorities engaged with, and to gain more detail on barriers and challenges to engagement as identified in wave 1 through interviewing local authorities and potential heat network partners. RA3 findings have and will continue to inform HNDU activity on stakeholder engagement.

Research methodology

Wave 2 research was qualitative and involved conducting semi-structured interviews with 12 HNDU-supported local authorities for RA1, and 10 in RA2/3, 6 consultancies (RA1), 6 HNDU staff (RA1), 4 NHS Trusts and 6 housing developers (both RA3). Interviews were conducted between May and July 2016

A 'realist' approach⁵ was adopted for RA1, to better understand the ways in which HNDU guidance is affected by the differing circumstances that may apply in different authorities.⁶ Interviews were analysed using a case study approach, triangulating evidence from different sources; interviews with local authorities, consultants, the HNDU lead, and associated documents (e.g. feasibility studies). As the research was qualitative, the reported views and experiences of interviewees cannot be considered representative of those held by the wider populations from which the samples were drawn.

⁴ HNIP is a UK Government (operating in England and Wales) capital support programme for new heat network developments. The pilot scheme ran between October 2016 – March 2017. See <https://www.gov.uk/government/publications/heat-networks-investment-project-hnip>

⁵ Interviews for RA1 analysed using realist methods, but not RA2 and RA3.

⁶ Realist approaches assume that no form of intervention works the same way for everyone. Consequently, a realist evaluation focuses on what works for whom, how and under what circumstances.

Summary of key findings

This section summarises the key findings from the Wave 2 evaluation; further details are provided in the main report.

Research Area 1 (RA1): How, in what circumstances and to what extent does HNDU guidance impact on local authorities?

Local authorities and HNDU project leads reported that HNDU provided guidance in a flexible format to allow for variation in the needs and circumstances of the local authorities. These needs can be dynamic, changing over time, as personnel change or the local authority reaches different stages of heat network development.

The case studies highlighted that HNDU guidance worked well as a flexible package in building local authority capability on heat network. Local authority officer felt that one-to-one support was a particularly important part of this package, with the other elements - written guidance, events and huddle - used to enhance this support as appropriate. Furthermore, these elements did not function in isolation; local authorities provided examples highlighting that they could be more effective when combined. Interviews with local authority and HNDU project leads also highlighted that offering a range of different guidance elements enabled HNDU to be adaptable to the often differing circumstances of local authorities.

Interviews with all stakeholder types found that HNDU guidance had triggered improvements – to different extents - in local authority capability on heat networks, and in the perceived quality of the heat network studies. These improvements happened in five main ways; see table A for descriptions and examples.

Table A. ‘Mechanisms’ through which HNDU guidance achieved change, with examples

Improvement type (mechanisms)	Example
‘ Capability-building ’; building skills and knowledge directly	A HNDU project lead providing information directly to a local authority officer
‘ Capability-facilitation ’; enabling local authority officers to ‘self-learn’	Through the provision of ‘learning tools’ like written guidance
‘ Enabling peer networking ’; enabling collaborative learning	HNDU supporting local authorities to share experiences with each other

‘Cheerleading’; enabling local authority officers to maintain momentum on projects

A HNDU project lead regularly ‘checking-in’ on a local authority officer to discuss progress

‘Independent critiquing’; enabling local authorities to engage more effectively with consultants

A HNDU providing a local authority officer suggestions about questions to ask the consultants

The case study interviews demonstrated that in cases where the HNDU guidance was successful in improving local authority capability, guidance was: based on sound technical expertise; relevant and timely in relation to the local authority’s current and anticipated work on heat networks; and pitched at the right level for the expertise and needs of the local authority officer and the local authority as a whole. In particular, the research found that HNDU project leads required good interpersonal skills, (e.g. being approachable, available and proactive), to enable one-to-one guidance to be effective in delivering improvements in local authority capability.

Local authority officers who had lower levels of heat network expertise, lacked time, had low levels of internal support within their local authority and/or had high levels of enthusiasm, were more likely to want higher levels of HNDU guidance. In general, the HNDU seemed to match the levels of support that the local authorities felt they needed. In cases where a local authority had an existing external source of in-depth technical support on heat networks, the local authority did not require as much guidance from the HNDU, and therefore the HNDU’s intervention had less of an impact in improving the capability of the local authority.

Local authorities put forward the view that they will require greater levels of support as they move through to detailed project development and towards commercialisation. They expressed concerns that HNDU project leads appeared to becoming increasingly stretched and saw this as something which could impact on the effectiveness of future HNDU guidance.

Research Area 2 (RA2): How are local authorities evaluating potential funding sources and commercial structures?

For the local authorities interviewed, projected rate of return on investment (ROI) was the most important factor in determining whether or not to proceed with a heat network development (projects need to be considered financially viable). The ROI also played a key role in decisions around funding sources, and choice of operating models.

The main ownership and operating models considered by local authority interviewees included ownership of the distribution system only⁷, ownership and operation of a heat network, and commercial partnership/contracting arrangements (joint ventures) with private sector bodies.

Most respondents had not yet confirmed their source of funding, but reported having access to a range of potential internal funding sources (e.g. Public Works Loan Board and capital reserves), and external funding sources (e.g. EU funding). Private finance was recognised as another potential source of investment, but only where projects offered sufficiently attractive ROIs.

Local authority interviewees, who were considering investing in a heat network, reported being prepared to accept ROIs in the range of 4-10%, with the final figure being dependent upon their operational context. In contrast some local authorities' reported that their experience was that private sector investors required a higher ROI - something that they suggested made it difficult to attract, or retain private sector interest in some schemes.

Some local authorities reported a willingness to accept a lower ROI (than might otherwise be the case) in the presence of strategic drivers, e.g. where a heat network contributed to their ability to realise economic development objectives. In contrast local authorities whose primary driver was income generation placed more emphasis on higher ROIs. Irrespective of their drivers, local authority respondents expressed concerns about the perceived riskiness of heat network projects and noted that this would be likely to raise the level of what their organisation would consider an acceptable ROI.

The level of project ROI was reported as being an important factor in determining local authority choice of ownership and operating models. In some instances local authority interviewees reported that they had not originally intended to invest in a scheme, but were now considering this because they had been unable to attract private sector interest, or had agreed to invest in order to ensure the engagement of key stakeholders. Other local authority interviewees noted that income generation either was, or had become, their primary driver and reported that this increased the likelihood of their investing in a development (as an owner operator or via a joint venture).

Sensitivity to risk was identified as being likely to play a major role in determining final choices regarding ownership and operating models, and finance. Joint ventures, facilitated through a blended funding approach to improve ROI, were reported as a key option for mitigating risk, through the sharing of risk and the importation of private sector expertise. Some interviewees reported that they were considering blending internal and external

⁷ The network of pipes that serve to transfer heat between end users. Ownership of the distribution system, the so-called pipe-co option, separates the function of heat capture or generation from heat transfer.

sources of finance in order to improve the ROI of a project (by reducing the overall costs of scheme finance) with a view to securing a private sector partner.

Research Area 3 (RA3): How can local authorities best engage with stakeholders to support the development of the heat network scheme?

Local authority interviewees reported dealing with a wide range of external stakeholders. Locally based, public sector stakeholders were identified as being the easiest group to deal with, owing to familiarity and established patterns of joint working. Local authorities reported mixed experiences of local private sector stakeholders. The most challenging groups for local authorities were organisations (both public and private) with head offices outside of the local authority area and, more specifically, housing developers.

Local authority interviewees reported a range of barriers to engaging with housing developers, including; a general lack of interest (e.g. perception that heat networks present additional complexity and risk); housing developers raising technical challenges that local authority interviewees felt ill equipped to respond to⁸; authorities lacking sufficient leverage to secure commitment from housing developers, and were reluctant to impose conditions in case the developers choose to go elsewhere.

Several local authority interviewees involved in complex multi-site schemes reported strategic stakeholders dropping out of proposed schemes caused disruption to the scheduling of schemes. These changes were generally the result of issues outside of the stakeholder's control (e.g. a reduction in or loss of access to finance). Other reported barriers included: stakeholders losing interest; and difficulties in securing access to data from potential customers on heat demand and current costs.

Housing developer interviewees reported that planning obligations were their main (and for some the only) driver for involvement in heat network projects. Heat networks were reported as being an appropriate option for high-density communal schemes and mixed developments (commercial and domestic). But concerns were reported about their role in small-scale, low-density, housing-only schemes. Specific concerns included: potential risk of higher consumer costs; doubts about their ability to deliver carbon reduction; uncertainty of long-term management and maintenance; and the difficulties of reconciling housing development timeframes with district heating developments.

Housing developer interviewees reported mixed experiences of engaging with local authorities⁹. Where engagement had been found to be effective and constructive, this was attributed to the local authority having been open to discussing developers' concerns and being prepared to be flexible.

⁸ Interviewees didn't provide specific examples.

⁹ The local authorities referenced were more than likely receiving support from the HNDU, but we cannot be certain, as this was not sampling criteria.

The NHS interviewees reported being familiar with the concept of heat networks, either through previous employment or because they had experience of existing or proposed combined heat and power (CHP) schemes on their own sites. They reported being receptive to the possibility of connecting on-site facilities to district heat networks, with the main driver of interest being the potential financial and, to a lesser extent, environmental benefits for their Trust. Key concerns were; the need to ensure that sites served by heat networks could guarantee continuity of supply (heat and hot water), and the challenge of aligning the scheduling of NHS site-based activity, with district heat network schemes.

All NHS interviewees had prior contact with local authorities regarding heat networks and reported that this had been constructive. Concerns included a lack of obvious progress and the protracted nature of discussions. NHS interviewees noted a willingness to continue dialogue, but flagged concerns about access to finance within their Trust and the restrictions this might place on their future involvement.

Both local authority and housing developer interviewees stressed the value of early engagement with stakeholders and the value of involving external experts. Housing developer interviewees felt the latter to be necessary as they felt there was a lack of expertise within their sector and often with the council officers they dealt with (usually planners). Although challenges weren't always resolved, local authority interviewees provided additional advice on how to engage, such as; be clear on the potential benefits of heat network schemes; early involvement of senior staff to demonstrate scheme credentials; establish clear and regular lines of communication between the project lead and other stakeholders.

1. Introduction

In September 2014 CAG Consultants were commissioned by the former Department of Energy and Climate Change (now the Department for Business, Energy and Industrial Strategy, BEIS) to evaluate the Heat Networks Delivery Unit (HNDU). The evaluation consisted of two waves of research activity each culminating in the production of a final report. This document constitutes the final report for Wave 2 of the evaluation; it was preceded by an interim Wave 1 evaluation report (August 2015).¹⁰

Background to the Heat Networks Delivery Unit (HNDU)

The HNDU was established in 2013 to support local authorities exploring heat network opportunities and to address identified¹¹ capability and capacity issues faced by local authorities when developing heat networks. The HNDU aims to facilitate an acceleration and expansion of technically and economically optimised heat network schemes within England and Wales. The establishment of the HNDU was one of a number of initiatives announced in the March 2013 document ‘The future of heating: meeting the challenge’¹² and forms part of the government’s strategy for decarbonising heat.

The HNDU is a specialist unit within BEIS, composed of both technical and commercial experts, with a wealth of experience in developing heat networks. The unit provides support in the form of grant funding and guidance to local authorities. Local authorities can apply to the HNDU for guidance only, or for a combination of grant funding and guidance.¹³ Successful applicants are assigned an HNDU ‘project lead’ and these individuals provide a ‘critical friend’ function for the duration of the applicant’s engagement with the unit.

What is HNDU guidance?

HNDU guidance encompasses a flexible package of guidance consisting of four main elements, described in Table 1.1 below. The exact nature of the guidance offered, and how it is provided, differs depending on the needs of the local authority.

¹⁰ DECC (2015), Evaluation of the Heat Networks Delivery Unit, DECC. Available at:

<https://www.gov.uk/government/publications/evaluation-of-the-heat-networks-delivery-unit>

¹¹ DECC (2013), Research into barriers to deployment of district heating. DECC. Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191542/Barriers_to_deployment_of_district_heating_networks_2204.pdf

¹² DECC (2013) The future of heating: meeting the challenge. Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/190149/16_04-DECC_The_Future_of_Heating_Accessible-10.pdf

¹³ All local authorities awarded grant funding from the HNDU receive guidance from the HNDU team.

Table 1.1 Description of HNDU guidance elements¹⁴

Guidance type	Description	Example(s)
One-to-one support	Direct support provided to a local authority by its assigned HNDU project lead. HNDU project leads are technical and commercial experts with practical experience of heat network development, and their role is to act as a critical friend. This involves both face-to-face support and 'remote' support provided through email, telephone and text message.	Face-to-face: attendance at key meetings during all the stages of development and early commercialisation (e.g. progress meetings with consultants). Remote support: written comments on draft specifications and draft reports.
Written guidance	Written guidance developed by the HNDU on various aspects of the heat network development journey. HNDU provide written guidance on tender specifications for all stages of heat networks, guidance on calculating social Net Present Value (NPV) and types of Internal Rate of Return (IRR). They also provide guidance on what heat networks are, how local authorities can apply for funding and how to complete metric templates. The main piece of guidance used by local authorities at the time of research was guidance on the development of feasibility study specifications.	Written guidance on tender specs for early stages of heat networks development, guidance on calculating social NPV and types of IRR, as well as a heat networks business case template.
Events	HNDU-delivered events, held to provide support to local authorities on the heat network development journey and to promote networking and training opportunities.	Technical information and guidance events, networking events, consultation events, training days (e.g. topic specific events on specific technology types and tailored training on the CIBSE Code of Practice).
Huddle	An online sharing platform used by the HNDU to share documents both privately and publically. It is designed to encourage HNDU-supported local authorities to share their knowledge and experiences with each other. ¹⁵	Technical documents, discussion topic threads on various aspects of heat networks development

Other forms of HNDU guidance - such as detailed guidance on the required information needed to produce an outline business case - were available at the time of the research, but these were not available to the interviewed authorities during the activity stages that the research focused on.

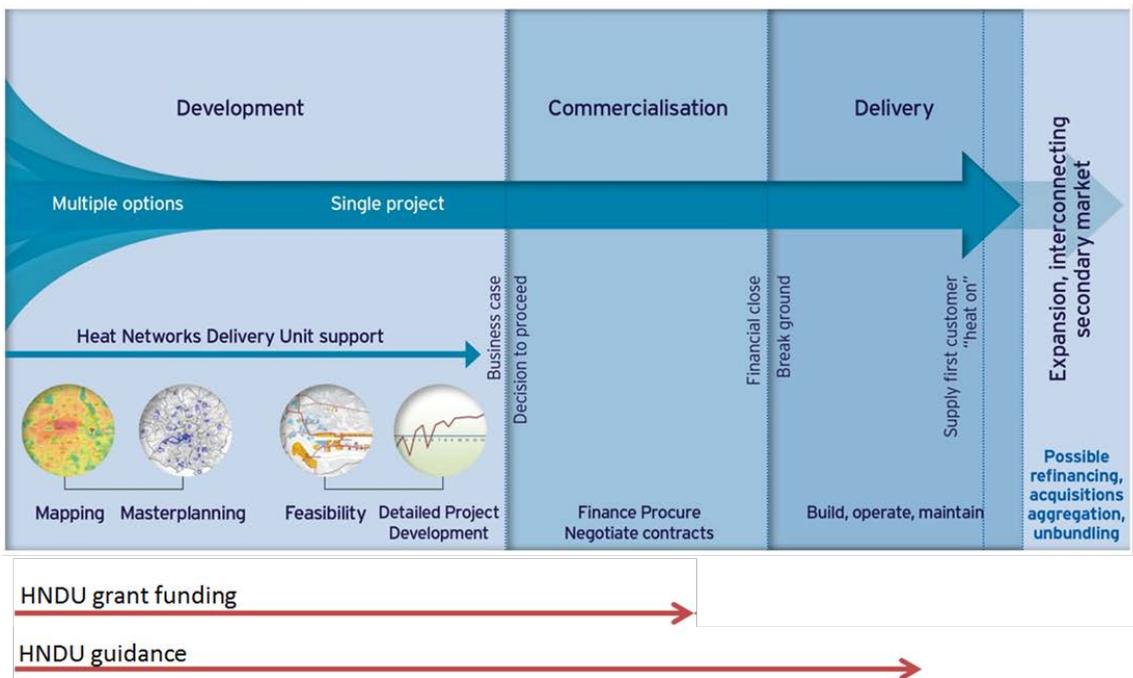
¹⁴ The guidance outlined in this table is reflective of the guidance available at time of interviewing local authorities (interviews conducted June-July 2016).

¹⁵ <https://www.huddle.com>

The aim of HNDU guidance

The aim of the guidance provided by the HNDU is to enable local authorities to progress through the development stage of the heat networks journey; i.e. mapping, energy masterplanning, feasibility, detailed project development and early commercialisation stages (see Figure 1.1).

Figure 1.1: The heat network journey¹⁶



Aims of the research

An independent evaluation of the HNDU was commissioned to provide to learning from the scheme so far, and inform the ongoing development of the HNDU. The evaluation consisted of two waves; the aim of Wave 2 was to extend and deepen the insight generated in Wave 1. Below are the three main research areas (RA) and rationale for this report.

Research Area 1 (RA1): How, in what circumstances and to what extent does HNDU guidance impact on local authorities?

The first wave of research identified the importance of HNDU guidance in enabling supported local authorities to proceed along their heat network journey, but offered limited insight into 'how' the guidance worked. RA1 was designed to address this and specifically explored the questions of how HNDU guidance is working, for what local authorities and under what circumstances. Sub-questions researched as part of RA1 included:

¹⁶ Source: Heat Networks Delivery Unit.

-
- What were the different elements of guidance support received by local authorities and their level of perceived quality and impact?
 - Which are the most valued elements of HNDU guidance support and how have they helped supported authorities?
 - Are there elements of guidance support that are less important?
 - What are the perceptions of local authorities on the frequency of the different methods of guidance support? Is the amount sufficient or would they have liked more/less?
 - Can the guidance support be delivered more effectively (in terms of value to the recipient and cost effectiveness) or through alternative delivery mechanisms? *(Including HNDU support and delivery mechanisms outside of HNDU).*

RA1 research has and will continue to provide learning as to how HNDU is or isn't working for particular local authorities, and to inform the on-going delivery of HNDU guidance and future decisions on HNDU and related policies.

Research Area 2 (RA2): How are local authorities evaluating potential funding sources and commercial structures?

Wave 1 research found that most HNDU supported local authorities had not progressed to making decisions about funding and commercial structures. Therefore RA2 was designed to develop a richer understanding of local authority decision-making processes (regarding funding and the choice of commercial structure) and the key factors which inform their choice. Sub-questions researched as part of RA2 included:

- What frames local authority decisions on whether to proceed with a project?
- What types/range of ownership/operating model options and funding sources do local authorities consider? How are local authorities making their decisions? Including:
 - High-level issues framing their choices (e.g. wider strategic considerations and/or benefits)
 - The perceived advantages and disadvantages of the different ownership/operating models considered
 - Considerations around potential exit strategies (if relevant)

The findings from RA2 have and will continue to provide an insight into how local authorities are making decisions, and more specifically to provide context of the types of

projects that may come forward for the Heat Networks Investment Programme (HNIP) pilot and main scheme.

Research Area 3 (RA3): How can local authorities best engage with stakeholders to support the development of heat network schemes?

The Wave 1 research identified the important role that external stakeholders play in local authority led heat network developments, and identified housing developers and NHS Trusts as being particularly challenging groups to engage. Subsequently the issue of stakeholder engagement was explored through a workshop, involving local authorities and external stakeholders, in October 2015. Stakeholders involved in the workshop noted the current lack of evidence and best practice on how to establish and manage stakeholder relationships. RA3 was designed to develop a richer understanding of the types of stakeholders that local authorities engaged with, and for local authorities and relevant stakeholders to provide views on how best to avoid and resolve challenges. Sub-questions researched as part of RA3 included:

- Who are the most significant/challenging stakeholders who play a significant part in determining the success of HNDU-supported heat networks? And what role do they play in the local authorities' current project(s)?
- What are the biggest barriers involved in working with these key stakeholders and when do/will they occur?
 - How have/will these barriers been overcome, if at all?
 - If local authorities have not experienced particular issues, do they envisage potential barriers occurring? And why/when?
- What can we understand about the context and experience of key stakeholders, to appreciate the drivers and barriers to engagement (e.g. issues with the stakeholders or local authorities in engaging)?
 - Do the local authorities know how to engage with the stakeholders?
 - Can the local authorities identify what the barriers are for the stakeholders (from the stakeholder perspective)?
 - What needs to happen/change for local authorities to be able to engage more effectively with key stakeholders and overcome barriers?
- What has worked well in engaging with stakeholders? Do the local authorities have any advice or good practice to share with other local authorities?

RA3 findings have and will continue to provide learning as to what is and isn't working in terms of stakeholder engagement, and therefore to inform future related policy decisions.

2. Methodology and Sample

Research methodology

The research approach for the Wave 2 evaluation was co-developed by CAG Consultants and BEIS research staff. RA1 had an evaluative focus, whilst RA2 and RA3 provided more of an insight and learning for the HNDU and related policies. A series of semi-structured interviews were conducted with local authorities, HNDU staff, consultancies, NHS Trust staff and housing developers (see appendix B for sampling criteria). Interview topic guides were developed for the purposes of this research (see Appendix A).

RA1 research approach

The focus of the RA1 research is on understanding ‘how’, for whom and under what circumstances the HNDU guidance works and as such should be regarded as a process evaluation. Wave 1 found that HNDU guidance was successful in enabling supported local authorities to proceed along their heat network journey, but offered limited insight into ‘how’ the guidance worked; a realist approach was adopted to explore this in more depth.

The research included in-depth semi-structured qualitative interview with local authorities, consultancies involved in delivering HNDU funded studies and HNDU staff involved in the delivery of guidance. The inclusion of non-local authority staff was intended to gain a deeper understanding of the context of each local authority, and to secure the views of those providing support to local authorities of how the effectiveness of this support was affected by the specific circumstances of the supported authority.

Realist approach

A theoretical realist framework was retrospectively developed during the analysis stage to explain the ways in which the different elements of HNDU guidance (face-to-face meetings, remote support, events, written guidance and huddle) impact upon recipients and in what circumstances; see appendix C for further details

A realist framework consists of: (a) the contexts (e.g. of the local authority/ local authority officer); (b) the mechanism (the reasoning in response to the intervention), which may or may not fire given certain contexts; and (c) the outcome(s) as a result of the intervention (either intended or unintended). The mechanisms of an intervention will only generate the desired outcomes in particular circumstances. Collectively, these are referred to as ‘CMO configurations’.

RA2 and RA3 research approach

RA2 and RA3 were designed to provide a deeper understanding of how local authorities are making decisions on heat network development to inform the HNDU and related

policies. Additional research included a review of eight HNDU supported feasibility studies and six feasibility studies produced prior to the establishment of the HNDU. Qualitative research was identified as being the most effective means of securing the range of experiences and depth of insight to inform policy decisions.

Sampling

The research included 25 semi-structured interviews (see table 2.1) and a review of 12 heat network feasibility studies to compare with interview responses. For RA1, 12 local authority case studies were conducted. Eight case studies involved local authorities that had completed HNDU-supported feasibility studies. The remaining four were with local authorities whose HNDU-funded feasibility studies were in progress.

Six of these case studies were ‘in-depth’, involving interviews with three separate individuals for: the local authority lead officer, the HNDU project lead and the lead consultant undertaking the feasibility study. An officer from a local enterprise partnership (LEP) was also interviewed for one of the case studies, as they were providing heat network development support to the local authority. The inclusion of multiple actors for each case study allowed for individual responses to be triangulated against the views of at least two other interviewees.

The remaining six supplementary case studies featured the relevant local authority officer only. These were introduced to bring the total number of local authority interviews to twelve, in order to ensure the research was based on a more diverse range of local authority experiences.

Table 2.1 RA1 sampling frame

Sample group	Sample Criteria	‘In-depth’ case study interviews ¹⁷	‘Supplementary’ case study interviews
Local authorities with completed feasibility study	BEIS has submitted feasibility study to CAG; feasibility study is a final version; local authority has <u>not</u> said they are ‘already proceeding’ in the screening survey	4 in-depth case studies: <ul style="list-style-type: none"> • 4 local authority leads • 4 consultants • 4 HNDU project leads • 1 Local Enterprise Partnership 	<ul style="list-style-type: none"> • 4 Local authority leads

¹⁷ For the local authority case studies, consultants and HNDU representatives were interviewed in relation to specific LA feasibility studies. Consultants had produced (or were producing) a feasibility study for the local authority being interviewed, and HNDU project leads had provided support to the local authority.

Local authorities with feasibility <u>in progress</u>	Data provided by BEIS suggest feasibility study is in progress; local authority has <u>not</u> said they are 'already proceeding' in the screening survey; local authority needs to pass screening	2 in-depth case studies: <ul style="list-style-type: none"> • 2 local authority leads • 2 consultants • 2 HNDU project leads 	<ul style="list-style-type: none"> • 2 local authority leads
--	--	--	---

The sampling aim was to interview eight local authorities interviewed who had completed an HNDU-funded feasibility study and for whom CAG could access the feasibility study for review. The other four local authority interviews would be with local authorities whose feasibility studies were in progress. Local authorities were purposively selected to ensure some diversity across factors such as local authority type, geography, urban/rural location, HNDU project lead, consultancy, etc. In practice, however, it was not possible to sample local authorities on these factors due to the limited population (see 'Limitations' section below).

Feasibility study assessments

The research also included an assessment of the feasibility studies against a set of quality criteria¹⁸, to assess whether the impacts of any issues identified in the interviews, were highlighted in the reports.

An additional six feasibility studies, commissioned by local authorities and completed prior to the existence of the HNDU were reviewed. The aim of this was to provide a comparison, and assess whether studies undertaken prior to the establishment of the HNDU were significantly different in quality or scope from those undertaken with HNDU support. In practice it proved impossible to secure the sample of documents required for this analysis to be completed. In addition the variable nature of the documents that were supplied to the researchers (not all documents were complete, some were still in draft form and overall there was significant variation in scope) meant that meaningful comparisons were not possible (see Appendix 4 for further details).

Analysis

Interviews were recorded and transcribed where interviewees permitted. Transcripts were coded using Excel and Nvivo software, and were analysed using a form of 'template analysis'. A coding template was produced prior to analysis, where the research team identified important themes.

Key research themes focused on the main research questions, and included prominent themes following an initial review of the interview transcripts. A set of codes was produced to enable the identification of potential context-mechanism-outcome (CMO) configurations during the coding and analysis process.

¹⁸ This quality criterion is used in-house by the HNDU, when assessing feasibility studies.

The analysis was carried out at a case study level first; individual CMO hypotheses were developed iteratively for each local authority, and were cross-checked against the findings from the feasibility study assessments. A meta-analysis was then conducted, bringing together the findings from local authority case study, resulting in the development of an overall CMO framework (see Appendix C).

RA2 and RA3 research

The aim of RA2 was to investigate how local authorities make choices regarding the financing of heat network projects and the type of business model. RA3 aimed to explore the issues of stakeholder engagement identified in wave 1, and included interviews with local authorities and with two key stakeholder groups (NHS Trusts and Housing Developers).

CAG undertook a screening survey with HNDU-supported local authorities to identify local authorities suitable for the RA2 and RA3 research and local authorities that were willing to help source potential NHS and housing developer organisations for the research. To answer RA2 and RA3, 10 semi-structured interviews were conducted with local authorities who were identified as nearing the end of the ‘development stage’ (see figure 1.1) and who indicated in the screener survey that they had completed a feasibility study. Local authorities ‘proceeding with heat networks’ were included in the initial sample frame, but were later removed¹⁹. Semi-structured interviews were also conducted with six housing developers and four NHS Trusts to inform RA3.

Table 2.2 RA2 and RA3 sampling frame

Sample group	Criteria	Number of interviews
Local authorities (11 local authorities were identified in the screener survey, 10 were interviewed)	planned to proceed to the detailed project development stage (but were not yet in process of doing so).	6
	considering whether to proceed to the detailed project development stage	2
	not proceeding with the development of a heat network, despite it being technically feasible and economically viable.	1
	not proceeding with the development of a heat network, because it was not technically feasible or economically viable.	1

¹⁹ Local authorities ‘proceeding with heat network development’ were excluded from the final sample frame due to the anticipation of involvement in research for the Heat Networks Investment Project (HNIP).

NHS Organisations	Contacts provided by local authorities interviewed; sought a range of different organisational types (e.g. different sizes, locations, etc.)	4
Housing developers		6

All interviews were conducted by CAG researchers; examples of the topic guides used can be found in Appendix A.

Analysis

Interviews were recorded and transcribed where interviewees allowed. Transcripts were then analysed using Nvivo software, and coded against the key research areas and sub-questions. Where relevant, additional insight from other sources, e.g. internal council papers, were also included and coded²⁰.

Limitations of the research design

As with all qualitative research the reported views and experiences of interviewees may not be representative of those held by the wider populations from which the samples were drawn. Whilst it is possible to generate reliable data from a small sample size it should not be assumed that findings will translate to the wider population, or that the full range of views and experiences will have been captured. In the case of this study the small number of interviews conducted with NHS Trusts and housing developers, relative to the total population size, means that the findings should be treated with some caution.

The findings provide an idea of the range and diversity of views and experiences of those interviewed, but may not represent the views of the population, particularly for the housing developer and NHS Trusts. In practice the number of interviews was dictated by the availability and accessibility of potential interviewees. Other challenges encountered during the course of the research are described below:

RA1 research challenges

- The sample population of eligible local authorities for RA1 proved to be much more limited than expected. The initial intention was to interview eight local authorities that had recently completed HNDU-funded feasibility studies with these being selected from a larger population, in practice the HNDU were only able to provide eight studies to the research team.
- The initial aim to inform RA1 was to review HNDU supported feasibility studies with similar studies undertaken before the advent of HNDU. In practice it proved difficult to secure comparable studies, and wide variations in the nature and scope of the

²⁰ This activity served mainly to confirm the views expressed in the local authority interviews, rather than generating additional insight.

studies meant that findings could not be drawn from them.

RA2 and RA3 research limitations

- There is a possibility of self-selection bias with the NHS and housing developer sample. Identifying and engaging with potential interviewees from these two populations was challenging and precluded purposive sampling. Some individuals may have chosen to participate in order to communicate a particular viewpoint which may not be representative of the wider population.
- In the Wave 1 research we were unable to identify any local authorities that were developing heat networks without HNDU support and so were unable to include a comparator group.
- For RA2 and RA3, it was originally intended that local authority participants would have completed a feasibility study, and would be purposively selected based on the stage of development. Removing those 'proceeding with heat network development' from the final sample frame²¹ left a small sample population of 11 local authorities. All of which were approached for interview, and 10 agreed to be interviewed (see table 2.2 for details).
- In addition, those classifying themselves as planning to proceed in most cases had yet to make a final commitment to proceed and key decisions regarding sources of funding and the anticipated operational model had not yet been made. As such the findings generally report the factors expected to inform decisions, rather than the factors which had informed decisions.
- The interviews found that most of the local authorities interviewed were planning to progress with their heat network, and only two were not. This could mean there is a bias in the findings towards local authorities with a more positive outlook towards heat network development.

²¹ This group were removed due to the anticipation of them being included in the sample frame for the heat networks investment project (HNIP) evaluation, and therefore anticipated respondent burden/fatigue.

3. Findings

This section describes the key research findings in relation to each of the three research areas.

RA1: How, in what circumstances and to what extent does HNDU guidance impact on local authorities?

This section presents our findings on the types of outcomes HNDU guidance was found to deliver, and an in-depth exploration of how, and under what circumstances, HNDU guidance contributes to these outcomes. It concludes by considering the value that local authorities place on HNDU guidance, and with local authority suggestions for improvements.

The findings are based on 25 qualitative interviews with officers from HNDU-supported local authorities, HNDU project leads and consultants delivering HNDU-funded feasibility studies (see Section 2 for more details of the sample population). A realist approach was used for RA1, to identify: (a) the contexts (e.g. for the local authority local authority officer); (b) the mechanism (the reasoning in response to the intervention), which may or may not fire given certain contexts; and (c) the outcome(s) as a result of the intervention (either intended or unintended). The mechanisms of an intervention will only generate the desired outcomes in particular circumstances. The RA1 findings are presented in a way to reflect this approach²².

What outcomes did HNDU guidance contribute to?

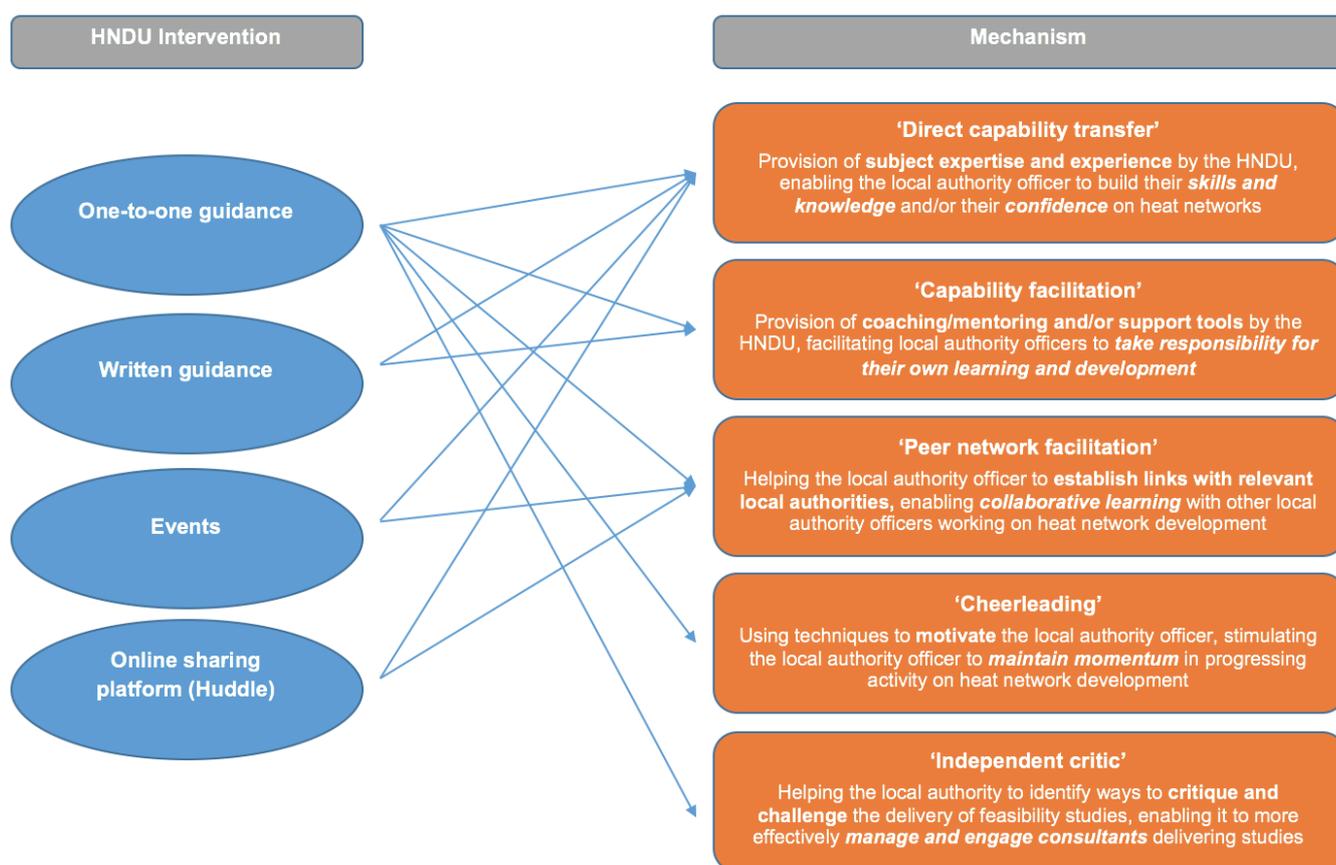
Interviewees highlighted that, when HNDU was successful, the primary outcomes were improved local authority officer capability to progress heat network development and improvements in the quality and comprehensiveness of heat network studies (e.g. feasibility studies). Occasionally, these led to a number of different secondary outcomes, including improvements in organisational capability on heat network development within a local authority, or increased senior-level buy-in.

²² The analysis involved a process of ‘theory-building’ i.e. the CMO configurations were developed ‘bottom-up’ from the interview findings. This is different to many realist approaches in which the research is used to test a pre-developed a theory rather than build one up. See Appendix C for more detail.

How, and under what circumstances, did HNDU guidance contribute to these outcomes?

Interviewees identified five main ‘mechanisms’²³ through which the achievement of these primary and secondary outcomes were triggered by HNDU guidance. Figure 3.1 describes which HNDU interventions prompted these five mechanisms to occur.

Figure 3.1 Elements of HNDU guidance and the ‘mechanisms’ through which they achieve change



The following sections describe each mechanism in turn. The tables present:

- the different intervention and local authority contexts (see ‘intervention contexts’ and ‘local authority contexts’ columns);
- how local authorities were found to respond to different elements of HNDU guidance where these contexts were present (see ‘mechanism’ column); and
- the main outcome(s) from these responses (see ‘primary outcome’ column).

²³ A mechanism describes the resources or opportunities provided by HNDU guidance (e.g. the direct provision of subject expertise and experience through one-to-one guidance) and the reasoning of local authority officers in response to these resources or opportunities (e.g. enabling the local authority officer to build their skills and knowledge on heat networks).

‘Capability-building’

Capability-building refers to situations where the direct *provision of subject expertise and experience* by the HNDU enabled a local authority officer to build their *skills and knowledge* and/or their *confidence* on heat networks, thereby leading to improved local authority officer capability to progress heat network development.

Interviewees highlighted examples of capability-building occurring through each of the four elements of the HNDU guidance. For one-to-one guidance, e.g., this happened through an HNDU project lead imparting their own technical knowledge or experiences. Local authority officers also reported that events, written guidance and Huddle all contained content that had provided them with relevant subject expertise and experience, to differing extents.

Table 3.1 describes the different contexts - both in relation to the intervention and local authority context - that determined whether, and to what extent, capability building occurred through the different elements of guidance. Many of these contexts were also important determinants of whether the other four mechanisms were triggered.

Table 3.1 CMO 1. ‘Capability-building’

Intervention contexts	Local authority contexts	Mechanism (reasoning and response to the resource provided)	Primary Outcome
Where HNDU guidance is: <ul style="list-style-type: none"> • based on sound technical expertise, • relevant and timely in relation to the local authority’s current and anticipated work on heat networks, and • pitched at the right level for the expertise and needs of the local authority officer and the local authority as a whole... 	... and where: <ul style="list-style-type: none"> • there is a perceived need to improve capability on heat network development (beyond that provided by other sources), and • the local authority officer has sufficient time to engage with the guidance... 	... the direct provision of subject expertise and experience by the HNDU... ... enables the local authority officer to build their skills and knowledge and/or their confidence on heat networks...	...leading to improved local authority officer capability to progress heat network development.

The following sections describe the evidence relating to both intervention and local authority contexts in more detail.

Intervention contexts: sound technical expertise

Where one-to-one guidance was successful in capability-building, local authority officers who had experienced this felt that the sound practical experience and technical expertise of HNDU project leads was an important contributory factor.

[The HNDU project lead] gives us that engineering technical background that we don't have, so it's been a really good balance with the bits that we're probably lacking within the authority (LA24)

The same local authorities also felt this expertise lent credibility to the guidance provided. Equally, with events, written guidance and Huddle, content based on sound technical expertise was also recognised and appreciated by local authority officers as contributing to capability building.

Local authority interviewees also felt that the breadth of expertise and knowledge provided through HNDU guidance was an important factor in enabling their capability to be built. E.g., some local authority officers appreciated the comprehensiveness of the written guidance on feasibility study specifications. Similarly, local authority officers reported it was beneficial for HNDU project leads to have sufficient breadth of knowledge to cover key aspects of feasibility study development, or to be able to link up with other members of the HNDU team if additional expertise was needed.

I'm not sure if it was the typical thing that they do, but [the HNDU project lead] brought up another colleague who was able to look at things from the financial perspective as well ...[and]... was able to give some good feedback to the consultant about certain financial models, and how we might tweak things a bit. (LA24)

Intervention contexts: relevant and timely

Local authority interviewees highlighted that HNDU guidance was successful in building capability when it was delivered flexibly, and was both relevant and timely for the local authority.

I felt that HNDU really got what it was like to be in a local authority, and to be juggling many-many demands with usually insufficient resource, and having to be quite pragmatic in terms of how you take things forward. They were really flexible. (LA23)

Local authority officers provided examples of the HNDU being able to provide more frequent support at critical times of the project (e.g. when a draft feasibility study was being reviewed), providing support through different means (one-to-one guidance, written guidance, events, peer-network support, etc.), and being able to adapt the guidance provided so that it met the specific needs of the local authority. Local authority officers felt this flexibility was an important feature of HNDU guidance and contributed to capability building. The findings from the Wave 1 evaluation also identified the importance of flexibility, suggesting that it was not just the type of support that was valued by local authorities but also the approach to delivery.

Another important feature of HNDU guidance for local authorities was ‘contextualisation’. For one-to-one guidance, e.g., interviewees felt that HNDU guidance was effective when the HNDU project lead was aware of, and understood, local context and circumstance, so that they could provide contextualised advice and support. Similarly, local authority officers felt that HNDU guidance worked well when the HNDU project lead understood the aims, objectives and strategic needs of the local authority, so their guidance could be tailored to suit. Conversely, one local authority officer felt that the absence of strategic support – e.g., helping the officer to promote heat network development as a strategic priority for the council, building buy-in from senior decision-makers - from the HNDU had hindered their ability to develop the business case for progressing their heat network.

In cases where local authorities had external sources of support on heat networks (e.g. from LEPs or academic institutions), it was important for an HNDU project lead to be adaptable to fit around and work with them.

In terms of written guidance, local authority officers commented that it was valuable for the guidance on feasibility study specification development to be flexible, so that it could be used to develop specifications tailored to their needs.

In the same way, local authority officers regarded events as more effective when they related to the particular stage a local authority had reached on heat network development. E.g., officers observed it was useful for events to provide case study information, highlighting how other local authorities addressed a particular stage of heat network development.

[Intervention contexts: pitched at the right level](#)

Local authority officers and HNDU project leads suggested that it was important for HNDU guidance to be pitched at an appropriate level in order for it to be effective. Firstly, when guidance was pitched at an appropriate level of specialist detail, local authority officers found it to be useful and understandable. E.g., local authority officers felt that HNDU guidance was not effective in improving their knowledge or expertise in cases where certain events or written guidance had been too technical for them. Conversely, officers reported that they would not attend an event if they felt it would not add to their expertise.

Second, local authority officers felt HNDU guidance was also more effective when delivered in a manner that met their needs and in a way that they could personally respond to appropriately. In this respect, interviewees felt that the relationship between the HNDU project lead and the local authority officer was very important. Local authority officers suggested that an HNDU project lead’s personal characteristics, such as good interpersonal skills, (e.g. being approachable, available and proactive), were particularly important in enabling capability-building to occur successfully.

In relation to one-to-one guidance, interviewees identified a number of delivery contexts that influenced whether HNDU guidance was pitched at the right level to meet their needs.

Local authority officers and HNDU project leads considered face-to-face guidance to be particularly important in establishing relationships, and this was a preferred means of communication for many local authority officers.

Related to this, local authority and HNDU interviewees suggested that early face-to-face contact between the HNDU lead and the local authority officer helped to facilitate a good working relationship between the two. Conversely, in one instance, a local authority officer had recently taken over the local authority's heat network project but had yet to meet, or have what they perceived to be sufficient contact, with the HNDU project lead. The officer felt this lack of face-to-face contact had hindered their ability to take forward the heat network project.

We're at a critical stage with the ... report coming out and I haven't had any feedback yet, or contact on those reports. I have asked for that, but I think [their] workload is such that I don't think [they] can focus as much as we would like [them] to. (LA17)

Local authority officers also thought that HNDU guidance was effective in building capability when the frequency of guidance matched the needs of their local authority. This varied according to contexts, such as the stage the local authority's project, the level of officer expertise, whether the local authority had another source of external support and the type, complexity and number of their projects.

Some local authority officers reported they would have liked marginally more face-to-face support than they received, or would have liked HNDU project leads to respond more quickly to remote support requests (e.g., commenting on a draft feasibility study). In these instances, however, the local authority officers did not think that this had adversely impacted on the effectiveness of HNDU guidance. This was because they still felt that the overall offer from HNDU was sufficient in meeting their needs.

At other times it was a bit hard to get hold of our HNDU contact; but I don't think it really held us up majorly. (LA20)

Local authority officers also felt that HNDU guidance was effective when it met their practical needs. E.g., local authority officers had not attended events if they considered their location to be too far or costly to travel to. Officers also reported a lack of communication as a barrier to attending events in some instances, either because they had not been made aware events happening, or because they had tried to register to attend, but had not received any response in return.

In relation to Huddle, local authority officers cited IT issues (e.g., Huddle not being compatible with the IT system, login difficulties, a view that it is not user-friendly) as barriers to its use, as well as a preference for face-to-face or telephone contact by some local authority officers.

The circumstances of the local authority was also a factor in the effectiveness of one-to-one guidance, including officer time, expertise, organisational support and enthusiasm, and the existence of external sources of support.

Local authority contexts: perceived need to improve capability

In cases where a local authority had an existing external source of in-depth technical support on heat networks, such as a Local Enterprise Partnership (LEP) or a local university, interviewees suggested that the local authority required less guidance from the HNDU. Nonetheless, interviewees still thought that HNDU guidance could be effective in these instances, provided that it complemented and added value to the external source of support. The Wave 1 HNDU evaluation report also found that local authorities that already had in-house expertise from previous work on heat networks did not require as much guidance.

Local authority officer expertise also appeared to have an effect on the level of HNDU guidance they felt they required. Local authority officers with lower levels of expertise appeared to have a greater demand for guidance (particularly one-to-one guidance) compared with those who reported having greater expertise.

Linked to this, the level of a local authority officer's enthusiasm for, and interest in, heat networks, and the level of organisational support for the officer, could also affect their demand for HNDU guidance. E.g., officers who were enthusiastic to learn more about heat networks appeared to want relatively high levels of one-to-one support, despite them having a relatively good level of expertise. Local authority officers who lacked corporate backing, or who lacked support from internal colleagues, could seek more one-to-one support from the HNDU to help compensate.

Local authority contexts: sufficient time to engage

There were two aspects to a local authority officer's time which influenced the impact of HNDU guidance. First of all, local authority officers suggested that the amount of time a local authority officer could spend on heat network development was a key factor in determining the level of HNDU guidance they required, particularly one-to-one guidance. Officers who considered themselves to be time-constrained, or who could spend only a relatively low proportion of their time on heat network development, indicated that they required higher levels of HNDU guidance. Conversely, local authority officer interviews indicated that a lack of time could also prevent them from making full use of all of the HNDU guidance elements. E.g., officers cited a lack of time as a barrier to attending events or using Huddle.

Whereas it's not my full-time job and so I don't have time just to go and read stuff on Huddle because it sounds interesting, unfortunately. I'd love to be able to do that but I don't really have the time. (LA18)

‘Capability-facilitation’

Capability-facilitation involved the provision of one-to-one coaching or support tools by the HNDU which enabled local authority officers to think about issues in different ways, to feel comfortable with new ideas and to *take responsibility for their own learning and development* (see Table 3.2). The key difference between capability-facilitation and capability building is that the former supports self-learning and development, whilst the latter involves direct provision of information.

Interviewees suggested that capability-facilitation occurred predominantly through one-to-one guidance, whereby a HNDU project lead facilitated change through acting as a coach, enabling a local authority officer to think about issues in different ways (e.g., by helping them to think more broadly about the scope of a feasibility study). Local authority officers also provided examples of written guidance enabling capability-facilitation. The guidance on the development of feasibility studies, e.g., was used as a ‘self-help’ tool, often in combination with one-to-one guidance, enabling local authority officers to think through and develop their own feasibility study specifications.

Table 3.2 describes the different contexts - both in relation to the intervention and local authority context - that determined whether, and to what extent, capability-facilitation occurred through the different elements of guidance.

Table 3.2 CMO 2. ‘Capability-facilitation’

Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome
Where HNDU guidance is: <ul style="list-style-type: none"> • based on sound technical expertise, • relevant and timely in relation to the local authority’s current and anticipated work on heat networks, and • pitched at the right level for the expertise and needs of the local authority officer... 	... and where: <ul style="list-style-type: none"> • there is a perceived need to improve capability on heat network development (beyond that provided by other sources) • the local authority officer has the motivation to for ‘self-learning’ on heat networks, and • the local authority officer has sufficient time to engage with the guidance 	... the provision of coaching/mentoring and/or support tools by the HNDU... ... facilitates local authority officers to think about issues in different ways, to feel comfortable with new ideas and to take responsibility for their own learning and development...	...leading to improved local authority officer capability to progress heat network development...

Contexts

The contexts that determined whether or not capability facilitation was triggered or not were broadly similar to those for capability building, with two key differences. The first is that the relationship between the HNDU project lead and the local authority officer was arguably even more critical for enabling capability-facilitation than for capability building. This is because local authority officers and HNDU project leads suggested that coaching

involved a greater level of trust and rapport than direct knowledge transfer. Where this relationship was successfully established, local authority officers referred to HNDU project leads as being valuable sounding boards and critical friends, who not only provided them with technical knowledge directly, but also helped them to work through problems and issues for themselves.

I kind of think my key message, and probably my key message throughout the whole of this interview will be around the value that we feel we're getting from HNDU, in having a critical friend that is assigned to [us]. (LA13)

The second difference, is that HNDU guidance was more likely to be successful in capability-facilitation when the local authority officer had sufficient motivation and drive for self-learning on heat network development. This relates to the factor highlighted above in relation to a local authority officer's enthusiasm for, and interest in, heat networks, but also relates a local authority officer's preferred learning styles. Some local authority officers preferred a more direct 'spoon-fed' approach to guidance, whereas others enjoyed an approach where they were more empowered to direct and develop their own learning.

'Enabling peer networking'

'Enabling peer networking' involved the HNDU helping a local authority officer to establish links with other, relevant, local authorities working on heat networks, which then enabled *collaborative learning* with other local authority officers working on heat network development.

Local authority officers provided examples of using networks established through HNDU guidance as a source of peer-to-peer support on their heat network journey. These links occurred through one-to-one guidance, events and through Huddle. Local authorities reported instances where HNDU project leads had directly helped them to establish links with other local authorities where it was thought that one or both of the local authorities could benefit through the sharing of knowledge and experiences.

The HNDU has helped in terms of putting us in touch with different colleagues from other authorities that are doing similar types of work. (LA14)

Table 3.3 sets out the different contexts - both in relation to the intervention and local authority context - that determined whether, and to what extent, capability-facilitation occurred through the different elements of guidance. The following sections describe the evidence relating to these contexts in more detail.

Table 3.3 CMO 3. 'Enabling peer networking'

Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome
-----------------------	--------------------------	---	--------------------

Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome
<p>Where HNDU guidance:</p> <ul style="list-style-type: none"> involves good interpersonal skills, and supports links and connections with other local authorities working on heat networks... 	<p>... and where:</p> <ul style="list-style-type: none"> there is a perceived need to improve capability on heat network development (beyond that provided by other sources) one or both of the local authorities could benefit through the sharing of knowledge and experiences... the local authority officer finds value in learning from others' experiences the local authority officer has the confidence to share their experiences, and the local authority officer has sufficient time to engage with the guidance... 	<p>...helping the local authority officer to establish links with relevant local authorities ...</p> <p>...enables collaborative learning with other local authority officers working on heat network development...</p>	<p>...leading to improved local authority officer capability to progress heat network development</p>

Intervention contexts

In relation to one-to-one guidance, interviewees once again highlighted that a good working relationship between the HNDU project lead and the local authority officer was important for enabling the HNDU project lead to establish links successfully. This helped local authorities to view a suggested link as credible and worthwhile pursuing.

Furthermore, HNDU guidance was also effective when delivered in a way which supported the establishment of links with other local authorities. E.g., local authority officers provided examples of events that had made provision in their agenda for networking in order to support local authority officers to make links with other local authorities.

Local authority contexts

Key contexts identified by local authority officers included:

- one or both of the local authorities recognising there is a benefit to the sharing of knowledge and experiences;
- the local authority officer finding value in learning from others' experiences
- the local authority officer having the confidence to share their experiences.

The latter was identified by local authorities as a barrier, or enabler, to using Huddle. One local authority officer, e.g., said that a lack of confidence in their own expertise on heat networks had meant that they did not contribute comments or answer questions on Huddle because they felt they had nothing of value to add.

‘Cheerleading’

This mechanism was unique to one-to-one support. It involved the HNDU project leads using techniques to provide local authority officers with personal motivation and impetus, which then stimulated them to *maintain momentum* in progressing activity on heat network development. For instance, local authority officers provided examples of HNDU project leads proactively and regularly ‘checking-in’ with them to discuss and monitor progress; something which they said provided them with the stimulus to move a project forward effectively.

Well [the HNDU project lead] would say ‘How are things going?’ [The HNDU project lead] would send me an email to say ‘What’s happening with ‘X’, or ‘Have you got this/that yet?’ (LA19)

Table 3.4 sets out the different contexts - both in relation to intervention and the local authority context - that determined whether, and to what extent, the independent critic mechanism was enabled by HNDU guidance.

Table 3.4 CMO 4. ‘Cheerleading’

Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome
Where HNDU project lead: <ul style="list-style-type: none"> • has good interpersonal skills, and • has a proactive approach to communication and where: <ul style="list-style-type: none"> • there is a perceived need to for ‘moral support’ on heat network development • the local authority officer has sufficient time to engage with the guidance... 	... using techniques to motivate the local authority officer... ... stimulates the local authority officer to maintain momentum in progressing activity on heat network development...	...leading to improved local authority officer capability to progress heat network development

Contexts

Local authority officers and HNDU project leads suggested that strong interpersonal skills and a proactive approach to communication from an HNDU project lead were important contexts in enabling this mechanism. E.g., one local authority officer said that regular proactive contact from the HNDU project lead had enabled them to successfully maintain the momentum of their project, and had given them ‘moral support’ during the journey. Local authority officers who lacked internal support in the local authority appeared to be particularly appreciative of this type of HNDU guidance.

‘Independent critic’

The ‘independent critic’ mechanism also occurred solely through one-to-one guidance. The mechanism involved a HNDU project lead acting as an ‘objective’, ‘independent’ source of guidance for local authorities, in order to identify ways to critique and challenge

the delivery of HNDU funded studies. This enabled the local authority officer to more effectively *manage and engage the consultants* delivering the heat network study. This resulted directly in perceived improvements in the quality and comprehensiveness of heat network studies (e.g. feasibility studies).

[Without HNDU involvement] it might not have been as holistic a study. Our consultant was very engineering focused, and it's getting them to look at those different aspects. (LA14)

Table 3.5 sets out the different contexts - both in relation to intervention and the local authority context - that determined whether, and to what extent, the independent critic mechanism was enabled by HNDU guidance.

Table 3.5 CMO 5. 'Independent critic'

Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome
Where HNDU project lead: <ul style="list-style-type: none"> • based on sound technical expertise, • relevant and timely in relation to the local authority's current and anticipated work on heat networks, and • pitched at the right level for the expertise and needs of the local authority officer and the local authority as a whole... 	... and where: <ul style="list-style-type: none"> • there is a perceived need for improving the way in which the local authority engages and manages its consultants on heat network studies, and • the local authority officer has sufficient time to engage with the guidance • the local authority is open to additional guidance from the HNDU without feeling undermined by it • the consultants working on a heat network study see value in HNDU's input... 	... helping the local authority to identify ways to critique and challenge the delivery of feasibility studies... ... enables the local authority to more effectively manage and engage the consultants delivering the heat network study...	...resulting in perceived improvements in in the quality and comprehensiveness of heat network studies (e.g.feasibility studies).

Contexts

On the HNDU guidance side, the important contexts were similar to those for capability building. Where the contexts differed were in relation to the local authority.

Local authority officers suggested that one-to-one guidance was more likely to be successful in this regard if they perceived a need for improving the way in which they engaged with the feasibility study consultants. This made them more receptive to an HNDU project lead's critique and challenge. This was the case, e.g., where an officer felt they lacked sufficient expertise to effectively review a feasibility study, or if they found engagement with the consultants challenging.

I think the feasibility study possibly wouldn't have asked all the questions that we needed to ask. And in terms of the actual study which was finally written, which you then want to go on and use to give to the private sector- to give to other partners - it's quite fundamental that's a document you can then widely disseminate, I think having [the HNDU project lead's] input has been really good with that. (LA18)

Local authorities indicated that one-to-one guidance was more successful when it was delivered in a collaborative manner; it was received less well when a more directive approach was taken.

One-to-one guidance was also more successful in enabling this mechanism when the consultants working on a heat network study saw value in HNDU's input. Where this was the case, consultants agreed the HNDU's input had helped them to identify improvements to the study without being onerous.

We'll attend meetings where I'm reporting to the local authority on progress on the feasibility, and what the findings are to-date. And then HNDU officers are very constructive, and quite detailed in their comments and suggestions about findings, and also putting forward identifying things that may be pursued a little more, and other things a little less. It's a very good constructive dialogue in those meetings. (Consultant 2)

Conversely, one-to-one guidance was less successful where a consultant felt that the level of detail, or the breadth of scope, being asked for, was not proportionate to the needs or resources of the study. In these instances, consultants felt that the HNDU input was driven more by a need to 'tick boxes' rather than by a consideration of the strategic needs of the local authority.

Local authority perceptions on the value of different elements of HNDU guidance

A key theme from the interviews was that HNDU guidance works well as a flexible package, with one-to-one support at its core, and the other elements used to enhance this guidance as appropriate. These elements do not function in isolation, and this research suggests that they can be more effective when combined. E.g., where written and one-to-one guidance were combined, local authority officers reported their specification as being more effectively tailored than it might otherwise have been with only the written guidance.

Without the guidance element at the very start, which really started with putting together the application for the funding for the energy masterplanning, and the feasibility studies. If we'd not had that engagement, then we wouldn't have got anywhere with it really because I knew very little about it at that point. (LA19)

One-to-one guidance from HNDU project leads appeared to be the most valued element of guidance in generating positive outcomes for local authorities. This is perhaps partly because this was the main route through which HNDU guidance is provided. But local

authority officers also felt it was important because it involved more personalised, more flexible and more contextualised guidance than the other elements of guidance could provide on their own.

The perceived value and effectiveness of the other elements of guidance varied depending on the circumstances of individual local authority officers and their local authorities. All the other elements provided some value to some types of local authorities. Therefore we cannot conclude that any particular element of guidance that was less important than another. As highlighted above, flexibility is an important factor in the success of HNDU guidance as whole. It is important to emphasise therefore that offering a range of different guidance elements is important for enabling this flexibility and allowing for differing local authority circumstances.

Can the guidance be delivered more effectively?

Those interviewed suggested a number of ways in which HNDU guidance might be delivered more effectively in the future.

Breadth and depth of guidance

Some local authorities indicated they might benefit from being able to access guidance on a wider range of issues. One gap identified in the research, e.g., was around stakeholder engagement. This was both building strategic buy-in and engagement within a local authority (e.g., through supporting local authority officers to engage with senior decision-makers) and engagement with external stakeholders (see RA3 findings below).

Local authorities also felt that they will require greater levels of bespoke guidance as they move through to detailed project development and towards commercialisation. This guidance is likely to require more depth in terms of more direct guidance from HNDU staff, as well as different types of expertise (e.g., financial, legal, stakeholder engagement).

Linked to this, they expressed concerns that HNDU project leads were becoming increasingly stretched, which could impact on the effectiveness of future HNDU guidance. These findings will therefore inform how the HNDU manages its resources to ensure that its guidance is effective in supporting local authorities to move forward to commercialisation.

Regional or local support

One view from local authorities was that they would benefit from guidance with a greater regional, or even local focus. This would help to enhance access to HNDU staff (for face-to-face meetings), could improve stakeholder links (by having an HNDU staff member who actively sought to build a regional network of relevant stakeholders) and ensure the HNDU guidance was based on regional and local knowledge. There could also be a greater emphasis on regional events to enable network building.

Events

Local authority officers suggested there is already a wide range of heat networks events run by other organisations. Interviewees were not always clear whether the events they had attended were run by the HNDU or not, and therefore were unable to provide any insight on how to make HNDU events more effective.

Huddle

The findings suggested that Huddle was not as widely used as it might be for sharing documentation and accessing peer-to-peer support. However, it is clear that local authorities value peer-to-peer support and case study information.

Summary of findings; research area 1

- When successful, HNDU guidance can trigger improvements in local authority capability on heat networks and in the perceived quality of the heat network studies²⁴.
- These improvements can happen in five main ways: ‘capability-building’ (building skills and knowledge directly), ‘capability-facilitation’ (enabling to ‘self-learn’), ‘enabling peer networking’ (enabling collaborative learning), ‘cheerleading’ (enabling local authority officers to maintain momentum on projects), and ‘independent critiquing’ (enabling local authorities to engage more effectively with consultants).
- The package of guidance that HNDU offers enables it to provide tailored, flexible support that fits the needs and circumstances of the local authorities. These needs are dynamic, changing over time as personnel changes or the local authority reaches different stages of heat network development.
- One-to-one guidance is a particularly important part of the HNDU package of guidance. But it would not work as effectively in building local authority capability without the other elements of guidance: written guidance, events and Huddle.
- HNDU guidance was successful when it was based on sound technical expertise, relevant and timely in relation to the local authority’s current and anticipated work on heat networks, and pitched at the right level for the expertise and needs of the local authority officer and the local authority as a whole.
- Good interpersonal skills were a particularly important factor in enabling one-to-one guidance to be effective in delivering improvements in local authority capability

²⁴ It is beyond the scope of the research to conclude whether guidance had an actual impact on improving the quality of feasibility studies.

-
- Local authority officers with lower levels of heat network expertise, lower levels of time to spend on heat networks, lacked internal support within the local authority, and had higher levels of enthusiasm, were more likely to require higher levels of HNDU guidance.
 - In cases where a local authority had an existing external source of in-depth technical support on heat networks, the local authority required less HNDU guidance.
 - Local authority officers expressed concerns that HNDU project leads were becoming increasingly stretched, and were concerned that this could impact on the effectiveness of future HNDU guidance.

RA2: How are local authorities evaluating potential funding sources and commercial structures?

RA2 research involved ten local authorities nearing the end of the development stage (see figure 1.1). The aim of the research was to provide insight into the factors that influence local authority decisions regarding finance, the nature of the role they play in a heat network development and the issues that frame and shape decisions regarding whether and how they proceed past the development stage. Interview findings were cross-referenced with other data sources including, where available, feasibility and detailed project design documents and internal council papers.

What frames local authority decisions on whether to proceed with a project?

Interviewees identified several factors they felt were, or would be, important in either informing or determining whether their authority decided to proceed with the commercialisation of a heat network. The most decisive of these was the projected return on investment (ROI) rate.

Return on investment

Some local authority interviewees noted that commercial, profit driven operator expectations for ROI²⁵ were, in general, higher than those local authorities might be prepared to accept. Examples were given of commercial operators walking away from schemes because the ROI had not matched their expectations. Interviewees were not asked about their understanding of private sector expectations, but one interviewee with previous private sector experience (LA7), reported that in their previous role they would have expected a scheme to generate 16%+ IRR (although they noted that they were

²⁵ In addition to ROI different interviewees referenced different forms of investment appraisal measure, e.g. Internal Rate of Return (IRR) and Net Present Value (NPV). The use of the term ROI is therefore intended as a catch all term, except in the case of quotes where the original measure is used.

drawing on experience that was now two years old and that the market has changed since then). Another local authority reported that their understanding was that a private company that they had had dealings with might expect an 18-20%+ IRR²⁶.

In contrast, local authorities reported being prepared to accept ROIs in the range 4-10% (generally expectations were at the higher end of this range), with the precise figure being informed by their corporate priorities.

for the Council, we might be happy with an IRR that's less than 10%, if it's hitting these other triggers as well around economic development, employment, skills and the wider social value that brings to (Town)'s communities. (LA8)

Considerations that inform the difference in levels of ROI considered acceptable by different local authorities include: the strategic role of a proposed heat network within wider regeneration and economic development plans, the need for heat networks to generate a competitive ROI in comparison with other potential investments and perceptions of risk (the higher the perception of risk the higher the required ROI). These issues are examined in more detail in the following sections.

Strategic significance

As reported in the quote above one factor reported as informing the level of ROI acceptable to a local authority was the strategic significance of the heat network. A number of local authority interviewees reported that their organisation's work on heat networks was being driven by staff with economic development and regeneration responsibilities, whose interest lay in the possibility of being able to offer a secure source of low carbon heat and power, at a cheaper rate than alternative supply options.

This was perceived as potentially helping to retain existing commercial activity in a local authority area and helping to attract new businesses or other forms of investment. Interviewees observed that local authorities faced increasing financial challenges and that regeneration could generate income in the form of increased income from business rates and increased returns from council tax, as well as generating other forms of benefit.

The Exec Director is very much focused on, as [gender removed] says, 'growing our way out of the austerity', and that growth is through house building, bringing new people to the borough, securing their council tax returns, but also growth economically from businesses staying and being attracted to the borough. (LA8)

²⁶ Private sector investors were not interviewed for this research and therefore it is not known whether the quoted figures reflect the actual, current cost of private sector finance.

Carbon reduction and, in one instance, fuel poverty were also referenced by local authority interviewees as being issues of strategic interest, that would be expected to play a part in informing their approach to heat networks.

Income generation

Another reported corporate driver for direct local authority involvement in heat networks was income generation. In some cases, this was reported to be a driver in addition to economic development.

Yes, it [income generation] wasn't the main driver. It's about bringing investment into the area really, and through the council intervening, and [unclear on recording] infrastructure and so on, it's seen as hopefully that can entice more investments into the area, so I think that was a key driver. (LA1)

For other local authorities income generation was the primary driver and interviewees prioritising income generation reported that a heat network investment would need to generate returns in the range of 7-10% (IRR). Some local authorities reported that their proposed heat networks had to compete for available funding with other projects, including other commercial opportunities. E.g. one interviewee reported that their authority already invested in commercial property developments, from which they expected a 7% ROI. In this instance, it was suggested that a heat network would need to generate a 10% ROI to be considered a viable investment, since property is expected to appreciate in value as well as generate income.

The way we compare investments is against our property portfolio, so if an investment in a heat network is better than what we would get from property, equal to or better, so 7% or more, then that's part of the consideration. That's the internal rate of return calculation, and the heat network at (Town) is demonstrating about 10%, so it is demonstrating greater value than investment in property. (LA10)

Perceptions of risk

A common concern reported by interviewees was perceived risk. A number of local authority interviewees reported that heat networks were seen as relatively risky investments, owing both to their unfamiliarity to local authority officers and elected members (e.g. in comparison with property), and to the long-term nature of heat network investments. This was reported by some as something that might inflate what their authority considered to be an acceptable level of ROI.

There's perceived risk in the novelty of the project. It's just not something we have done before, whereas purchasing of commercial buildings is a lot more straightforward. So, it tends to make it a little riskier and we therefore would need a slightly higher return. (LA3)

One interviewee noted that they felt a constant need to reassure internal stakeholders. Others expressed concern that perceptions of risk would influence the decision-making process, particularly in authorities where financial or other pressures were heightening sensitivity to risk.

There's a lot of change going on anyway within the Council, so it's an added stress for us to take on something this new. (LA6)

Ownership and operating models: options, and funding sources

Types of ownership model considered

Ownership and operating models considered by local authority interviewees included:

- Ownership of the distribution elements (pipe network) of a system only, the so-called 'pipe-co' option
- Local authority ownership and operation of a heat network (distribution system and heat source)
- Partnership arrangements (joint ventures) with private sector bodies. The details of this type of arrangement were reported as being variable. E.g. a local authority might own the heat network, but contract delivery and operation to a third party; or a local authority might be a co-investor in a private sector heat network. One interviewee expressed an interest in some level of community ownership.

The other aim is to possibly look at community involvement in the centre, developing a community-owned model that is then partly also invested in by the council. (LA2)

Types of funding source available to local authorities

Most of the local authorities interviewed for RA2 had not yet made final decisions regarding funding and were therefore reporting on potential or proposed funding sources. A number of actual or potential internal and external funding sources were reported as being available (in principal) to local authorities, but the release of such funds was reported as being contingent on other factors (e.g. perceptions of risk, ROI etc., see section below).

The most commonly referenced source of funding was the Public Works Loan Board (PWLB)²⁷; local authorities also reported sources such as capital reserves and capital receipts received from the sale of land or other assets. Where available, these funding sources were cited as being low cost (in the case of PWLB) or zero cost (in the case of

²⁷ The Public Works Loan Board is a statutory body that provides a source of low interest finance to local authorities and some other forms of public body.

reserves and capital receipts) and in some instances were reported as allowing authorities to improve the ROI on a heat network project by reducing the overall cost of financing the scheme.

Other local authority interviewees noted that they expected to use a blend of funding types. E.g., local authority funds, such as PWLB, but matched with capital sourced from external bodies such as loans from the Green Investment Bank (GIB) or investment from authorities from other areas interested in heat networks as an investment proposition. Private finance was identified as another potential source of investment, but it was noted that the availability of this form of funding was dependent upon prospective projects having sufficiently attractive ROIs.

We know from engagement with the market, there is more than enough money available out there to invest in these projects. It's getting the right projects, which are commercially investible. It's not the lack of finance out there, it's getting the ones who will actually go forward. (LA7)

Blended public / private approaches to finance were seen as offering an approach to improving the ROI of a project, thereby improving its attractiveness to private investors and commercial scheme operators. Interviewees cited examples where they were considering using low-cost capital sources, such as PWLB and council reserves, in tandem with external funding, to improve the ROI on projects.

Yes, it will be a blend of finance. So, you can imagine projects going forward with some element of maybe local authority funding, which could come from the local authority itself, or could come from the heat network investment fund²⁸, blended with private funding, and together that collective blended funding makes the project happen. (LA7)

The potential use of Community Infrastructure Levy (CIL)²⁹ funding was also reported as another way in which local authorities might help to enhance a scheme's ROI.

So, we have put heat networks on our CIL schedule (Community Infrastructure Levy). It's possible that could develop contributions, could fund a part of a heat network through to therefore improve [the ROI]. So, effectively you're funding some of their capital, which then improves the return on the rest of the capital funding. (LA3)

Other potential funding sources reported by interviewees include the Heat Networks Investment Project (HNIP), regional investment funds and EU funding, although one local

²⁸ This is a reference to the Heat Network Investment Project.

²⁹ The Community Infrastructure Levy is a planning charge, levied on developers, that was introduced by the Planning Act 2008 as a tool to enable local authorities to support the delivery of local infrastructure developments.

authority interviewee noted that an application for EU funding, specifically ERDF funding, had been rejected because it did not offer sufficient evidence of innovation; a key condition for the scheme.

In some cases, local authority interviewees reported limited access to capital as a constraint. In general, however, they were relatively optimistic, suggesting that if a scheme made financial sense then funding could be found.

If the scheme has a good enough return, I think there will be enough interest to fund it within the Council, regardless of whether other opportunities or means exist to fund it. (LA3)

Ownership and operating models: factors informing decision making

Decisions regarding the choice of ownership and operating model appear to be influenced by a combination of four main factors, each discussed in more detail below.

Strategic significance

A number of interviewees reported that their original intention had been to act as a facilitator and enabler of privately owned heat network developments, rather than to become involved in the ownership and management of such schemes. Some noted that this remained their intention. However, others reported being involved in schemes that had proven insufficiently attractive to the private sector and, rather than allow them to fail, they had taken the decision to become more directly involved in the funding or development of a heat network to ensure their wider strategic objectives could be achieved.

It was seen that if the Council was to intervene, and not just intervene as a promoter but also demonstrate the commitment through investing in the network, so that would... provide, I suppose, the additional comfort that was needed for the property developers to sign up to it. (LA1)

Attractiveness of a heat network as an investment proposition and the commercialisation agenda

Some interviewees noted that financial pressures in their organisation had generated a heightened interest in income generation, reporting that the nature and level of their organisation's involvement in a heat network development may depend upon how attractive an investment proposition a scheme was found to be.

I think in any of these schemes, if the prospects were attractive enough there's a possibility that the Council would become more involved. (LA5)

Another local authority interviewee noted that their views had changed during the scheme development phase and reported that, whilst they had originally become involved in heat networks because of the potential for delivering social benefits, they were now interested in the opportunity for revenue generation.

Whereas back at the end of 2014, when we had the original study, we weren't necessarily looking to particularly invest, it might be that we might look to invest if the returns are good enough and/or we take a more active role than we might have done back then. (LA11)

Restricted access to funding

Some local authority interviewees noted that they had restricted access to capital and that this was likely to inform their choice of operating model. E.g. one interviewee noted that their organisation had originally intended to act as both the owner and operator of a proposed heat network, as they felt this would better enable them to ensure the future expansion of the network and thereby to deliver public benefit. However, owing to a change in their authority's financial position, this was now unlikely to occur.

The County Council is also no longer in the position to invest that kind of funding, given the financial situation we are in, into such a project. (LA9)

Sensitivity to risk

Risk was reported as being a critical factor in determining final decisions regarding both funding and the likely operational model pursued by a local authority led scheme.

I don't think funding is an issue, particularly. It's more the acceptance of risk and where the risk is owned. So, it's more about that, rather than money. (LA10)

A number of local authority interviewees noted that they were considering an owner-operator model, but that this was perceived within their authority as a higher risk option. In one case, it was suggested that this was because of the unfamiliarity of the authority in running such an enterprise, and the need to recruit specialist staff. Consequently, there was a feeling that the authority would be more likely to pursue a joint venture, as a way of mitigating risk; an outcome also anticipated by several other local authority interviewees.

I think if the Council were able to get something where a commercial company would come in, deliver everything, and they would get a guaranteed income from it, then I think that would be the most palatable model. (LA6)

One local authority interviewee reported that they had opted to establish a local authority-owned pipe-co, rather than to install an energy centre. This was seen as a less risky option owing to lower investment costs and the sharing of risk with an energy service company (ESCO). This organisation also noted that having an exit strategy could help to reduce perceptions of risk through being able to describe how, in the future, the authority might be able to sell the pipe-co on as an asset.

Summary of findings; research area 2

- The most decisive factor determining whether or not a local authority decided to proceed with a heat network project was the level of return on investment.

-
- Local authorities who viewed a heat network development as being of strategic significance, e.g. in relation to delivering local economic and regeneration objectives, reported that they would be more likely to consider accepting lower ROI rates (4-10%) than where a network was being pursued for direct commercial gain.
 - Income generation was reported as a primary and secondary driver for local authority interest in heat networks.
 - In some cases local authorities reported that they had not initially intended to take an active stake in a heat network development, but had opted to do so during the development process either in order to drive forward their strategic priorities or to pursue income generation.
 - The main types of operating model considered by local authorities included ownership of the transmission system only; ownership and operation of the heat network; and public/private partnerships (joint ventures).
 - Local authorities reported having access to a range of potential funding sources including PWLB, capital reserves and capital receipts. Local authorities were aware of the possibility of securing private finance but this was reported as being expensive. In some cases local authorities noted that access to finance, even for financially viable schemes, was not in and of itself the key issue for their organisation
 - Risk was seen as being the key factor in determining an authorities decisions regarding finance, operating model and the final decision to proceed. Local authorities reported that heat networks were seen as risky owing to their unfamiliarity and the long-term nature of the investment.
 - Risk mitigation strategies being considered by local authorities generally centred on ensuring some form of private sector engagement primarily through joint ventures and the use of public finance to enhance the ROI of prospective heat network developments.

RA3 How can local authorities best engage with stakeholders to support the development of the heat network scheme?

RA3 research

RA3 research involved 10 interviews with local authorities nearing the end of the development stage (the same group involved in RA2). In addition a series of semi-structured interviews were undertaken with two types of stakeholders, identified in the Wave 1 research as being both strategically important and challenging to engage: housing developers (7 interviews) and NHS Trusts (4 interviews).

Participants in the housing developer interviews were generally senior-level staff who had a high level of authority or influence over their organisation's involvement in heat networks. All housing developer interviewees worked in the private sector, except for one social housing provider. One housing developer provided interviews with two staff, whilst another participated as an appointed representative of the National Home Builders Federation. Three interviewees did not wish to be recorded, or quoted in this report.

The NHS Trust interviews involved staff responsible for on-site energy and wider facilities management (FM) and included both direct employees and individuals employed by external third party FM contractors.

Key stakeholder groups

Local authorities reported engagement with a range of stakeholder types. In broad terms, these can be classified as internal, external public sector and external private sector.

Internal stakeholders

The most significant internal stakeholders for local authorities - i.e. those critical in some way to the success of a project – were reported to be finance officers, elected members and corporate management teams. These stakeholder types, particularly the latter two groups, were identified as playing a decisive role in determining whether schemes proceeded and, if so, on what basis.

External stakeholders

Whilst local authority interviewees consistently referred to the same type of internal stakeholder, they identified a much more diverse, often project-specific, range of external stakeholders. Some examples of significant external stakeholders in the public sector included universities, other local authorities, museums, NHS Trusts and HM Prison Service. These were all identified as potential heat network customers, but in some instances, they were also reported as being potential sites for energy centres and therefore possible suppliers of heat and power. This is consistent with the findings of the Wave 1 research.

Other local authorities were also reported as being potential investors in some proposed heat networks. Other identified external stakeholders in the public sector included Local Enterprise Partnerships (LEPs) and HNDU staff both of which were referenced as being an important source of guidance and financial support.

Significant external stakeholders in the private sector were reported to be:

- potential customers such as leisure centres, hotels and business parks
- potential customers / suppliers in the form of developers (housing and commercial) and energy from waste plant operators; and potential heat network operators in the form of ESCOs.

Local authorities reported examples of challenges with both forms of external stakeholders (public and private), but suggested that in general they found locally based public sector organisations to be relatively easy to engage with. This was attributed to the fact that local authorities generally have long-established links with such organisations. Even so some individual examples of problems, e.g. uncertainty about when or if proposed future development activity might proceed, were reported for some hospitals and universities.

So we did some engagement with the University of (City), and the local hospital, I wasn't involved in that but we found engaging with some of those a lot more difficult. One of them already has a mini-heat network on their campus, and the other one felt we were at too early a stage to get involved. (LA11)

When asked about the types of stakeholder that they had found to be the most challenging to engage with, a number of interviewees reported experiencing problems in their dealings with developers, particularly housing developers. This finding is consistent with the Wave 1 research. Developers were also noted as being strategically important, owing to their influence and control over the connection of potential customers (both domestic and commercial) to proposed heat networks. E.g., one local authority reported that a local hospital had dropped out of a heat network development owing to the attitude of a housing developer towards heat networks.

One reason why the hospital dropped out was because it relied on a development taking heat, and that developer had quite a negative attitude towards heat networks (LA3)

More generally organisations with central offices based outside of an area, e.g. HM Prison Service, supermarkets and hotel chains, were also identified as being challenging to engage with.

If the people in charge were locally based then it's been easy, but where you've got decision-makers in head offices in London or wherever, that's made it much more difficult. (LA3)

Specific stakeholder challenges

Lack of interest

In some instances, local authority interviewees with experience of dealing with housing developers, reported lack of interest in heat networks as being a major challenge.

I don't think the timeline is an issue for developers, I just don't think it's a priority for them. They just want to go in for the least expensive, high-volume solution that they can have. (LA5)

Some local authority interviewees reported that they felt that housing developers saw heat networks as something that made their lives more complicated and / or something that generated a risk for their business. E.g., one local authority interviewee noted that the

developer they were dealing with was concerned that a scheme they had been asked to install in a new housing development would not be connected to a wider network, and that this might expose them to reputational risk.

I think there was some concern reputationally that they didn't want to be seen as being responsible for if it was to fail, and so on, so that if they were to provide this and then it didn't work or the opportunity on the other sites didn't come forward, and so on. (LA 1)

In this instance, the local authority reported that they were looking to address the developer's concerns by agreeing to take on responsibility for ensuring the development of the wider heat network.

Interviewees reported several issues they felt restricted their ability to engage effectively with housing developers, including a lack of time and technical competence.

As I was talking about the developer; it would have been good to have the technical expertise at our disposal to counter some of their arguments. Although we did try that! It's also having the time to force discussions through the planning process and what have you. (LA3)

Insufficient 'leverage' and local conflicts of interest

Some local authority interviewees noted that they felt the planning system did not provide them with sufficient leverage when negotiating with housing developers. One interviewee suggested that, at least in some parts of the country, developers had an advantage when negotiating with local authorities, as the latter did not want to jeopardise new developments in their area.

Whereas in London a local authority might have a bit more bargaining power in terms of any new developer for new development, in (City) we don't have as much bargaining power. So, the more obstacles and things we throw in the way, the less likely they are to want to put up the scheme as a whole. (LA11)

Challenges associated with uncertainty

The dependence of the economic viability of proposed heat networks on uncertain future developments was a challenge reported when dealing with housing developers, e.g., one local authority interviewee noted that their business planning had been disrupted by an unanticipated change in the rate at which a housing developer expected to develop a site, and the consequent impacts on forecast figures for heat demand and revenue. Examples of schedule disruptions to proposed stakeholder projects were also reported in relation to university and leisure centre developments.

And then at the end, when we finally had our report, we looked at the phasing and we noticed it's a year off; not because we made a mistake, but simply because within the time we've written the report there was already a year of delay. (LA2)

Interviewees also identified a number of examples of heat network projects being disrupted as a result of key stakeholders, and publicly funded bodies in particular (local and national), having to withdraw from proposed heat network developments as a result of internal reorganisation and / or reductions in funding³⁰.

However, when we started this refresh of the project we established that the [named organisation] itself had a lot of uncertainties around its estate, and at that point were not keen to engage in looking at a district energy network when they did not know whether or not they would be keeping the site here at [city]. (LA9)

No solution was identified to this issue, but interviewees noted that these issues also introduced additional risk and made the development process more protracted.

Difficulties associated with centralised energy procurement

Another reported challenge was associated with organisations, both private and public, that procure energy via national contracts. Interviewees dealing with such bodies noted that, when seeking to engage such bodies as potential customers, it could be difficult to identify and engage with the right people, and that some organisations appeared unwilling to consider local supply contracts.

It's often difficult to get hold of the right person, but also they are tied into either regional or national contracts for their gas and electricity supply. (LA11)

Other challenges

Other examples of challenges included stakeholders losing interest, owing to the drawn out nature of heat network development projects, and problems in securing access to data on heat demand and costs from potential heat network customers. In one instance, a local authority interviewee noted that they had resolved a problem of this type through the use of a non-disclosure agreement. In another case, however, an interviewee reported that several major potential private sector customers had refused to share cost data for fear of undermining their negotiating position.

So, they don't want to say 'Our tariff is x', so you can compare it. It's, 'Well, you tell us what tariff you can offer and then we'll tell you if we're interested or not.' (LA8)

This same group of potential customers were also unwilling to enter into extended contracts beyond five years, which reportedly undermined an initial investment proposal put forward by a private sector ESCo. In this instance, the local authority reported that they were considering making a direct investment in the development of the heat network, on the basis that the site is of strategic importance and, as such the Council is prepared to

³⁰ Specific examples cannot be provided as this may compromise confidentiality.

accept a relatively low rate of return on any investment they might make. In addition, they were considering whether it would be possible to get the stakeholders to agree to ‘in principle’ longer-term contracts by using benchmarking clauses.

One of the concerns was in three to five years they’re not prepared to contract for longer than that. But when I’m speaking to our legal advisers, they were saying, ‘You could have an energy supply agreement for longer than that if you talked about benchmarking and about always being a percentage below the national average of the power tariff.’ (LA8)

Advice on stakeholder engagement

Aside from the specific examples of solutions reported above, interviewees tended to give generalised responses when asked about how best to deal with challenging stakeholders. It was noted that effective engagement took time and that it should be started early. But that it was important that those initiating engagement should have a clear idea about what they wished to explore with stakeholders and why. Interviewees also noted that it was important to understand what stakeholder motivations were and how they might be expected to benefit from a heat network project.

You need to engage with your potential customers at an early stage, they need to be fully on board. You mustn’t lose sight of them, and you must keep them close to you as you work through the project. (LA8)

Engaging the ‘right’ people was also seen as important. Selling the proposition to senior stakeholders early in the process was seen as helping to ensure the involvement of operational staff. In some instances, interviewees reported that bringing in senior-level council staff to initial meetings could be useful in demonstrating commitment. For the same reason, one organisation reported that it had been helpful to get participants to sign up to a Memorandum of Understanding.

Maintaining close contact and involving stakeholders at key points during project development was seen as important in ensuring that stakeholders remained engaged with the process. Finally, the involvement of external experts (e.g. HNDU staff) was seen as better enabling lead organisations to respond effectively to stakeholder queries and challenges.

Housing developer engagement with local authorities

All housing developer interviewees reported having current or recent experience of engagement with local authorities regarding heat networks. The level and breadth of experience, however, varied widely.

Some housing developer interviewees reported having been involved in multiple schemes at different scales³¹, involving both communal, stand-alone (small scale, development site specific, multi-user schemes not connected into wider networks) and district heating schemes and mixed developments (i.e. those that included both housing and non-domestic properties). Others had only been involved with a single scheme or housing-only schemes. Whilst interviewees were not always explicit about the type or scale of development they were discussing, subsequent analysis found that interview comments tended to resolve around three main forms of development:

- Communal heating schemes – high-density, multi-occupancy housing (e.g. flats and tenements)
- Islanded district heat schemes – site-specific, low-density housing only
- District heat schemes – area-wide, mixed developments

Housing developer drivers and views on heat network developments

Responding to planning permission conditions were cited as the main reason for interviewees' involvement in heat networks.

Increasingly we're seeing the local authorities and the planners pushing more and more for it. (HD2)

Some housing developer interviewees indicated they would not install heat networks without the driver of planning requirements.

No other drivers were reported (for housing developers³²), but interviewees noted that they saw heat networks as an appropriate solution for certain forms of development scenario. In general, housing developer interviewees saw heat networks as being potentially appropriate for high-density communal housing and mixed developments (housing plus commercial and/or public sector buildings). Their suitability for use in small-scale, low-density, housing-only schemes – something a number of housing developer interviewees reported having experience of – was seen as questionable.

Given high density built forms, the tower blocks and apartments, we obviously use networks a lot more on those built forms than traditional terraced or low-density homes. We still do it on those, but that built form would require a much larger number of units to actually justify a heat network. (HD2)

³¹ Specific examples cannot be provided as this may compromise confidentiality.

³² It was noted that local authorities and stakeholders might benefit from heat networks, e.g. via reduced carbon emissions and through the establishment of an income generation asset.

Housing developer interviewees all identified one or more issue or concern with heat networks. The four main reported areas of concern were:

- The potential for heat networks to lead to higher end customer costs (as compared with suggested alternative options)
- Doubts about the ability of heat networks to deliver claimed benefits in terms of carbon and reduced consumer costs
- Issues associated with the long-term management and maintenance of networks
- Difficulties associated with reconciling housing development timeframes with long-term district heating strategies

The view was expressed that heat networks were, in at least some circumstances, not the most cost-effective way of delivering heat and hot water to domestic properties. Housing developer interviewees concerned about the potential for increased consumer costs reported that they had a responsibility to the heat customer and were therefore concerned to ensure they received a good service (heating and hot water) at a competitive price.

It's got to demonstrate that it's going to save residents money. First of all, we've got to get service, but the first obvious one would be it's going to save residents money. (HD3)

Small-scale, islanded, housing-only, district heat schemes were seen as a particularly high-cost option because of high installation and lifetime management costs.

We did this analysis a few years ago though, but it would be difficult, I would have thought, for 600 to 800 units or below, low density with no commercial or diversification of load, it would be difficult. I think I would probably be looking at other solutions. (HD2)

One housing developer interviewee estimated that, in a scheme they were involved in, householders might end up paying three times as much for water and heating as might have been achieved via alternative systems.

A related concern for housing developer interviewees was that advocates of heat networks were claiming that they would deliver carbon and consumer cost reductions that either could not be achieved or could be achieved more cost-effectively through other routes; e.g., through improvements in building fabric combined with solar photovoltaic powered electric heating systems³³.

³³ With reference to new builds.

What's happening in housing is that over time the tightness and the fabric first approach housing that everybody's adopting these days, means that once you've heated something you don't lose heat very quickly. So your heat demands are reducing all the time, and there are other ways of heating the house that is very low-cost; solar PV e.g. is a very efficient way of heating a house, a very cost-effective way of doing so. (HD5)

Developers who had experience in building stand-alone, island, heating systems noted that these carried ongoing management and maintenance responsibilities, reporting that, in general, they had little interest in taking these on and would instead arrange for an ESCo to run the scheme.

We're not generally in the business of maintaining and managing assets for 50 or 100 years. It generally falls to the utility providers to do that. (HD5)

ESCo contracts usually run for 20-25 years and concerns were expressed about who would take on the management of heat networks once the ESCo contract finished. As an aside, it was noted that to safeguard customer interests in the long term, it was important to ensure that the construction of the network and energy centre was of sufficient quality.

What we've found as a group over the last few years is that if you leave it to a contractor to put you an energy centre in, you get something that probably works for them from a capital perspective, but may not work for us from long-term maintenance. (HD4)

A final concern related to the potential complexities of connecting communal heating systems with future area-wide heat networks. It was suggested that this could be difficult to achieve, as an ESCo agreement would involve a long-term contract and would have to meet legal and financial commitments over the period, which could restrict its ability to connect to a wider network. It was also reported that there might be technical compatibility issues and that it was difficult for developers to try to deal with this when the details of future district schemes were unknown.

I think the difficulty lies in those networks are not in place yet, the details of which they're developed to can differ massively between local authorities; and requiring a technical design for our sites to be compatible with something that we may not know about, in terms of what the technical parameters are, where they lie, what kind of service provision they'll have for our site, for our customers, for our residents. (HD2)

Experience of dealing with local authorities

Housing developer interviewees reported extensive engagement with local authorities and in particular council planning officers. Their experience of such engagement was mixed, varying from highly constructive to inflexible. Interviewees suggested that these differences often came down to differences between individual officers and their council's approach to district heat network development.

Where engagement was found to be effective and constructive, this was attributed to the council being open to discussing developers' concerns and being prepared to be flexible. In particular, interviewees were keen to see a more flexible approach being taken to dealing with small-scale, low-density housing schemes. Suggestions included allowing developers to offer alternative solutions to addressing local authority carbon and cost objectives or, where there is a firm local authority commitment to a district heating scheme, allowing developers to install the infrastructure that would allow a housing scheme to be connected to future district heat networks, rather than requiring them to install standalone, islanded, systems.

It was suggested that engagement should be initiated as early as possible to develop a mutually acceptable way forward to minimise the risk of future disagreements.

We didn't want to go off by ourselves and go all the way down the line, 'This is our solution,' to then be brought back to square one by the planning authority, both saying, 'We don't agree with that.' (HD4)

Capacity and capability issues

Finally, housing developer interviewees expressed the view they often lacked technical expertise in heat networks and had found this was often also the case with local authority planners. Interviewees noted that the quality of dialogue in previous projects had been enhanced where independent technical experts had been brought into their discussions³⁴. It was also suggested that planners might benefit from being provided with appropriate technical guidance. Finally, with a view to improving engagement and understanding between the housing sector and Government, it was suggested that BEIS should engage with the Home Builders Federation and in particular their new heat networks sub-group.

NHS Trust engagement with local authorities

Experience of heat networks

NHS Interviewees reported having a degree of familiarity with the concept of heat networks, either through previous employment or because they had experience of existing or proposed combined heat and power (CHP) schemes on their own sites³⁵. They reported being receptive to the possibility of connecting on-site facilities to district heating schemes, the main driver of interest being the potential financial and, to a lesser extent, environmental benefits for their Trust.

³⁴ In some cases, independent technical experts had been brought in to facilitate dialogue, and paid for their expertise, whilst for other cases it was not clear how they had become involved.

³⁵ Also known as 'campus schemes'

Contextual issues

A key contextual issue for the interviewees was the need to ensure the continuity of heating and hot water to hospital sites. On-site heating systems were seen as offering a significant advantage in comparison to off-site supply in terms of continuity of supply.

I guess we're probably still needing some convincing that it can be as resilient, as effective, and as efficient as having individual plant for a particular building. (NHS4)

The need for off-site heat network developments to be aligned with on-site developments was another contextual issue. NHS interviewees who reported that they were intending to upgrade or replace existing heating systems, e.g. by installing a combined heat and power (CHP) plant, were more receptive to considering opportunities to link into wider initiatives than those whose equipment was relatively new and in good condition.

Experience of dealing with local authorities

All NHS interviewees were involved in on-going discussions regarding heat networks. These were reported as having been initiated and led by the local authority. NHS interviewees indicated that they were playing a lead role on behalf of their organisation in these discussions, but reported varying levels of authority and influence over their organisation's decision-making process. Discussions were generally entered into voluntarily, except where heat network engagement was a requirement of planning conditions.

In general, NHS interviewees reported that their engagement with local authorities had been constructive. However, concerns were expressed about the limited practical outputs achieved and the protracted nature of the discussions.

The dialogue that I've been involved in has been constructive... My criticism would be the time it's taken to get to this stage, really. (NHS4)

Another concern was that NHS interviewees were still unclear as to how their Trust might benefit from any future involvement in a district heat network, making it more difficult to justify continued engagement in discussions.

Interviewees reported that they were willing to continue to engage in dialogue, but indicated that linking their sites into future heat network developments would require them to be able to address a number of challenges. These included the need for water to be supplied to the site at a sufficiently high temperature to minimise the risk of Legionella and Pseudomonas, and the complexity of existing on-site management arrangements.

And then if you're going to do the PFI Buildings, you've got those contractual arrangements with them. And believe you and me, that is not a one-minute fix, that takes months and months. (NHS1)

Interviewees expressed particular concern about the lack of finance available to the NHS and suggested that they felt that other public sector bodies had better access to funding. It was also noted that, where a Trust was running a deficit, even accessing funding for small-scale schemes with short payback times (2-3 years) was challenging.

We've got agreement for the Salix loan, but because we are in deficit we can't take up that loan. (NHS1)

NHS interviewees did not identify solutions to these challenges, other than to note the need for any heat network development activity to be financially self-sustaining.

Summary of findings; research area 3

- The most significant internal stakeholders for local authorities were reported to be finance officers, elected members and corporate management teams, and reported external stakeholders included a wide range of both public and private sector organisations.
- Housing developers were identified as being the most challenging group for local authorities to deal with. Reported issues included a perceived lack of interest on the part of developers, a lack of time and expertise (amongst local authorities) to enable them to respond effectively to developer queries and challenges.
- Another group reported as difficult to engage, by local authorities, was organisations whose headquarters were located outside of the local authority area. These were found to be difficult to access and in some cases resistant to the establishment of local supply contracts.
- Interviewees reported several examples where an uncertain business environment had undermined business planning as a result of key stakeholders needing to drop out or amend their role within a proposed development.
- Local authority advice on stakeholder engagement was largely generic and focused on a recommendation to engage early with external stakeholders and to maintain regular communication.
- The need to comply with planning conditions was the main reported reason for housing developer involvement in heat networks.
- Housing developer views on heat networks tended to be informed by the type of heat network they had experience of. Scale was reported as being important and some were critical of reported planning requirements to install heat networks in smaller, low density, housing only development schemes.
- Housing developer interviewees saw heat networks as appropriate in some circumstances but reported four main concerns: potential higher consumer costs;

doubts about heat networks delivering claimed carbon savings; responsibility for the long term management of networks; and the challenges associated with reconciling housing development timeframes with long-term district heating strategies.

- Housing developers recommended that they be involved in heat network discussions as early as possible and suggested that the inclusion of an independent technical advisor could be helpful in facilitating discussions.
- Reported drivers for NHS organisations to become involved in heat networks were the opportunity to secure financial benefits and carbon reduction. Concerns included ensuring the security and quality of their heat supply.
- In general, NHS interviewees reported that their engagement with local authorities had been constructive. However, concerns were expressed about the limited practical progression achieved and the protracted nature of the discussions.
- Although prepared to engage in discussions regarding heat network developments NHS interviewees were uncertain about the scope for practical involvement owing to financial constraints.

Appendices

Appendix A: Example Topic Guides

RA1 topic guide

Example RA1 topic guide, for use with local authorities with completed or 'in progress' feasibility studies. This topic guide was adapted to use for interviews with other interview groups (i.e. HNDU advisors and consultants).

Topic area	Main question	Sub-questions	Estimated time
Introduction	See script above <i>Remind the officer that we are interested primarily in the support they received in relation to the commissioning and production of the feasibility study</i>		3 (3)
	I want to start off by asking you some contextual questions, e.g. about your role and experience, and the experience and knowledge of your local authority in relation to heat networks		
Context and capacity	Can you please explain your role within the local authority?	How long have you been in this role? Where do you sit within the organisation? How much of your time is spent on heat network related activity? Do you feel that you are able to invest sufficient time in such activity? What role do you play in relation to decisions about the	5 (8)

		<p>development of heat networks in your local authority?</p> <p>Who else from your local authority is involved and in what ways?</p> <p>Do you feel that your heat network project has corporate / senior level support? Please explain why this might be the case.</p>	
Capability	<p>How confident are you that you and your organisation have the technical skills and understanding to engage effectively in heat network development?</p>	<p>Please explain why you think this?</p> <p>Are you able to identify any particular areas where you feel you do / do not have access to particular skills or types of expertise?</p> <p>Where do you look for advice or assistance in relation to your heat network project?</p> <p>Do you feel that you and your authority's ability to take forward work on heat networks has improved in recent years? If so, please describe how.</p>	
HNDU support	<p>I want to turn now to the support that you have received from the HNDU, particularly in relation to the development of your feasibility study.</p> <p>To be clear, by support we mean face-to-face meetings; written guidance materials; 'remote' support (such as emails and telephone calls); events and training, and the provision of Huddle.</p> <p>Could you please describe the types of HNDU support that you have received?</p>		3 (11)
Types of support received	<p><i>Guidance for interviewer: depending on the answers provided above, probe to find out more about the different types of support mentioned above:</i></p>		

	<ul style="list-style-type: none"> • <i>Written guidance</i> • <i>Face-to-face meetings</i> • <i>Remote support</i> • <i>Events (and training)</i> • <i>Huddle</i> <p><i>Focus MORE on those elements of support that the local authority had most of.</i></p> <p><i>ONLY cover the types of support that the local authority received.</i></p>		
	I now want to ask you about the different types of support you received in a little bit more detail...		
<p>Written guidance</p> <p>(HNDU provide written guidance on tender specs for all stages of heat networks, we also provide guidance on calc. social NPV and types of IRR. They also get guidance on what heat networks are, how LA can apply for funding, how to complete metric templates.)</p>	<p>What types of written guidance documents did you use?</p>	<p>At what stage(s) of the project did you use them?</p> <p>How often did you use them?</p> <p>Did you find the guidance helpful? If yes in what ways? If NO please explain why.</p> <p>Were some forms of written guidance more useful than others?</p> <p>Did you find that you needed or wanted access to other forms of written guidance?</p> <p>Did you use any non-HNDU written guidance and if so why and how did you secure this material?</p>	4 (15)
<p>Face-to-face meetings (including meetings that may have been attended by consultants or</p>	<p>You mentioned that you'd had one or more face-to-face meetings with HNDU advisors.</p>	<p>What was the purpose of these meetings?</p> <p>How often did you have these meetings? Were they pre-scheduled (e.g.. such as an inception meeting) or ad-hoc, or</p>	4 (19)

other external bodies)		<p>both?</p> <p>Did you find these meetings helpful and if so how? We are particularly interested in understanding whether you feel that they improved the quality of your feasibility study.</p> <p><i>(E.g.. what was the impact in terms of skills, knowledge, networks, leadership buy-in, added value, quality of outputs, etc.)</i></p> <p>If you did NOT find the meetings helpful please explain why not?</p> <p>Do you have any suggestions as to how face-to-face meetings might be made more useful?</p> <p>Would you like to have had more or less face-to-face meetings than you did? Please explain your answer. <i>(Probe to understand if there were any barriers to not having sufficient meetings)</i></p>	
Remote support (emails, telephone calls)	You mentioned that you'd had interactions with your HNDU advisor via email and/or telephone.	<p>What types of contact did you have and what was their purpose?</p> <p>Who initiated this contact?</p> <p>How frequently did you have contact, via emails and/or calls, with the HNDU?</p> <p>Was this contact helpful to you and if so how. We are particularly interested in understanding how such contact may have contributed to the quality of the feasibility study?</p> <p>Could this contact have been more effective? If yes please</p>	4 (23)

		<p>explain how and why?</p> <p>Would you like to have had more or less email and phone contact than you did? Why? <i>(Probe to understand if there were any barriers to initiating sufficient contact).</i></p>	
HNDU events programme	You mentioned you had attended an HNDU event or events. Which ones were they?	<p>In what way or ways did you hope to benefit as a result of attending these events?</p> <p><i>(Probe in relation to: e.g.. networking with other LA's, encouraging ambition of heat network development, increasing confidence in HN development (e.g.. discussing common issues with other LA's).</i></p> <p>How, if at all, did attending the event (or events) influence the quality of your feasibility study?</p> <p>Were there any unexpected outcomes associated with your attendance as such events?</p> <p>In what ways might these events have been more helpful to the development of your feasibility study? Please explain how and why?</p> <p>Would you like to have attended more events than you did? If YES why? <i>(probe to understand if there were any barriers to attending more).</i></p>	4 (27)
Huddle <i>Note that Huddle is used by HNDU to host technical documents and is</i>	You mentioned you have used HNDU's Huddle service.	<p>What are your perceptions of huddle? Please explain your answer.</p> <p>How often did you use it?</p> <p>And what did you use it for? (e.g. downloading</p>	3 (30)

<p><i>intended to serve as a 'community of practice' space for HNDU LAs</i></p>		<p>documents/guidance, data sharing / networking with other LAs / expressing interest in events)</p> <p>What contribution, if any, do you think Huddle made to the quality of your feasibility study?</p> <ul style="list-style-type: none"> • <i>What were the main benefits? Probe directly or indirectly, did they improve your skills/knowledge</i> <p>Are there alternatives to Huddle and if so what are they and do you make active use of these? Do these resources offer anything that Huddle doesn't?</p>	
<p>Types of support not received</p>	<p><i>For any types of support NOT reported as having being received/engaged with and/or reported as not being useful/beneficial</i></p> <p><i>(e.g.. Written guidance, Face-to-face meetings, Remote support, Events, Huddle), find out why...</i></p>		
	<p>Am I right in concluding from your answers so far that you did not receive/use the following:</p> <p>[list types of support not received]?</p>	<p>Why didn't you receive or use this type/these types of support?</p> <p>Were there times when you considered requesting or using support but didn't? If so why?</p>	<p>5 (35)</p>

Overall	Overall, how effective would you say the support from the HNDU has been in helping your local authority with heat network development so far?	<p>In what ways has HNDU support contributed to the quality of your feasibility study? Why?</p> <ul style="list-style-type: none"> • What difference has it made? Probe (e.g.. to skills, knowledge, networks, leadership buy-in, added value, quality of outputs, etc.) <p><i>Were there particular contexts or reasons why the support was effective, or not effective?</i></p> <p>Did you find that the support worked as a package, i.e. that different types of support were mutually self-reinforcing? Please explain your answer.</p> <p>Were some types of support more/less useful than others? If so, which were the most/least useful and why?</p> <p>In hindsight, would you have interacted with HNDU support differently? Were there any types of support that you would have liked more, or less of? Which were they and why?</p> <p>How would you characterise the approach to support that HNDU provide? (E.g.. helpful, friendly, intrusive, overbearing, available).</p>	6 (40)
Other sources of support	<p>Aside from anything you may have already mentioned were there other sources of support, outside of the HNDU, that you used in supporting your local authority's work on heat network development (particularly your feasibility study)?</p> <p>If so, what were they? (e.g.</p>	<p>Why did you use these other types of support?</p> <p><i>Were they providing something the HNDU was not?</i></p> <p>How helpful/unhelpful was this support? Why?</p>	3 (43)

	networking/good practice advice from other LA's)		
IF participant has agreed that DECC can listen to their recording	Based on what you have told us can I just check that you are still happy for us to share a copy of the recording with DECC?		1 (44)
Thank you and close	Is there anything else you would like to add about the support you have received from the HNDU?		2 (46)
	If we needed to, would you be happy to be recontacted for this research?		

RA2/3 topic guide

Example topic guides used to interview local authorities that plan to proceed with the commercialisation of a heat network, and was adapted for other local authority groups (e.g. those not proceeding with heat network projects). The 'stakeholder engagement' section of the topic guide was adapted for interviewing housing developers and NHS staff.

Topic area	Main question	Sub-questions	Estimated time (minutes)
Introduction	See script above		3 (3)
Context	Can you please explain your role within the local authority?	Where do you sit within the organisation? What influence would you say you have in relation to decisions about the development of heat networks in your local authority?	3 (6)

		<i>[particularly decisions about commercialisation of heat networks]</i>	
	Can you briefly summarise the heat network development activity your local authority has undertaken over the last few years	<i>[Contextual question to understand journey to date]</i> Has the work been led by the local authority? <i>If not, then by whom?</i> Who have been the local authority's main partners on this work?	
Commercialisation - scene-setting: where have they go to, what decisions have been made, what options did they investigate	We understand that your local authority has a completed HNDU-funded feasibility study and has taken the decision to proceed towards the commercialisation of a heat network as a result. Can you summarise how far you have got in terms of your plans to proceed towards the commercialisation process?		3 (9)
	What benefits does the council anticipate will be achieved from the heat network?	Which of these are most important to the council? Why? How, if at all, was the decision to proceed with the heat network informed by wider considerations (drivers) and council priorities?	3 (12)
	Can you briefly explain the ownership or operating model that you have chosen for the heat network? <i>e.g. wholly owned and operated, joint public-private venture, third-party owned and operated</i>	What has been decided about who will own, develop and operate the heat network?	3 (15)
	And what funding source, or sources, will be used to finance the heat network?	What is the expected rate of return and what IRR did the authority consider to be viable?	3 (18)

	e.g. grant/loan/other	Are there are other finance considerations that a decision to proceed is contingent on?	
	Can you briefly tell me about any other options you may have considered in terms of ownership and operating models for this heat network? And what other funding sources were considered, if any?		3 (21)
	To what extent has the local authority considered an exit strategy, if at all? (please explain your answer)		2 (23)
Commercialisation - how and why did they make their decisions	How did you consider: (a) whether to proceed with the commercialisation of the heat network? (b) which ownership/operating and funding options to take forward?	How did the council explore the options from feasibility study? What processes and criteria were used to decide upon whether to go ahead and which options to choose? Did you ever consider not going ahead? If so, why was this? To what extent do your decisions about funding and finance affect your choice of ownership/operating model (and vice versa)? And who was involved in these decisions, and when? [<i>internal and external</i>] Were any particularly influential in terms of the decision to proceed? To what extent were non-financial considerations taken into account? How did you make your final decision?	4 (27)
	What were the main influencing factors on the decisions taken? <i>i.e. in relation to the decision whether to proceed or not, and which operating model and funding source(s) were chosen</i>	For the decision about the ownership and operating model, what were the perceived advantages and disadvantages of the options you explored? And for the decision about funding source, what were the perceived advantages and disadvantages of the options you explored, if different to ones you've already mentioned?	4 (31)

	And why?		
Stakeholder engagement	<p>I'd like to ask you now about your experience of engaging with stakeholders to take forward your heat network.</p> <p>First of all, who are the most significant stakeholders for you in terms of determining the success or otherwise of your heat network?</p>	<p>Can you explain why these stakeholders are important to the success of your heat network? <i>What role will they play and why is it important?</i></p> <p>How did you identify these stakeholders and at what stage of the project did you approach them?</p> <p>To what extent has engagement with these stakeholders affected your decision to proceed? How?</p>	4 (35)
	How confident would you say that you and your local authority are in your ability to engage effectively with these stakeholders?	Please explain why	2 (37)
	Related to this, what has worked well in terms of engaging with these key stakeholders on heat network development?	<p>What has enabled this successful engagement, and how?</p> <p>Are you able to provide any examples of this?</p>	5 (42)
	What would you say have been the most significant challenges in terms of engaging with key stakeholders?	<p>Why, and with whom?</p> <p><i>Probe:</i></p> <ul style="list-style-type: none"> • <i>Are the challenges about the stakeholders themselves?</i> • <i>And/or are there issues with how the local authority engages with the stakeholders (i.e. the approach they are using?)</i> • <i>When (what stages) do these issues occur?</i> 	

		<ul style="list-style-type: none"> • <i>Have any of these challenges been overcome? If so, how</i> <p>Are there any other stakeholders you feel you should have engaged with, or would like to have engaged with? If yes, why haven't you engaged with them?</p> <p>What do you think needs to change to enable you to engage better with these stakeholders?</p>	
Future challenges	Looking ahead, do you anticipate any significant challenges in relation to:	<ul style="list-style-type: none"> • Engaging with stakeholders? • The next, immediate steps of heat network development? • The development of the heat network up to its build? 	2 (44)
Lessons learned	Based on your experiences so far, what advice would you have given to yourself/give to other local authorities on embarking on detailed project development and the commercialisation process for their heat network?		4 (48)
	What advice would you give to other local authorities about engaging with stakeholders on heat network development?	<i>Probe: is some learning more applicable to some stakeholder types or to certain stages of heat network development?</i>	
IF participant has agreed that DECC can listen to their recording	Based on what you have told us can I just check that you are still happy for us to share a copy of the recording with DECC?		1 (49)
Thank you and	Add closing questions		1 (50)

close			
-------	--	--	--

Appendix B: Approach to sampling

The following section describes the approach to sampling taken during the research.

Overall sample strategy

The initial sampling strategy was to select participants purposively to achieve range and diversity in relation to carefully chosen sample criteria. The aim of qualitative research is not to measure prevalence³⁶. The sample was therefore not intended to be statistically representative of the wider research population. Instead, the aim was to explore the range of views and experiences of each sample groups.

Quotas specifying the number of participants that were needed for each sample group were set to ensure a balanced and diverse sample. However, a number of practical limitations (see 'Limitations' section in the main report) meant that for a number of the sample groups, the quotas were not reached. Overall numbers therefore had to be bolstered by increasing the number of interviews with other sample groups.

Tables B.1 through to B.3 show the total numbers of interviews achieved against the sample targets.

Table B.1 Number of achieved interviews against sample target

Sample group	Sample target	Number of interviews achieved
Local authorities	24	22 (plus one Local Enterprise Partnership)
HNDU project leads	6	6
Consultants conducting HNDU-supported feasibility studies	6	6
NHS organisations	4	4
Housing developers	4	6

³⁶ The sample size was somewhat constrained by the availability and accessibility of potential interviewees.

RA1 sampling

The sampling aim was to interview eight local authorities who had completed an HNDU-funded feasibility study and for whom a feasibility study could be made available for review. The other four local authority interviews would be with local authorities whose feasibility studies were in progress.

For each sample group, we wanted to purposively select a range of local authorities to ensure some diversity across factors such as local authority type, geography, urban/rural location, HNDU project lead, consultancy, etc. In practice, however, it was not possible to purposively sample the eight with completed feasibility studies because the total sample population was also eight (see 'Limitations' section in the main report).

Details of the sample population were provided by HNDU, including contact information and details about each local authority's progress on the heat network development journey. This information was not always accurate, so CAG undertook further checks to verify the information HNDU provided.

Table B.2 Number of achieved interviews against sample target for each sample group in RA1

Sample group	Sample target	Number of interviews achieved
Local authorities with <u>completed</u> feasibility study	8	8 (plus one Local Enterprise Partnership)
Local authorities with feasibility study <u>in progress</u>	4	4
HNDU project leads	6	6
Consultants conducting HNDU-supported feasibility studies	6	6

A total of 25 interviews were achieved for RA1. The interviews focused on case studies of 12 local authorities. Eight case studies involved local authorities that had completed HNDU-supported feasibility studies. The remaining four were with local authorities whose HNDU-funded feasibility studies were in progress.

Six of these case studies were 'in-depth', involving interviews with three separate individuals for: the local authority lead officer, the HNDU project lead and the lead

consultant undertaking the feasibility study. An officer from a local enterprise partnership (LEP) was also interviewed for one of the case studies, as they were providing heat network development support to the local authority. The inclusion of multiple actors for each case study allowed for individual responses to be triangulated against the views of at least two other interviewees.

The remaining six case studies featured the relevant local authority officer only. These were introduced to bring the total number of local authority interviews to twelve, in order to ensure the research was based on a more diverse range of local authority experiences.

Table B.3 Final RA1 sampling frame

Sample group	Sample Criteria	'In-depth' case study interviews ³⁷	'Supplementary' case study interviews
Local authorities with <u>completed</u> feasibility study	BEIS has submitted feasibility study to CAG; feasibility study is a final version; local authority has <u>not</u> said they are 'already proceeding' in the screening survey	4 in depth case studies: <ul style="list-style-type: none"> • 4 local authority leads • 4 consultants • 4 HNDU project leads • 1 Local Enterprise Partnership 	<ul style="list-style-type: none"> • 4 Local authority leads
Local authorities with <u>feasibility in progress</u>	Data provided by BEIS suggest feasibility study is in progress; local authority has <u>not</u> said they are 'already proceeding' in the screening survey; local authority needs to pass screening	2 in depth case studies: <ul style="list-style-type: none"> • 2 local authority Leads • 2 consultants • 2 HNDU project leads 	<ul style="list-style-type: none"> • 2 local authority leads

RA2 and RA3 sampling

The sampling aim was to interview twelve local authorities who had completed an HNDU-funded feasibility study (in addition to those interviewed for RA1). These local authorities would be interviewed for both RA2 and RA3. For RA3, the aim was also to interview 4 housing developers and 4 NHS organisations³⁸.

³⁷ For the local authority case studies, consultants and HNDU representatives were interviewed in relation to specific LA feasibility studies. Consultants had produced (or were producing) a feasibility study for the local authority being interviewed, and HNDU project leads had provided support to the local authority.

The local authority sample groups were selected to ensure some diversity across factors such as local authority status in relation to decisions about whether to proceed with detailed project development. In practice, however, limitations on the overall population numbers for each sample group (see Limitations section in the main report) meant that the numbers achieved for each sample group differed from the target.

Screening Survey

CAG undertook a screening survey with HNDU-supported local authorities to identify:

- Local authorities suitable for the RA2 and RA3 research, using it to identify local authorities who had completed an HNDU-supported feasibility study and what their next steps were going to be; and
- Local authorities that were willing to help source potential NHS and housing developer organisations for the research.

Table B.4 Number of achieved interviews against sample target for each sample group in RA2 and RA3

Sample group	Sample target	Number of interviews achieved
Local authorities: in process of proceeding to the detailed project development stage following feasibility study	3-4	0
Local authorities: planning to proceed to the detailed project development stage (but not yet in process of doing so).	3-4	6
Local authorities: considering whether to proceed to the detailed project development stage	2-3	2
Local authorities: not proceeding with the development of a heat network, despite it being technically feasible and economically viable.	2-3	1
Local authorities: not proceeding with the development of a heat network, because it was not technically feasible or economically viable.	0	1
NHS Organisations	4	4
Housing developers	4	6

Appendix C. Research Area 1: CMO Framework

This appendix sets out a final context-mechanism-outcome (CMO) framework for the research. This shows the contexts through which HNDU guidance led to improved local authority officer capability to progress heat network development. It also provides an explanation of the process through which the CMO framework was developed.

Approach

Our approach to RA1 was based on realist evaluation principles. A realist approach³⁹ emphasises the importance of understanding not only *whether* a policy contributes to outcomes (which may be intended or unintended) but *how*, for *whom* and in *what* circumstances.

Taking a realist approach involves the development of a set of CMO configurations. A CMO configuration is a hypothesis that, under a given set of circumstances (context), the resource offered by an intervention will prompt a certain response (mechanism) that will generate an outcome (intended/unintended).

Typically in a realist evaluation, an initial set of CMO configurations are theorised, then evidence is collected to test them. A final set of CMO configurations are then developed based on the research findings.

In this research, however, the findings themselves were used for theory-building (rather than theory-testing).⁴⁰ An initial CMO framework was developed. But at the analysis stage of the research, the research team agreed it was not framed at the right level of detail or abstraction to be useful as an analysis tool. The final CMO framework was therefore built from the bottom-up through analysis of the research findings only, rather than through testing the initial framework against these findings. This involved creating a coding framework that facilitated the identification of contexts, mechanisms and outcomes for each local authority case, and then analysing these to identify an overarching CMO framework for the research as a whole.

CMO configurations and applicability of findings

CMO configurations are the key analytical tools of realist evaluation⁴¹. The CMO framework consists of five key CMO configurations. Each configuration describes:

³⁹ R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.

⁴⁰ This is also a valid realist approach. See e.g.: R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.

⁴¹ R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.

-
- a. Contextual factors (e.g. of the local authority/ local authority officer or the way HNDU guidance was delivered);
 - b. Mechanisms (the local authority's reasoning in response to the HNDU guidance). These are the 'causal forces' or processes, which may or may not fire given certain contexts; and
 - c. Outcomes (intended or unintended) as a result of the intervention.

The mechanisms of an intervention will only generate the desired outcomes if particular contexts are in place.

The process of developing and testing CMO configurations provides explanations of how and why a programme works in different contexts. The idea behind realist evaluation is that these insights can support decisions about how best to scale up or roll out a programme⁴².

CMO configurations can be pitched at different levels of abstraction. For the configurations below, we sought to identify 'middle range theories' (MRTs). Pawson and Tilley argued MRTs are most useful because they are specific enough to generate particular propositions to test and general enough to apply across different situations⁴³. As such, the learning from the evaluation can be generalised to similar capability-building programmes. E.g. many of contextual factors that lead to a mechanism such as 'capability-building' firing (e.g. guidance based on sound expertise, flexible guidance provision, etc.), should also be transferable to other capability-building programmes for local authorities.

Finally, the CMO configurations are based on the idea of 'generative causality'. In other words, the mechanisms only fire when the context is conducive. As such, the findings cannot be regarded as universally applicable. Instead, the CMO configurations provide an indication of the conditions in which HNDU guidance works (or not) and how they do so. The aim is to allow decision makers to assess whether interventions that proved successful in one setting may be so in another setting, and to help programme planners in adapting interventions to suit specific contexts⁴⁴.

⁴² Westthorp, G. (2014), *Realist Impact Evaluation: An Introduction*, Methods Lab, September 2014. Available at: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9138.pdf>.

⁴³ R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.

⁴⁴ Better Evaluation, *Realistic Evaluation*. Available at: http://betterevaluation.org/en/approach/realist_evaluation

CMO framework for HNDU guidance

The CMO configurations table (c.1) shows the mechanisms through which different contexts led to improvements in local authority officer capability as a result of HNDU guidance.

In developing the framework, we have adapted the approach used by Vogel and Punton in their evaluation of the BCURE programme⁴⁵. Vogel and Punton recognised that realist evaluators have a recurring conceptual challenge in differentiating between the mechanism and the intervention. To clarify this difference, they decided to incorporate features of the intervention as an additional element to their CMO configurations, in order to separate out features that are inherent in or under the control of the programme (such as training design or length), from contextual factors that are not (such as professional incentives to participate in the training) when considering what might trigger a particular mechanism.

We have followed a similar logic by separating out the ‘intervention’ contexts (those determined by the programme of HNDU guidance) and local authority contexts (those that affect a local authority or local authority officer’s engagement with HNDU guidance). As with Vogel and Punton, our CMO configurations read as sentences to help the reader to clearly understand the relationship between the contexts, the mechanism and the outcomes.

⁴⁵ Vogel, I. and Punton, M. (2016), *Building Capacity to Use Research Evidence (BCURE) Evaluation: Stage 1 Synthesis Report*, Submitted by itad. Available at: <http://www.itad.com/reports/building-capacity-use-research-evidence-bcure-evaluation-stage-1-synthesis-report/>

Table C.1 The HNDU Evaluation CMO Framework

CMO	Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome	Secondary Outcome
CMO 1: 'Capability- building'	<p>Where HNDU guidance is:</p> <ul style="list-style-type: none"> • based on sound technical expertise, • relevant and timely in relation to the local authority's current and anticipated work on heat networks, and • pitched at the right level for the expertise and needs of the local authority officer and the local authority as a whole... 	<p>... and where:</p> <ul style="list-style-type: none"> • there is a perceived need to improve capability on heat network development (beyond that provided by other sources), and • the local authority officer has sufficient time to engage with the guidance... 	<p>... the direct provision of subject expertise and experience by the HNDU...</p> <p>... enables the local authority officer to build their skills and knowledge and/or their confidence on heat networks...</p>	<p>...leading to improved local authority officer capability to progress heat network development...</p>	<p>...which can also lead to perceived improvements in in the quality and comprehensiveness of heat network studies (e.g. feasibility studies).</p>
CMO 2: 'Capability facilitation'	<p>Where HNDU guidance is:</p> <ul style="list-style-type: none"> • based on sound technical expertise, • relevant and timely in relation to the local authority's current and anticipated work on heat networks, and • pitched at the right level for the expertise and 	<p>... and where:</p> <ul style="list-style-type: none"> • there is a perceived need to improve capability on heat network development (beyond that provided by other sources) • the local authority officer has the motivation to for 'self-learning' on heat networks, and • the local authority officer 	<p>... the provision of coaching/mentoring and/or support tools by the HNDU...</p> <p>... facilitates local authority officers to think about issues in different ways, to feel comfortable with new ideas and to take responsibility for their own learning</p>	<p>...leading to improved local authority officer capability to progress heat network development...</p>	<p>...which can also lead to perceived improvements in in the quality and comprehensiveness of heat network studies (e.g. feasibility studies).</p>

CMO	Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome	Secondary Outcome
	needs of the local authority officer...	has sufficient time to engage with the guidance	<i>and development...</i>		
CMO 3: 'Enabling peer networking'	Where HNDU guidance: <ul style="list-style-type: none"> has good interpersonal skills, and supports links and connections with other local authorities working on heat networks... 	... and where: <ul style="list-style-type: none"> there is a perceived need to improve capability on heat network development (beyond that provided by other sources) one or both of the local authorities could benefit through the sharing of knowledge and experiences... the local authority officer finds value in learning from others' experiences the local authority officer has the confidence to share their experiences, and the local authority officer has sufficient time to engage with the guidance... 	...helping the local authority officer to establish links with relevant local authoritiesenables collaborative learning with other local authority officers working on heat network development...	...leading to improved local authority officer capability to progress heat network development	...which can also lead to perceived improvements in in the quality and comprehensiveness of heat network studies (e.g. feasibility studies).
CMO 4: 'Cheerleading'	Where HNDU project lead: <ul style="list-style-type: none"> has good interpersonal 	... and where: <ul style="list-style-type: none"> there is a perceived need to for 'moral 	... using techniques to motivate the local authority officer...	...leading to improved local authority officer capability to	...which can also lead to perceived improvements in in the quality and

CMO	Intervention contexts	Local authority contexts	Mechanism (Resource... reasoning and response)	Primary Outcome	Secondary Outcome
	<ul style="list-style-type: none"> skills, and has a proactive approach to communication ... 	<ul style="list-style-type: none"> support' on heat network development the local authority officer has sufficient time to engage with the guidance... 	<p>... stimulates the local authority officer to maintain momentum in progressing activity on heat network development...</p>	progress heat network development	comprehensiveness of heat network studies (e.g. feasibility studies).
CMO 5: 'Independent critic'	<p>Where HNDU project lead:</p> <ul style="list-style-type: none"> has good interpersonal skills delivers guidance in a timely and flexible manner has sound technical expertise, and understands local needs and circumstance... 	<p>... and where:</p> <ul style="list-style-type: none"> there is a perceived need for improving the way in which the local authority engages and manages its consultants on heat network studies, and the local authority officer has sufficient time to engage with the guidance the local authority is open to additional guidance from the HNDU without feeling undermined by it the consultants working on a heat network study see value in HNDU's input... 	<p>... helping the local authority to identify ways to critique and challenge the delivery of feasibility studies...</p> <p>... enables the local authority to more effectively manage and engage the consultants delivering the heat network study...</p>	...resulting in perceived improvements in in the quality and comprehensiveness of heat network studies (e.g. feasibility studies).	

Appendix D: Review of HNDU supported and non-HNDU supported feasibility studies

Introduction and Methods

Eight HNDU supported feasibility studies⁴⁶ and six feasibility studies produced prior to the establishment of the HNDU⁴⁷ were reviewed as part of the evaluation. This work was primarily conducted to investigate whether activity identified in the qualitative interviews could be detected in the reports received by the supported local authorities, i.e. to track the impact of HNDU support. The research aimed to address the high-level research question:

- Research Area 1 (RA1): How, in what circumstances and to what extent does HNDU guidance impact on local authorities?

The secondary aim of reviewing feasibility studies was to assess the overall quality and scope of the reports. The review of the six non-HNDU supported studies were undertaken to provide a form of comparison, i.e. to establish if there were any clear differences, in quality and or scope between studies produced prior to the establishment of the HNDU and those produced with HNDU support – a raising of standards being one of the HNDUs wider objectives. After reviewing both sets of studies, the evaluation could not make any valid conclusions on whether there was a difference in scope and quality between HNDU supported and non-supported studies. See below for further details.

Feasibility studies were reviewed using the HNDU's Techno-economic Feasibility Evaluation Framework. The framework lists forty-nine criteria with these being organised under the following headings.

- Energy data
- Energy supply
- Energy centre location
- Network routes
- Technical details
- Economic
- Risks

⁴⁶ These eight studies were produced for the local authorities interviewed for RA1, by four different consultants. Funding for the studies came was provided during HNDU funding rounds 1-4.

⁴⁷ Studies produced during the period 2009-2013.

-
- Heat network code of practice (compliance with minimum standards)
 - General issues

The reviewed reports were classified as having met the criteria in full, in part or not met. The review process was led by a technical expert with experience of developing and reviewing techno-economic studies for heat networks. To ensure consistency and to provide quality assurance each study, and the associated review, were checked by the CAG project manager. In order to ensure that the assessment criteria were applied correctly, CAG liaised with HNDU staff to ensure that there was a shared understanding of the template criteria meant and what HNDU expectations were.

Limitations of the approach and insights gained

In practice the feasibility study review did not provide sufficiently robust findings to inform RA1. It also proved to be of limited value in terms of providing quality assurance or as a means of investigating potential quality differences between HNDU and non-HNDU supported heat network feasibility studies. However, the exercise did provide some key insights into the nature and diversity of feasibility studies, and factors to keep in mind when assessing quality.

The reasons the feasibility study review wasn't able to provide robust findings are:

Sample

- **Not direct comparisons:** The original sample frame aimed to use the feasibility studies produced from the case studies for RA1. For a counterfactual, the aim was to review the feasibility studies undertaken by the same group of consultancies that produced the HNDU supported reports. In practice it was only possible to include counterfactual reports for two of the four consultancies, thus preventing a direct comparison from being made.
- **Availability of reports:** Securing studies, both HNDU supported and non-HNDU supported, proved to be challenging. As a result three of the HNDU supported studies included in the review had not been formally signed off as being 'final' drafts.⁴⁸ Similarly, one of the studies produced without support from the HNDU was proved to be an early stage draft of poor quality, and was therefore excluded from the sample. The inclusion of studies that had not been formally signed off may not provide an accurate picture of the quality of the final output.

⁴⁸ These documents were included in the sample, as they were deemed to be late versions, rather than first or second drafts.

-
- Studies were expected to be either feasibility studies or detailed project design documents (Part 2 report). In practice all studies were found to be feasibility studies.

Method

- **Availability of documents:** The documents supplied to the assessment team did not contain all of the information required to allow for a full review (e.g. previous drafts). Some of the studies appeared to be interim or partial studies, which meant that not all of the assessment criteria applied.
- **Applicability of criteria:** In some instances criteria were not applicable to the reviewed reports. Generally this was either because particular criteria did not relate to the type of report being reviewed, or because an issue had been addressed in a previous report (which was not available for review). As a result, none of the reviewed reports met all of the HNDU criteria, but there were several legitimate reasons why reviewed studies did not satisfy some of the HNDU criteria. Therefore, the quality, and in particular the 'fitness for purpose' of individual reports cannot not be assessed solely on the basis of the number of criteria met. This again makes comparisons between reports difficult.
- **Diversity of studies reviewed:** The reviewed studies varied widely in detail and scope, and in some instances assessment criteria either did not apply, or were only partially relevant. This again undermines the validity of comparisons between individual studies or across the sample.

General insights from studies

As a result of the limitations reported above, no key findings were generated due to issues with the robustness of the approach. However, this exercise generated a number of insights:

- Most of the studies did not consider cooling.
- All of the HNDU supported studies were found to have been future proofed, i.e. to have given due consideration to the use of lower carbon heat sources as they become available. Only 2 of the pre-HNDU studies were found to have given this adequate consideration.
- Non-HNDU supported studies show more evidence of consideration of the use of heat from energy from waste, which may be reflective of local opportunities.
- Most of the studies have not approached their district network operator (DNO) or given thought to potential gas network constraints.
- Estimates based on quotes are not generally used in financial modelling.