



UK Government

RAF008/2324: Evaluation of the Heat Network Efficiency Scheme

Phase 3: Interim Impact Evaluation of Revenue Projects and Second Process Evaluation

Acknowledgements

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Contents

Contents	3
Glossary	4
Executive Summary	8
Report Scope and Introduction	15
Evaluation Methodology	21
Process Evaluation Findings	26
Revenue Projects Impact Evaluation Findings	40
Implications	50
Next Steps	55
Annex 1: Evaluation Questions	56
Annex 2: Evaluation Methodology	59
Annex 3: Theory of Change	60
Annex 4: Contribution Analysis	62
Annex 5: Policy response following HNES Phase 3 evaluation	72

Glossary

Assessors – Expert Technical Advisors (TA) from Ramboll, who are responsible for reviewing the applications received and making recommendations for funding to the Investment Committee (IC).

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

Building Management System (BMS) – A BMS is a computer-based control system installed in buildings that controls and monitors its main mechanical plant such as boilers and ventilation to maintain optimum comfort conditions. Typically found in larger buildings, a BMS provides comprehensive control over the building's mechanical and electrical systems, encompassing heating, ventilation, lighting, and hydronic systems¹.

Capital Grants – HNES capital grants fund up to (but not including) 50% of the delivery (installation) of eligible heat network intervention/improvement measures. There is a budget of up to £30m in total for capital projects across FY23/24 and FY24/25².

Capital Projects – Capital projects are successful applicants to HNES who have been awarded capital funding to deliver (install) eligible intervention/improvement measures.

Citizens Advice – Citizens Advice offers online and in-person advice on various topics including bills, benefits, grants and council tax to people across the UK.

Chartered Institution of Building Services Engineers (CIBSE) - The Chartered Institution of Building Services Engineers is an international professional engineering association that represents building services engineers.

Competition and Markets Authority (CMA) – The CMA is the UK's principal authority responsible for competition and consumer protection. It enforces competition and market regulation by investigating cases, providing rulings, issuing penalties, and supporting government and other market regulators.

Consultants – Consultants are specialist third parties who conducted HNES optimisation studies for revenue projects or supported capital projects to deliver and/or commission improvement measures. In some cases, they also advised on the technical and data-specific aspects of projects' applications to the scheme.

¹ The London School of Economics and Political Science. (2024). Building temperatures and BMS from <https://info.lse.ac.uk/staff/divisions/estates-division/a-z-of-services/maintenance/building-temperatures-and-bms>.

² It is important to note that the figures included in this report represent the period of time from which this report was written. Figures should therefore not be taken as up to date for the Scheme, which has had additional funding allocated and further funding rounds since the report was written. The latest funding awards for HNES can be found on the Gemserv website: <https://gemserv.com/heat-network-efficiency-scheme-hnes/>

Consumer Scotland – Consumer Scotland is the statutory, independent body set up by the Scottish Parliament to promote consumer protection across water, energy and postal services.

Customer Detriment – Customer detriment is the potential harm or disadvantage that heat network consumers may face due to factors such as high prices, poor service quality, unreliable supply, or lack of choice and transparency³.

Customers In Need – Dwellings supplied heat/energy by a heat network, in which a resident or residents are considered financially vulnerable and will therefore benefit significantly from reduced costs for heating or service improvements through HNES support. This includes any of the following categories (or equivalent) of status or accommodation type: social housing; low-income housing; customers in fuel poverty; extra care housing; low-income care homes and supported housing.

Delivery Partner, Gemserv – Gemserv is the HNES delivery partner and was also the delivery partner for the HNES Demonstrator Scheme. Gemserv are responsible for the mobilisation and day-to-day delivery of HNES and ongoing performance monitoring.

HNES Demonstrator⁴ – The HNES Demonstrator provided heat network upgrade funding to successful applicants prior to the launch of the main HNES. It was a £4.175m grant support programme for FY 21/22, split by revenue grants (budget up to £0.375) and capital grants (budget up to £3.8m).

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

Energy Ombudsman – The Energy Ombudsman is a free and impartial service that aims to resolve disputes between consumers and suppliers in the energy sector.

External Consultants – See ‘Consultants’.

External Partner – An external partner is an organisation that is supporting Gemserv (see ‘Delivery Partner’) to deliver the HNES and the HNES Demonstrator. This includes Ramboll (supporting Gemserv on application assessment), Turner and Townsend (on pre-application engagement/support and cost consultancy), and Lux Nova Partners (on legal advice).

³ The Department for Energy Security and Net Zero. (2023). Heat networks regulation – consumer protection from <https://assets.publishing.service.gov.uk/media/64d0bb84a4045e0011a84b44/heat-network-consumer-protection-consultation-document.pdf>

⁴ The Department for Energy Security and Net Zero and The Department for Business, Energy & Industrial Strategy. (2021). Heat Network Efficiency Scheme Demonstrator from <https://www.gov.uk/government/publications/heat-network-efficiency-scheme-demonstrator>

Green Heat Network Fund (GHNF) – The GHNF is a DESNZ capital grant funding programme launched in 2022⁵ that supports the commercialisation and construction of new and existing low and zero carbon (LZC) heat networks in England.

Heat (or Hydraulic) Interface Units (HIUs) – A HIU is a device that provides centralised heating and hot water for multiple properties using one large heat source.

Heat Network – A heat network is the system of insulated pipes which transports heat from a source (or multiple sources) to more than one end user. There are two types⁶ of heat networks:

1. **A communal heat network** which supplies heat and hot water to a number of customers within one building only.
2. **A district heat network (district heating)** which supplies heat and hot water to customers in more than one building. District heating networks can range in size from a few hundred metres supplying just a few homes to several kilometres of pipe supplying heat and hot water to multiple buildings in a development.

Heat Network Transformation Programme (HNTF) – The HNTF is a government initiative to support the development and decarbonisation of low and zero carbon heat (and cooling) networks. The programme includes the HNES, GHNF, Heat Network Zoning, Market Frameworks, Consumer Protections and Sector Skills.

Heat Network Zoning – Heat network zoning is the identification and designation of zones where heat networks provide the lowest-cost, low-carbon heating option.

Heat Networks Delivery Unit (HNDU) – This Department for Energy Security and Net Zero team provides support and guidance to local authorities in England and Wales who wish to explore heat network opportunities.

Heat Networks Investment Project (HNIP) – The HNIP was the previous government capital grant funding programme for heat networks which provided £320m to gap fund projects in England and Wales.

Heat Network Efficiency Scheme (HNES) – HNES is a £32m⁷ grant support programme. It is a government scheme that provides funding to public, private and third-sector applicants in England and Wales to improve the performance of existing/operational heat networks where customers and/or operators are experiencing sub-optimal outcomes.

⁵ For more details about the GHNF, see here: <https://www.gov.uk/government/publications/green-heat-network-fund-ghnf>.

⁶ The Department for Energy Security and Net Zero. (2023). Evaluation of the Heat Networks Investment Project from [Evaluation of the Heat Networks Investment Project – Final report \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk)

⁷ Since this report was written, HNES has been allocated extra funding. More information can be found here: [Apply for the Heat Network Efficiency Scheme \(HNES\) - GOV.UK](https://www.gov.uk/government/consultations/apply-for-the-heat-network-efficiency-scheme-hnes)

Heat Network Technical Assurance Scheme (HNTAS) – HNTAS is a technical assurance scheme that aims to ensure that heat networks meet a minimum level of performance and reliability.⁸

Net Zero – The term ‘Net Zero’ refers to a balance between the carbon emitted into the atmosphere and the carbon removed from it. The Net Zero strategy⁹ sets out policies and proposals for decarbonising all sectors of the UK economy to meet our net zero target by 2050.

Ofgem – Ofgem is the UK's energy regulator that regulates energy markets for consumer protection.

Operators – Heat network operators are building owners or managers who are responsible for complying with all relevant legislation. They supply heat and/or cooling to more than one end user, and charge those end users for the supply of heating, cooling or hot water.

Optimisation Study – A heat network optimisation study is a process of assessing the performance of existing district heating or communal heating projects that are operating sub-optimally and resulting in poor outcomes for customers and operators, and assessing packages of improvement measures. These studies are funded from the revenue grants provided by the HNES and HNES Demonstrator (See ‘Revenue Grants’).

Public Sector Decarbonisation Scheme (PSDS) – The PSDS provided grants for public sector bodies to fund heat decarbonisation and energy efficiency measures. The scheme supports the aim of reducing emissions from public sector buildings by 75% by 2037, compared to a 2017 baseline, as set out in the 2021 Net Zero and Heat and Buildings strategy¹⁰.

Revenue Grants – Grants to fund up to 100% of procurement or mobilisation of external third-party support to carry out optimisation studies. There is up to £2m available in total across projects for revenue grants across FY23/24 and FY24/25¹¹.

Revenue Projects – Revenue projects are successful applicants of HNES or HNES Demonstrator who have been awarded funding to procure or mobilise support to undertake optimisation studies.

⁸ The Department for Energy Security and Net Zero. (2024). Heat Network Technical Assurance Scheme guidance from [Heat Network Technical Assurance Scheme \(HNTAS\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/heat-network-technical-assurance-scheme-hntas)

⁹ The Department for Energy Security and Net Zero. (2021). Net Zero Strategy: Build Back Greener from <https://www.gov.uk/government/publications/net-zero-strategy>

¹⁰ The Department for Energy Security and Net Zero. (2023). Heat and buildings strategy from <https://www.gov.uk/government/publications/heat-and-buildings-strategy>

¹¹ It is important to note that the figures included in this report represent the period of time from which this report was written. Figures should therefore not be taken as up to date for the Scheme, which has had additional funding allocated, and further funding rounds since the report was written. The latest funding awards for HNES can be found on the Gemserv website: <https://gemserv.com/heat-network-efficiency-scheme-hnes/>

Executive Summary

Programme Overview

It is important to note that the figures included in this report represent the period of time from which this report was written. Therefore, figures do not represent the current status of HNES, which has had additional funding allocated and further funding rounds since the report was written. Some projects have also since withdrawn from the Scheme. The latest funding awards for HNES can be found on the Gemserv website¹².

At the time of writing, the Heat Network Efficiency Scheme (HNES) was a £32 million revenue and capital grant support programme spanning FY23/24 and FY24/25. An additional £45m capital grant funding to 27/28 was announced in December 23. It supports improvements in existing district and communal heating projects that are performing sub-optimally and aims to reduce carbon emissions by making heat networks more efficient, reduce customer detriment to improve consumer confidence, and help prepare the heat network market for sector regulation and standards. Launched in February 2023, the scheme is open to public, private, and third-sector applicants in England and Wales, with funding to be spent by 2028. The scheme will deploy £2 million in revenue grants for procuring third-party support to identify causes of sub-optimal performance and recommend costed improvement options, and £30 million in capital grants for the installation of measures to improve efficiency and address sub-optimal outcomes.

Across its first five¹³ rounds, HNES has received a total of 254 applications. To date, £32.09 million has been awarded to 198 projects. This consists of £29.2 million to 54 capital projects and £2.88 million to 144 revenue projects.

Evaluation Scope and Approach

RSM UK, supported by ACE Research, CAG Consultants and Winning Moves, have been appointed by the Department for Energy Security and Net Zero (DESNZ, the Department) to conduct process, impact and value for money evaluations of HNES throughout its duration. This report reflects Phase 3 of the evaluation (January 2024 to June 2024) and provides the **second process evaluation of HNES** and an **interim impact evaluation of the HNES revenue projects**.

This second process evaluation seeks to understand how well the scheme has been delivered to date, including what has worked and what has not, and how this can be used to improve

¹² Gemserv. (2023). Heat Network Efficiency Scheme (HNES) from <https://gemserv.com/heat-network-efficiency-scheme-hnes/>

¹³ The successful applicants across the first five funding rounds are currently in progress whereas applicants to funding rounds 6, 7 and 8 are still under assessment.

HNES and future schemes. The interim impact evaluation of revenue projects assesses whether the optimisation studies are allowing operators to make informed decisions, what improvements can be made and how, and the potential savings that are likely to be delivered across the measures proposed.

The evaluation has adopted a theory-based approach, drawing on a programme Theory of Change (ToC), detailed in Annex 3. Data was collected through stakeholder interviews, applicant surveys, data analysis and a review of Gemserv monthly programme level reports. Data collection has involved interviews with 12 capital applicants and consultants, as well as 20 revenue project operators and consultants. Interviews were conducted from January to April 2024. In addition, two online surveys (with telephone follow-ups) were issued to the population of beneficiaries from rounds 1 to 3, namely:

- a survey on the procurement and monitoring processes for capital and revenue projects (February 2024), which received 31 responses (43% response rate)
- a survey on the early impacts from the revenue projects only (May 2024), which received 19 responses (37% response rate).

The process evaluation also included a review of Gemserv monthly programme level reporting, focussing on risks. Impact evaluation findings are limited by the relatively low number of projects who had applied for capital funding after receiving revenue funding at this stage.

Process Evaluation Findings

The process evaluation sought to understand what has worked well, what could be improved and lessons for different projects in HNES and future rounds of HNES. The following are the key findings:

HNES Scheme Delivery

What worked well:

- Most projects reported an efficient transition from application success to project mobilisation, with a significant majority experiencing no procedural issues, highlighting effective initial setup processes.
- The majority of participants reported positive interactions with the scheme's administration, praising the clarity and supportiveness of communications from Gemserv and its partners.
- There were continuous improvements to the scheme's administration, including refinement of guidance documents and support mechanisms such as webinars, which helped projects to comply with reporting requirements.

What could be improved:

- 64% of capital and all surveyed revenue projects experienced delays in delivery due to internal factors such as resourcing and contract negotiations.
- Delays in capital project delivery were frequently attributed to a scarcity of contractors with the expertise required to complete the building work. This impacted on project timelines and increased the risk of non-compliance with funding deadlines.
- Numerous projects highlighted the challenges of aligning project mobilisation with funding deadlines, often necessitating extensions and adjustments to meet operational realities.

Key Lessons:

- While communication from Gemserv was generally positively received, feedback suggested a need for more personalised interactions to clarify project-specific queries and ensure a better understanding of complex requirements.
- Communications from Gemserv, especially around project updates and reminders, could benefit from being more specific about which projects they refer to so as to avoid confusion among consultants who manage multiple projects.
- There is a valuable opportunity in facilitating knowledge exchange on common challenges including contract negotiations, through webinars or collaborative sessions, which could significantly benefit both new and ongoing projects by sharing lessons learned and best practices across the scheme.

Funded Project Experience

What worked well:

- The majority of capital and revenue projects effectively utilised their allocated funds within the fiscal year, with a high percentage of projects spending their total funding, demonstrating effective financial management under tight timelines.
- Projects with strong stakeholder support, such as from local authorities, relevant housing associations and tenants, and those well-aligned with broader organisational goals, generally experienced smoother project mobilisation and fewer implementation challenges.
- Projects were generally successful in mobilising the necessary resources, including expertise and workforce, particularly where there was a proactive approach to procurement and team formation, allowing for flexibility and responsiveness in project execution.

What could be improved:

- Despite effective financial management, projects faced challenges in bringing together funding, expertise, workforce, resources, and stakeholder support, especially for capital

projects. These challenges were compounded by financial management complexities, such as the need to spend allocated funds within the fiscal year.

- Difficulty in securing technical expertise and necessary supply chain engagements often delayed project mobilisation and execution, particularly for capital projects where 42% reported difficulties in procuring supply chain organisations.
- Capital and, to a lesser degree, revenue projects faced challenges in data collection and management, with a substantial proportion of projects finding the collection of necessary monitoring data difficult due to its detailed and highly technical nature.

Key Lessons:

- Initially, frequent financial risks, such as rising material costs, highlighted the need for more rigorous financial planning from projects to stay within budget and ensure adequate funding throughout the project lifetime. Over time however, project-level financial management has increasingly evolved to become more proactive.
- Developing stronger networks and support mechanisms for engaging supply chain partners and technical experts may mitigate delays and improve project execution efficiency, particularly for capital projects.
- Introducing more structured and clear guidelines for data collection, possibly through training sessions and the use of detailed case studies may help project teams manage the complexity of data requirements more effectively. This approach would mitigate against initial misinterpretation of reporting requirements and improve the overall quality of monitoring data submissions.

Funded Project Outcomes, Outputs and Next Steps

What worked well:

- The optimisation studies were effective in identifying key technical issues such as inadequate insulation and inefficient heat control systems.
- Having clear project objectives that align with organisational goals and strong stakeholder engagement enabled projects to achieve successful outcomes.

What could be improved:

- There was significant variability in outcomes achieved, particularly among revenue projects. Factors such as project management quality, technical challenges, stakeholder engagement, and the effectiveness of procurement strategies affected these outcomes.
- Projects were asked whether they will apply to GHNF and many expressed uncertainty. This indecision was often due to difficulties in securing match funding and uncertainties about the economic feasibility and payback periods of proposed improvements, and some projects may not meet the GHNF criteria.

Key Lessons:

- Simplifying and clarifying the funding application processes could reduce uncertainties and aid projects in planning and securing funding. This includes providing detailed guidelines on eligibility, application procedures, and expected timelines.
- Future rounds of funding could support ensuring the availability and capability of relevant contractors and maintenance professionals. This could include creating a pre-qualified contractor list or providing additional support and training to enhance the technical capabilities of teams involved in project implementation.

Impact Evaluation Revenue Project Findings

The impact evaluation has assessed the perceived value of the optimisation studies and their anticipated impact. It has also identified potential areas for improvement, next steps for the revenue projects, whether operators are delivering similar works across their portfolios outside of HNES funding, and if the optimisation studies are supporting any internal business cases or investment decisions for improvements.

Value and Effectiveness of Optimisation Reports

- Operators appreciated the depth of analysis provided by the optimisation studies. The reports have been instrumental in providing detailed analyses and recommendations, providing a comprehensive review of heat network systems and highlighting specific performance issues and proposing targeted interventions. The detailed assessments enabled tailored recommendations which were instrumental for planning upgrades and interventions.
- These reports offer a holistic view of network performance, crucial for identifying the most impactful networks, alongside cost-benefit considerations which helped operators to prioritise interventions that offer the best return on investment. Operators indicate that insights from these studies significantly aid in building strong cases for capital improvements, highlighting the direct pathway from revenue-funded explorations to capital project applications.
- 84% of survey respondents felt the optimisation studies increased their confidence in their heat network's operation. Operators valued recommendations that were communicated clearly and were accessible to non-technical staff.
- The perceived usefulness of recommendations varied, with some seen as easy to implement and cost-effective, while others were deemed to be too costly or technically demanding.

Factors Influencing Implementation Decisions:

- The decision to implement changes was heavily influenced by the cost of improvements and the expected return on investment. Operators needed to balance the upfront costs with long-term benefits, such as energy savings and carbon reductions.
- Operators prioritised recommendations based on cost-effectiveness and the level of disruption to residents. Low-cost and minimally disruptive measures were preferred, highlighting the need for strategic planning in the application of more extensive, capital-intensive recommendations.
- Other important considerations included the potential to reduce carbon emissions, which aligns with upcoming regulations such as the Heat Network Technical Assurance Scheme (HNTAS), and the potential impact of improvements on resident welfare and operational costs. Operators indicated that they were more likely to implement improvements if the benefits were clear to residents.

Next steps for revenue projects

- While most operators that were interviewed are still deciding whether to implement the improvements, one project has decided to self-fund recommendations. Respondents emphasised how essential cost-effective solutions are, as cost and funding are the biggest barriers for operators to implement changes.
- While this is a challenge, consultants ensured that the optimisation studies prioritised improvements from low-cost and least disruptive to residents, to costly and disruptive to residents. This has allowed operators to identify immediate actions and phase capital-intensive changes. Although demand has been high for HNES capital funding, projects are still deciding if and how they will proceed with capital works.
- Once final decisions are made, 84% of survey respondents plan to take various actions regarding their heat networks. These plans include implementing identified improvements, including through HNES capital funding, switching to low carbon heat sources, and upskilling their workforces.

Interim Contribution Claims

Based on the evaluation findings, this report has provided an update of the interim Contribution Claims. This update has tested each contribution claim, evaluating the current and expected evidence against the backdrop of the programme's ToC. Given the early stage of the impact analysis, all contribution claims are inconclusive and will be further tested throughout the evaluation. This is explained further in the main body of the report.

Next Steps

Phase Four of the HNES evaluation (July 2024 to December 2024) will focus on three key aspects of HNES: the **final process** evaluation of both revenue and capital projects, the **interim impact evaluation** of capital projects and the **impact evaluation of HNES Demonstrator capital projects**.

The **final process** evaluation will cover post-upgrade (for most capital projects in funding rounds 1-2), one year on from funding delivery and post-optimisation for revenue projects. This will also involve pulling together all process evaluation strands. The **interim impact** evaluation will utilise baseline and monitoring data, and the contextual findings from the evaluation to estimate primary fuel savings; carbon emissions reductions; network efficiency; cost of heat; and service interruptions. Customer detriment will also be captured through surveys with customers. The **impact evaluation of Demonstrator capital** projects will focus on whether the capital projects in the HNES Demonstrator realised their benefits after making changes to their heat networks.

Report Scope and Introduction

RSM UK, supported by ACE-Research, CAG Consultants and Winning Moves, have been appointed by the Department to evaluate HNES. This evaluation report will focus on the processes and interim impacts of HNES. It presents learnings, drawing on projects' experiences, and is designed to inform the delivery of future funding rounds. This chapter provides an overview of the UK heat network sector and its policy context, HNES, and the purpose of this report.

The UK Heat Network Sector and Policy Context

The UK heat network sector is integral to the country's strategy to achieve its 2050 Net Zero emissions target, currently serving approximately 3% of the nation's heat demand.¹⁴ There are approximately 11,847 registered heat networks in the UK, providing heat and hot water to 507,714 final customers¹⁵. Around 88% of buildings connected are residential, and 90% of registered UK heat networks use natural gas as their primary fuel.¹⁶ Projections by the Climate Change Committee (CCC) estimate that by 2030, 19%, and by 2050, 20% of UK heat will need to be supplied by heat networks to meet carbon targets cost-effectively.¹⁷ The government's ambition is to increase the proportion of heat provided by heat networks to 20% by 2050; targeting an increase in heat network supply from 12.9 TWh in 2020 to 95 TWh by 2050.¹⁸

However, the sector faces significant challenges that restrict its growth, including high initial capital costs, perceived investment risks due to a lack of regulation, insufficient supply chain capacity, and a lack of competitive pressures on pricing and service quality.¹⁹ These issues have historically deterred private finance. In response, significant regulatory measures have been implemented to address these challenges. The Heat Network (Metering and Billing) Regulations 2014 introduced requirements for operational transparency, and the recent Energy

¹⁴ The Department for Energy Security and Net Zero. (2023). Heat network zoning: consultation summary: [Heat network zoning: consultation summary - GOV.UK](#)

¹⁵ DESNZ (2023). Heat Networks registered under the Heat Network (Metering and Billing) Regulations statistics: December 2022 from <https://www.gov.uk/government/statistics/heat-networks-registered-under-the-heat-network-metering-and-billing-regulations-statistics-december-2022>

¹⁶ Ibid

¹⁷ Climate Change Committee. (2020). The Sixth Carbon Budget – The UK's path to Net Zero from <https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf>; Energy UK. (2023). Towards a roadmap for heat networks from: <https://www.energy-uk.org.uk/publications/towards-a-roadmap-for-heat-networks/>

¹⁸ The Department for Energy Security and Net Zero. (2023). UK heat networks: market overview from: <https://www.gov.uk/government/publications/uk-heat-networks-market-overview/uk-heat-networks-market-overview-html>

¹⁹ Climate Change Committee. (2020). The Sixth Carbon Budget – The UK's path to Net Zero: [The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf](#) (theccc.org.uk)

Act 2023 established Ofgem as the heat networks regulator, establishing an authorisation regime with standards for pricing, consumer information, service quality, and carbon limits.²⁰

To help improve the quality and efficiency of heat networks, the government is developing the Heat Network Technical Assurance Scheme (HNTAS) in close collaboration with industry. Once introduced in regulation, HNTAS will mandate that heat network Responsible Parties demonstrate compliance with a set of minimum technical requirements, many of which build on the CIBSE Heat Networks Code of Practice (CP1). The government's work will legally oblige heat network operators to adhere to minimum technical standards. HNTAS is also expected to introduce stakeholder engagement mechanisms, governance structures to ensure accountability and enable decision making, and provide training courses for new roles such as HNTAS assessors. Ultimately, HNTAS aims to protect consumers through improving network performance and reliability, cut emissions by improving system efficiency, enhance long term heat network affordability, and boost investor confidence.

In addition, fiscal incentives, such as the 100% business rates relief for low-carbon heat networks introduced in HM Treasury's 2021 Business Rates Review, support green investment in the decarbonisation of non-domestic buildings. The government is also supporting the heat network sector directly, notably through the Heat Network Transformation Programme (HNTP). In place since 2013, this programme aims to foster a sustainable heat network market across England and Wales and includes the Green Heat Network Fund (GHNF, England only)²¹, a capital grant fund supporting the construction of new low and zero carbon heat networks, the Heat Networks Skills Programme, and the Heat Network Efficiency Scheme (HNES).²² Further details are provided on the scope of HNES below. HNTP, which operates alongside programmes supporting decarbonisation of the wider heat sector, aims to improve consumer outcomes and confidence in heat networks as a technology that can provide reasonably priced and reliable low carbon heating and cooling. Since 2013, the Heat Networks Delivery Unit (HNDU) has provided grants and expert guidance to local authorities in England and Wales for early-stage heat network development projects. Also, the (then) BEIS Heat Investment Vehicle (BHIVE) assists public sector heat network owners and developers in procuring funding and related services.²³

With an investment potential estimated between £60bn and £80bn, the sector is poised for significant expansion and a key objective of both government financial and regulatory support to the sector is to create market conditions that encourage private investment.²⁴ However,

²⁰ The Department for Energy Security and Net Zero. (2023). Heat networks regulation – consumer protection from <https://assets.publishing.service.gov.uk/media/64d0bb84a4045e0011a84b44/heat-network-consumer-protection-consultation-document.pdf>

²¹ The Department for Energy Security and Net Zero. (2024). Green Heat Network Fund: scheme overview from [Green Heat Network Fund \(GHNF\): guidance on how to apply - GOV.UK](https://www.gov.uk/government/publications/green-heat-network-fund-scheme-overview)

²² The Department for Energy Security and Net Zero. (2022). Heat Network Efficiency Scheme (HNES) Scheme Overview from: [Apply for the Heat Network Efficiency Scheme \(HNES\) Round 7 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/heat-network-efficiency-scheme-hnes-scheme-overview)

²³ Triple Point (n.d). BHIVE from: [BHIVE – GHNF \(tp-heatnetworks.org\)](https://www.bhive.org.uk/)

²⁴ The Department for Energy Security and Net Zero. (2023). UK heat networks: market overview from <https://www.gov.uk/government/publications/uk-heat-networks-market-overview/uk-heat-networks-market-overview-html>

operational inefficiencies and the cost-of-living crisis pose ongoing challenges, impacting customer satisfaction particularly in less efficient networks. As described above, the HNTF aims to address these challenges and develop new heat networks, enhance existing ones, and support the sector's growth with a focus on net-zero targets, consumer protection, emissions reduction, and market expansion. HNES is a key part of this.

Heat Network Efficiency Scheme

HNES was launched to enhance existing heat networks that are experiencing sub-optimal outcomes. It provides funding for optimisation studies to help identify actions that operators can take to improve the operation of their networks and for the delivery of eligible intervention / improvement measures. It also seeks to address wider barriers such as funding gaps, lack of specialist knowledge and poor targeting of improvements.²⁵ These improvements are intended to improve outcomes for both network customers (addressing areas of detriment) and owners/operators (through improved heat generation/delivery efficiency). The scheme aims to support short-term and sustained savings in fuel consumption and reductions in carbon emissions, focusing where customer need is greatest and laying the groundwork for projects to optimise performance, enabling more efficient and effective further decarbonisation in the future (for example, through separate applications to the GHNF).

At the time of writing, HNES is a £32m²⁶ grant support programme, spanning financial years 2023/24 to 2024/25.²⁷ It is open to public, private, and third sector applicants in relation to district heating or communal heating projects in England and Wales. It follows on from the HNES Demonstrator, which ran from October 2021 to March 2022. HNES is specifically targeted at addressing rising costs for heat network consumers and places a significant emphasis on projects that reduce detriment for residential “*customers in need*”. This group encompasses “*Dwellings supplied heat/energy by a heat network, in which a resident or residents are considered financially vulnerable and will therefore benefit significantly from reduced costs for heating or service improvements through HNES support. This includes any of the following categories (or equivalent) of status or accommodation type: social housing; low-income housing; customers in fuel poverty; extra care housing; low-income care homes and supported housing*”²⁸.

²⁵ The Department for Energy Security and Net Zero. (2023). Heat Network Efficiency Scheme Guidance for applicants from <https://assets.publishing.service.gov.uk/media/64be92e39c2df000d94030d/heat-network-efficiency-scheme-guidance.pdf>

²⁶ Since this report was written, HNES has been allocated extra funding. More information can be found here: [Apply for the Heat Network Efficiency Scheme \(HNES\) - GOV.UK](https://www.gov.uk/government/publications/heat-network-efficiency-scheme-hnes)

²⁷ HNES has been allocated additional grant funding, latest information can be found here: <https://www.gov.uk/government/publications/heat-network-efficiency-scheme-hnes>.

²⁸ The Department for Energy Security and Net Zero. (2023). Heat Network Efficiency Scheme Guidance for applicants from <https://assets.publishing.service.gov.uk/media/64be92e39c2df000d94030d/heat-network-efficiency-scheme-guidance.pdf>

The scheme also aims to address market failures, such as information gaps and investment barriers, by facilitating targeted project assessments and evidence/data gathering and sharing, thereby leading to initial efficiency gains and facilitating long-term decarbonisation.

HNES offers two types of funding:

- **Revenue grants (HNES budget of up to £2m across FY23/24 and FY24/25):** Funding for procurement or mobilisation of external third-party support to carry out Optimisation Studies. These studies will assess heat network projects to identify causes of sub-optimal performance and recommend costed intervention or improvement measures. The optimisation studies consist of two works packages: assessment of network operational performance, including reporting²⁹; and development of network optimisation opportunities, including reporting and recommendations³⁰.
- **Capital grants (HNES budget of up to £30m across FY23/24 and FY24/25):** Funding of up to (but not including) 50% of capital costs for the delivery and installation of eligible intervention or improvement measures. Capital grants will fund investment in four aspects of heat networks: energy centre/plant rooms, primary/secondary distribution networks, tertiary networks, and metering³¹.

The objectives and expected benefits of HNES are outlined in Table 1. These include primary fuel savings, carbon emissions reductions, improved network efficiency, reduced heat costs, and fewer service interruptions:

Table 1: HNES objectives, expectations, and benefits

Objective	Associated Benefits
Reduce carbon emissions by making heat networks more efficient	1) Primary fuel savings 2) Carbon emissions reductions 3) Improved network efficiency
Reduce customer detriment to improve	4) Reduced cost of delivered heat 5) Reduced service interruptions

²⁹ To investigate the current operation and condition of the network in order to develop a baseline against which optimisation measures can be developed and their impact quantified.

³⁰ To identify potential optimisation measures and quantify the costs and impacts that implementing these could have on network performance.

³¹ The Department for Energy Security and Net Zero. (2023). Heat Network Efficiency Scheme Guidance for applicants from <https://assets.publishing.service.gov.uk/media/64be92e39c2df0000d94030d/heat-network-efficiency-scheme-guidance.pdf>

Objective	Associated Benefits
consumer confidence	
Help prepare the heat network market for sector regulation and standards	6) Performance indicator data for HNTAS development – HNES application baselining data 7) CP1 compliance estimates for HNTAS development 8) Installation impact and cost data 9) User testing of draft compliance tool

The scheme prioritises projects that are likely to maximise benefits, offer value for money, and significantly address customer detriment, focusing especially on "*customers in need*." Interested projects are expected to demonstrate their eligibility for funding in their application by evidencing how they plan to meet scheme's primary objectives.

At the time of writing, five funding rounds of HNES have been completed, with a total of 254 applications submitted—158 for revenue projects and 96 for capital projects. Housing Associations were the predominant applicants for revenue projects, whereas Local Authorities most frequently applied for capital projects; however, Housing Associations achieved a higher success rate in securing funding.

Successful applicants typically served a lower percentage of customers considered in need and managed smaller networks with fewer individual residential customers compared to rejected applicants. Over these first five funding rounds, a total of £32.09m was awarded to 198 projects. Of this, £29.21 million was allocated to 54 capital projects and £2.88m to 144 revenue projects, highlighting the significant investment directed towards enhancing the efficiency and effectiveness of heat networks across the UK.

Table 2: Funding Awarded for Funding Rounds 1-5

	Number of Applicants	Number of Projects Awarded Funding	Total Funding Awarded (£m)	Average Funding Awarded (£m)
Capital Projects	96	54	£29.21	£0.54
Revenue Projects	158	144	£2.88	£0.02
Total	254	198	£32.09	£0.16

Purpose of this Report

In this report we evaluate the processes of the first five rounds³² of HNES and assess the impact of the revenue project support.

The **process evaluation** has assessed the delivery of HNES so far. It has gathered insights on how projects managed the procurement for optimisation studies (revenue projects) and upgrade works (capital projects). The evaluation has explored the execution of these works, including how stakeholders were convened, agreements reached, and any barriers or facilitators encountered during the process.

The **interim impact** evaluation of the revenue projects has evaluated the perceived value, anticipated impact, and forthcoming steps for revenue projects, seeking to understand the broader influence of these projects beyond the scope of HNES funding. The analysis includes the influence of the optimisation studies on decision-making for revenue projects and has also explored whether operators are applying similar improvement strategies in projects outside of HNES.

³² This evaluation focuses on the first five funding rounds as these rounds had completed their application processes at the time of this evaluation. Round six was still open for applications and was not included.

Evaluation Methodology

This chapter provides a summary of our research approach including, key evaluation questions and a summary of our data collection and analysis methods. Fuller details of our methodology can be found in Annex 2.

Overview of Methodology

Taken as a whole, the evaluation of HNES is adopting a theory-based approach structured around the HNES ToC (outlined in Annex 3) and incorporating Contribution Analysis (outlined in Annex 4). This will synthesise evidence from qualitative and quantitative sources to examine what works, how, for whom, and what underpins different types of outcomes at each stage across the typology of funded projects. Evidence sources include interviews conducted across three process and four impact evaluation workstreams, beneficiary and customer surveys, analysis of monitoring and baseline data, value for money (VfM) modelling, and quasi-experimental analysis using Interrupted Time Series Analysis (ITSA).

In this phase, our process evaluation has relied on: interviews with applicants/operators and consultants of revenue and capital projects; surveys with operators; and a review of Gemserv monthly programme level Monitoring and Reporting (M&R) data. The impact evaluation for HNES revenue funding has included interviews with applicants and consultants and surveys with applicants.³³

The key objectives at this stage of the evaluation include:

- **Interim process evaluation of the HNES (capital and revenue projects):** to understand how the HNES procurement and mobilisation stages are working, what emerging impacts HNES is having, and what improvements can be made for projects in later funding rounds; and,
- **Impact of the HNES (revenue projects):** to understand the perceived value and (anticipated) impact/next steps for revenue projects.

Key Evaluation Questions

The evaluation is structured around a set of process, impact, and value for money evaluation questions. These are listed in **Annex 1** for the full five phases of the evaluation.

³³ The evaluation also planned to include analysis of applications made for capital funding after projects received revenue funding, to help assess the role of revenue projects in building a pipeline of applicants to capital projects. However at this stage there were limited numbers of projects who had translated from revenue to capital funding and therefore this was not included in this phase of the evaluation.

Phase 3 process evaluation questions focus on identifying delays and procedural issues between application success and project setup, assessing scheme delivery and potential improvements, understanding how projects integrate resources and stakeholder support, and evaluating the impact of monitoring data requirements. They also explore overall project experiences, variations in outcomes, and procedural challenges. Additionally, they assess the effectiveness of post-award support, the application of project-level learnings to the wider sector, and the potential for projects to apply to the GHNF.

The impact evaluation questions focus on whether the optimisation study enabled operators to make informed decisions about improving their heat networks, identifying potential improvements for operators, exploring how operators intend to fund these improvements, and understanding the reasons behind operators' decisions not to proceed with improvements, including the barriers and potential solutions.

The key evaluation questions for this phase (Phase 3) are summarised below.

Table 3: Key Evaluation Questions for Phase 3

Phase	EQ	Evidence collection / research activities	Analysis
3a: Second Process Evaluation	PEQ10-19	Interviews; survey; M&R review	Thematic analysis; survey analysis
3b: Interim Impact Evaluation (Revenue)	IEQ6-9	Interviews and survey	Thematic analysis; descriptive/statistical analysis; contribution analysis

Approach to Data Collection and Analysis

This phase of the evaluation has sought to gather data in the following ways:

- **Process and impact interviews:** These were conducted online via Microsoft Teams. The interviews were carried out virtually to encourage participation, lasted 45 minutes to balance depth with respondent fatigue, and were semi-structured to capture a broad range of perspectives, including any unexpected ones. Interviews were recorded and transcribed with each respondent's permission.
- **Applicant surveys:** To minimise respondent burden these were conducted online. The first survey was conducted with applicants/operators and consultants of both revenue and capital projects to obtain feedback on the procurement and optimisation/upgrade process. The second survey was conducted with operators of revenue projects to obtain feedback on the perceived value and impact of the optimisation study and next steps.

- **Gemserv M&R report review:** A review of Gemserv M&R reports for July - November 2023 was undertaken focussing on the issues and risks reported across the monthly reports.

The **recruitment of interviewees** took place during January and March 2024. It was carried out via email. Table 4 details the target number of interviewees for each stakeholder type and the number of respondents who agreed to be interviewed.

Table 4: Interview Respondents

Type	Target	Respondents
Revenue Applicants	10	10
Revenue Consultants	10	10
Capital Projects	12	12

For the two applicant surveys, the method used mirrored that of the surveys from phase 2. They both included applicants from rounds 1 – 3 of HNES, to ensure that enough time had passed since project initiation that insights would be meaningful. For the procurement and monitoring survey, this was determined to be 6 months after monitoring and reporting responsibilities began, meaning the survey was rolled out in February 2024. For the revenue impact survey, this meant the survey was sent out in May 2024, 9 months after monitoring and reporting responsibilities began.

The proposed topics for both surveys, and subsequent research tools, were reviewed by the Department and inputted into an online survey software, before being issued to survey populations. The team allowed for follow-up contact attempts over email and telephone. For the revenue impact survey, this also included contact from Gemserv to those who hadn't responded to the survey invitation before the follow-up calls commenced.

For the procurement and monitoring survey, there was a total of 73 applicants from rounds 1-3 who were eligible for the survey (20 with capital projects only, 46 with revenue projects only and 7 with both capital and revenue projects). This corresponds to 140 projects (45 capital projects and 95 revenue projects) with unique application reference numbers (URNs), as some organisations submitted multiple bids across multiple heat networks. Table 5 details the applicants who responded to the survey, both number of applicants and number of projects covered, split by funding type (capital or revenue). These are presented against target response numbers based on an estimated response rate of 25%. Overall, responses covered 31 applicants and 71 projects, representing 43% and 51% response rates respectively.

Table 5: Procurement and Monitoring Survey Responses

Type	Target	Responses	Population	Response Rate
Capital Applicants	26	14	20	-
Revenue Applicants		12	46	-
Both Capital and Revenue Applicants		5	7	-
<i>Total number of respondents</i>		31	73	43%
Capital Applications	49	32	45	-
Revenue Applications		39	95	-
<i>Total number of applications</i>		71	140	51%

For the revenue impact survey, there were 93 eligible revenue projects from rounds 1-3, which covered 51 unique respondents. This decreased from the number of revenue projects/applicants in the procurement and monitoring survey due to the withdrawal of projects from HNES prior to the survey. As this was the fourth time this group had been contacted for survey purposes, despite implementing measures to minimise survey fatigue, we anticipated a lower response rate than the previous surveys. Targets were therefore set at 30%. Eligible applicants received three email invitations to participate (including one email correspondence from Gemserv) and three phone call contact attempts. Table 6 details the number of applicants who responded to the survey, split by funding round, and the number of projects covered by these applicants. 19 individual respondents completed the survey, representing a 37% response rate. This survey included a greater number of questions which required a response per project, and responses covered 35 individual projects, representing a 38% response rate.

Table 6: Interim Revenue Impact Survey Responses

Round	Target Number of Responses	Target Response Rate	Responses	Population	Response Rate
Round 1	15	30%	5	15	33%
Round 2			8	20	40%
Round 3			4	11	26%
Multiple Rounds			2	5	40%
<i>Total number of respondents</i>			19	51	37%
<i>Total number of projects</i>	27	30%	35	93	38%

Our analysis of the evaluation data included the following elements:

- **Thematic analysis of interviews data:** This was carried out using a spreadsheet to collate responses. Responses were segmented initially by stakeholder group and topic guide question and subsequently by overarching evaluation question. Response text was coded, and these codes were used to develop 'themes' relevant to each evaluation question. Both inter-group and inter-theme links were explored. Thematic findings were presented along with an explanation and supporting quotes.
- **Analysis of survey data:** Following completion of fieldwork for the applicant surveys, the data collected was anonymised and recoded to ensure respondents' confidentiality. Descriptive analysis of key process outcomes was then conducted to understand beneficiaries' levels of satisfaction with, and suggested improvements for, the HNES procurement and monitoring processes of project delivery (including reflections on the third parties used, monitoring requirements and the support received throughout). For the revenue impact survey, similar analysis was conducted to understand the extent to which recommended actions have been taken forward, and any initial realised impacts, or anticipated future impacts, of the optimisation studies.
- **Review of M&R reports:** Monitoring reports were reviewed, and relevant process indicators (mapped to research questions) were identified and included in a data analysis framework. Descriptive/statistical analysis was undertaken, and analytical insights were collated in an analysis note, alongside data tables and charts.

Further details of our methodology are provided in Annex 2.

Caveats

A number of caveats should be considered when interpreting phase 3 evaluation findings.

At this early stage of the scheme, the number of revenue projects applying for future funding (HNES or other) to progress with the suggested network improvements is limited and therefore, analysis of programme impact is constrained.

Additionally, as with any study that draws on interview or survey data, it is important to note the possibility of inaccuracies in the data that respondents provide, as well as the potential for factors such as social desirability bias i.e. where respondents may tend to give answers that they feel interested parties wish to receive, rather than fuller or different recollections.

Future phases of the HNES process evaluation work will likely be able to draw on larger population and sample sizes, ensuring that findings from phase 3 can be further triangulated in due course. Equally, further triangulation may be possible between respondent data and programme performance data, aiding additional assessment of robustness.

Process Evaluation Findings

This chapter synthesises findings from qualitative analysis to provide a narrative of findings relating to the processes of HNES. The chapter will cover the experiences of the procurement, optimisation and upgrade process. Each section highlights the research questions that have been considered in compiling the narrative findings. The findings are presented thematically, referencing the relevant evaluation questions, using the evaluation number that corresponds to the list of questions in Annex 1.

Scheme Delivery

This section covers the implementation of HNES by Gemserv and the Department, detailing the transition from application success to project mobilisation, assessing the efficacy of ongoing scheme delivery, evaluating the effectiveness of post-award communications, and identifying procedural or process issues that may hinder the delivery of intended benefits.

Relevant Process Evaluation Questions:

- 10. What happens between application success and project set up, and are there any recurrent procedural blocks or delays?
- 11. How effectively is the scheme being delivered and what improvements can be made?
- 17. How effective have the post-award communications, guidance and support for operators been in ensuring projects efficiently move through Optimisation Study delivery (revenue grants) or procurement, build, and initial operation stages (capital projects)?
- 16. Are there any procedural or process problems inhibiting delivery of benefits?

Project mobilisation

The phase from application success to project mobilisation was widely perceived as efficient, with most projects reporting no procedural issues. However, 35% of surveyed projects³⁴ – 58% of capital projects and 18% of revenue projects – reported experiencing unexpected delays during this phase. The primary delays during project setup were internal to the projects, such as resourcing and contract negotiations. These issues were reported by 64% of capital projects and by all revenue projects who experienced delays. Additionally, 36% of capital project respondents that experienced delays cited issues relating to the scheme's timing and payment processes, including delays and uncertainties about the timing of funding receipt, and 17% of

³⁴ Note: all references to surveys in this Process Evaluation Findings chapter refer to the procurement and monitoring processes survey for capital and revenue projects.

survey respondents cited internal governance and external resourcing, such as for external contractors capable of delivering works, as further barriers.

For capital projects, challenges often arose due to contractor availability, which sometimes led to delays. One respondent highlighted the relative ease of securing project management consultants compared to the difficulty of finding contractors capable of executing the building work: *"there were enough project management consultants for us to choose from who would like the work... the prime constraint was the people able to actually carry out the building work."*

Complications aligning project mobilisation with funding deadlines were commonly noted with one capital project stating, *"we've got the funding awarded and the grant funding agreement I think needed to be signed within a week, which was never ever going to happen. I had to get that extended two or three times."* One capital project reported that having to begin delivery in the winter period, due to the timing of funding notifications, has exacerbated resident issues.

Conversely, revenue projects generally moved smoothly through the post-award phase, with 82% of survey respondents indicating no significant procedural delays. These projects quickly transitioned into preparatory activities such as collecting technical specifications, design drawings, and consumption data. However, internal procurement challenges, typically within local authorities, occasionally caused delays.

Post-award support and scheme delivery

Gemserv, supported by Ramboll, Lux Nova, and Turner and Townsend, serves as the HNES Delivery Partner, managing the scheme on behalf of the Department. Their responsibilities include overall scheme delivery, application management, monitoring and reporting and communications and events.³⁵

A condition of HNES grant funding is that grant recipients must submit monthly M&R returns detailing project progress, risks, issues, and budget drawdowns. For capital projects, updates on benefits and Key Performance Indicators (KPIs) are also required quarterly once funded works have been installed and commissioned. These M&R returns are essential for tracking the expenditure of grant funds and ensuring the objectives of HNES are achieved. From July to November 2023, the M&R reports demonstrate continuous improvements in the scheme's administration, notably through the refinement of guidance documents and the introduction of support mechanisms such as webinars. These developments have been pivotal in addressing recurrent issues with submission errors and clarifying reporting requirements. This constitutes a successful application of a user-focused approach by Gemserv to scheme delivery.

Feedback regarding post-award communications, guidance, and support from Gemserv has been predominantly positive. The majority of project participants have commended the clear and supportive administration of the scheme, describing it as *"smooth"* and *"clear."*

³⁵ The Department for Energy Security and Net Zero. (2024). Heat Network Efficiency Scheme (HNES): overview from <https://www.gov.uk/government/publications/heat-network-efficiency-scheme-hnes/heat-network-efficiency-scheme-hnes-overview>

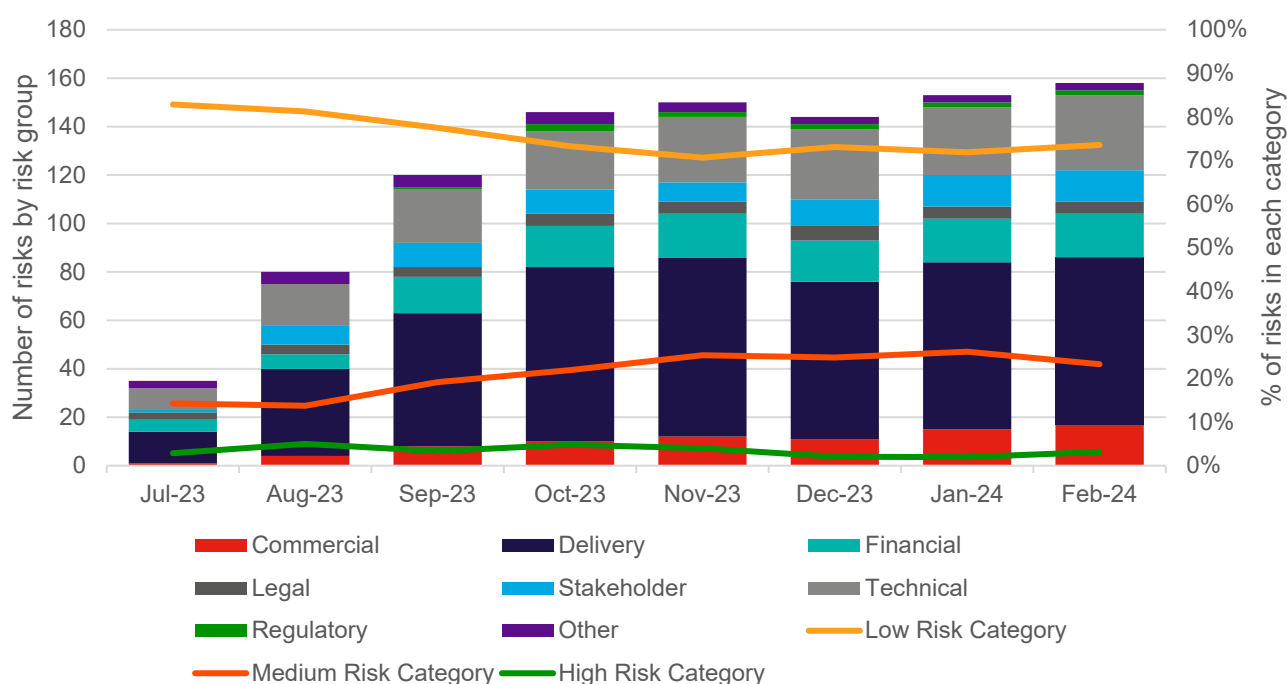
Specifically, 58% of capital and 65% of revenue project respondents found the communications and guidance easy to understand, and 79% of capital and 76% of revenue respondents found them helpful. Participants have expressed overall satisfaction with the support provided by Gemserv, noting the administration as being “clear and well-supported.” For example, one capital project participant praised Gemserv’s responsiveness:

“They’re really helpful when we contact them about anything. I’ve not got a bad thing to say about them and how they’ve administered it. They were brilliant at extending the dates on the signature on the grant funding agreement” – Capital Project

Procedural and process challenges

The M&R feedback consistently identified procedural and process challenges across both capital and revenue projects, impacting delivery timelines and complicating risk management. These issues were most prominent in October and November’s 2023 M&R reports, underscoring the necessity for ongoing enhancements to the scheme’s operations. The M&R reports highlight that the capital projects face a range of significant risks as outlined in Figure 1 below.

Figure 1: Capital Risks³⁶



Capital projects frequently faced high risks due to delays in financial approvals. These delays affected project timelines and budgets. Supply chain issues, such as lead times for equipment and workforce availability, compounded these problems. Delivery risks were also significant, with structural issues and hazardous working conditions often delaying progress.

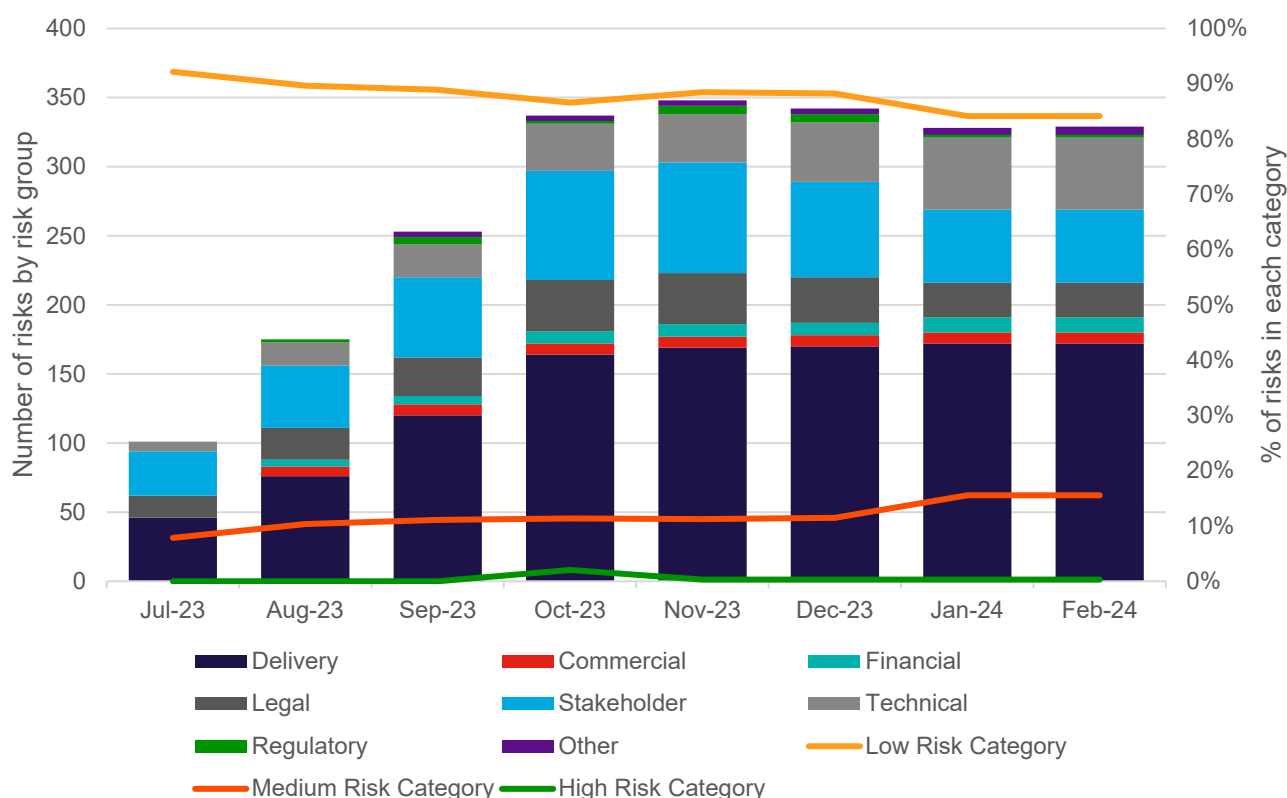
³⁶ The risk category lines present the percentage of low, medium and high risks as a proportion of total risks for each month.

In August 2023, supply chain issues made up 62% of delivery risks, mainly due to equipment lead times and workforce availability. September 2023 saw a high number of delivery and technical risks, with supply chain (38%) and access (27%) as the biggest categories, with the majority of the latter pertaining to gaining access to dwellings. October 2023 continued to highlight delivery risks, focusing on supply chain (35%) and access (24%).

In November 2023, delays in securing internal funding and procurement of services raised financial risks. By December 2023, the focus remained on supply chain and access risks, with high residual risk scores due to structural issues and hidden pipework. January 2024 noted high risks in financial approvals and procurement delays. February 2024 identified the highest number of risks, with 159 reported. Delivery (43%) and technical risks (20%) were predominant. Financial risks, such as delayed programme approvals and grant payment issues, were also prominent. Projects often required extensive mitigation efforts, such as value engineering exercises and emergency response preparations, to manage these risks effectively.

Figure 2 illustrates the key risks faced by revenue projects as presented in the M&R reports.

Figure 2: Revenue Risks



Revenue projects frequently encountered delays attributed to procedural inefficiencies, notably during the initial phases of data collection. Resource constraints and insufficient access to necessary information often prolonged the data gathering phase, impacting project timelines. Legal concerns also posed significant risks, particularly issues surrounding the secure handling and sharing of sensitive data. Stakeholder engagement further complicated these projects, with difficulties in synchronising efforts across various departments and external organisations.

Areas for improvement of scheme delivery

Stakeholder feedback has identified areas where Gemserv could improve communication methods and guidance. Stakeholders have suggested that Gemserv move beyond email communications and incorporate more personal interactions, such as phone calls or tailored feedback sessions. This approach would help clarify project-specific queries and foster a more collaborative relationship between the scheme administrators and project teams.

Some revenue project consultants noted that while the communication channels are open and effective, the execution of email communications could be improved. For example, a revenue consultant suggested a more consolidated approach to email communications by *“only sending an email to the main person and everyone else cc’d”* as *“having multiple streams of communication makes things slightly confusing.”* Additionally, the specificity of communications from Gemserv was highlighted by interviewees as an area needing improvement. An issue is the lack of detail in reminders and updates sent by Gemserv, which can cause confusion, especially for consultants managing multiple projects. As one revenue consultant pointed out, *“when Gemserv sends out emails saying, ‘A reminder for this report,’ it’s like, ‘Well, which one?’ I’m working on six schemes”*.

The scheme may also benefit from providing personal contacts to the projects. This suggestion was raised by several capital projects and one revenue applicant. One capital project reported that the single Gemserv email address raises the threshold of questions that they would ask as projects were not sure who they were addressing it to:

“There’s a common email address which goes out to everybody. To me, that inhibits me slightly from engaging in a conversation or a dialogue because I’m not quite sure who that’s going to go out to or who’s going to pick it up. Not being able to have a personal contact, to me, makes me more inhibited to engage. I think I would have probably liked to have had an occasional review or occasional phone call, which was just to check and make sure that we were progressing okay or that everything was understood.” – Capital Project

Furthermore, sharing lessons learned and best practices through webinars and collaborative sessions could offer significant benefit to both new and ongoing projects, enhancing overall scheme effectiveness and participant satisfaction and supporting continual improvement of project delivery:

“Maybe sharing lessons learned from other applicants. There was one webinar, I believe, by other applicants or other projects who had won it and something on those lines. A bit more detailed or sharing specific project implementation aspects, that kind of knowledge sharing or experience sharing from the other schemes or other companies like us. For example, going forward, if HNES can share our experiences with others, which will be useful for others.” – Capital Project

Project Experience

This section details how projects within HNES manage to consolidate funding, expertise, workforce, resources, and stakeholder support to achieve success. It also examines the challenges and enablers faced in this process, including providing monthly monitoring data during various project phases, the insights that are gained from these experiences to ensure effective and appropriate data collection, and the overall experience of both project participants and decision-makers within the HNES. Variations by project type and the reasons behind these differences are highlighted.

Relevant Process Evaluation Questions:

12. How do projects manage to bring together the funding, expertise, workforce, resources, and wider stakeholder buy-in to make them a success? What were the barriers and enablers?

13. What are the experiences of projects of providing monthly monitoring data? Has the monitoring created any difficulties for projects during the upgrade phase? What learnings can be applied to ensure robust and proportionate data is collected?

14. What has the overall experience of HNES been for projects and decision makers, and how does this vary by project type and why?

Mobilising funding, expertise, workforce, resources

HNES spans multiple funding rounds, distributing capital and revenue grants from FY23/24 to 2024/25³⁷. HNES mandates that projects complete the financial drawdown of all of their grant funding allocated to each financial year by the end of that particular year, with no carryover to subsequent financial years. Each year, projects are advised of the deadline for submitting grant claims, typically around mid-March. Despite 42% of survey respondents acknowledging the simplicity of the grant funding process and 32% commending its promptness, M&R reports revealed ongoing challenges in securing and managing funds.

“Obviously, I can say budgets are very, very tight within this... The mobilisation is reliant on funding. I think that was possibly the difficulty of it.” – Capital Project

Figure 3 shows the proportion of capital³⁸ and revenue projects³⁹ over fundings rounds one to five who managed to spend their total funding in FY 23/24.

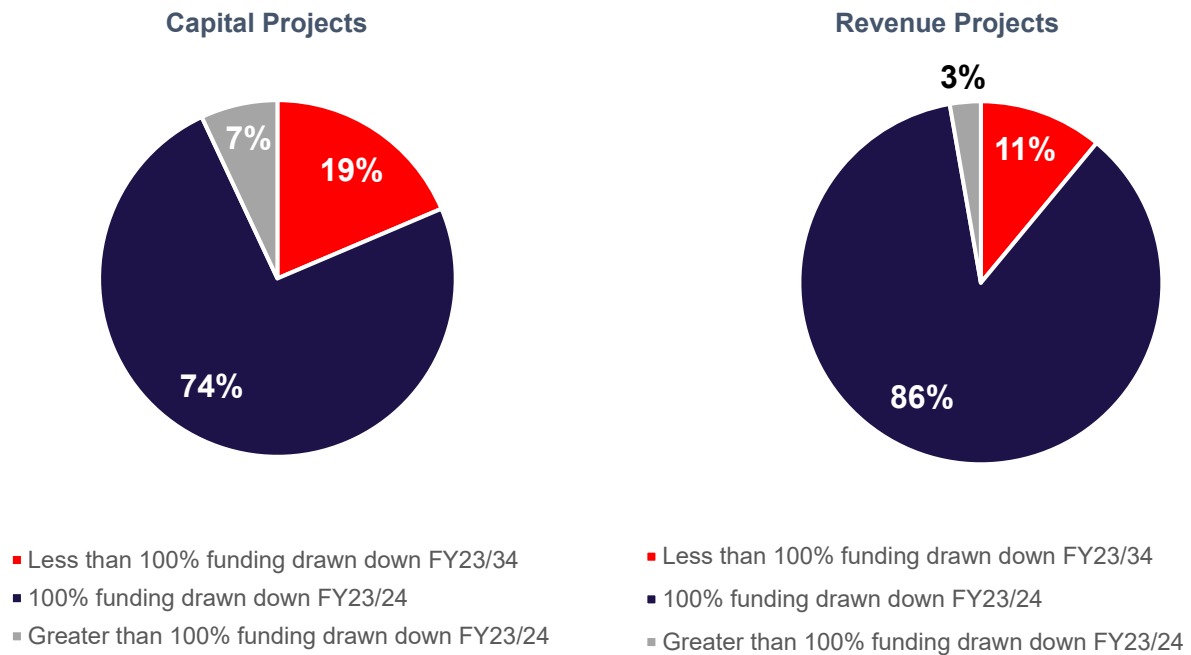
Figure 3: Project funding drawn down at end of FY23/24⁴⁰

³⁷ As noted above, HNES has been allocated additional funding for 25/26 to 27/28.

³⁸ Data missing for 9 capital projects

³⁹ Data missing for 31 revenue projects

⁴⁰ Subject to overall FY budgets, where projects were progressing ahead of schedule they were able to request brining forward grant spend from 24/25, subject to Departmental approval



Most projects (74% of capital and 86% of revenue projects) were able to fully utilise their FY23/24 grant allocations within the year. However, the requirement to spend funds within financial years without prior expenditure recognition added additional burden to financial management. Evidence from the M&R reports showed that financial risks were particularly pronounced in the latter months of 2023, with several reports noting concerns over rising material costs and projects going over budget. The need for careful financial planning and management was evident, as was the importance of securing sufficient funding to cover unexpected increases in costs.

Stakeholder engagement and supply chain issues have also emerged as a challenge, evidenced by difficulties in synchronising project mobilisation with stringent funding deadlines and the need for rapid integration of external consultants and contractors. Capital projects in particular faced significant hurdles in procurement processes, with 42% of capital survey respondents indicating difficulties in engaging necessary supply chain organisations for installation works. In contrast, 53% of revenue survey respondents found it relatively easy to engage third parties for conducting optimisation studies, however M&R reports highlighted stakeholder risks such as in managing diverse teams and coordinating across departments.

“[the challenge is] probably getting contractors interested in projects which they need to jump on at the drop of a hat, but also could be pulled away from them at the same speed.” – Capital Project

Stakeholders’ buy-in for revenue projects prior to the application was “an easy pitch” for all respondents. One project highlighted that 100% funding for the optimisation study made the competition attractive. Projects benefited from clear motivations aligned with company Net Zero targets, which eased the process of securing stakeholder support. Two revenue applicants highlighted the attractiveness of the scheme, stating:

"Buy-in was fine. Net Zero targets are one of our priorities and this scheme is good for this, I've got no problem with buy-in." – Revenue Operator

"Stakeholders buy-in was easy - already knew that we wanted to improve this. In terms of resources, it's about making sure that it's fixed into the planning when we've got so many other priorities." – Revenue Operator

Technical issues, such as the commissioning of Heat Interface Units (HIUs) and pipework integrity, were recurrent in capital projects, necessitating high levels of technical expertise and often leading to project commissioning delays. To manage these complexities, projects adopted strategies such as early material procurement and the formation of dedicated teams focused on heat network improvements. These strategies helped accommodate financial and technical unpredictability, with proactive communication and structured project management.

Despite these challenges, proactive communication and stakeholder management strategies, including regular updates and meetings, have been crucial in maintaining project momentum.

Experiences and difficulties of providing monitoring data

Interview respondents mostly reported finding the provision of providing monthly monitoring data *"fine"* and *"quite straightforward"*. A capital project highlighted that the repeated data requirement has made the process easier for them, stating:

"We're provided with a template every month asking us for monitoring data. We have that process now, slick and robust. We can turn that around in the same day." – Capital Project

While 78% of capital project survey respondents and 88% of revenue project survey respondents expressed satisfaction with the administrative support for submitting monitoring information, the actual collection and management of data posed difficulties, particularly for capital projects. This was reflected in the survey responses, where 42% of respondents reported collecting the necessary data difficult.

"It's been mixed, providing [data points] while there's works going on in the plant, that's been tricky. I think a lot of our data is estimated." – Capital Project

Capital projects have encountered substantial difficulties in data management, primarily due to the detailed and technical nature of the data required. Capital project delivery often involves intricate modifications to infrastructure, necessitating precise and granular data collection. Survey feedback indicates that 42% of capital project respondents found data collection to be challenging, citing issues with data access, conversion, and the granularity needed for effective monitoring. This complexity often led to initial misinterpretations of reporting requirements, suggesting a gap in preparatory guidance provided to project teams. While data requirements for M&R can be found in the 'HNES Guidance for Applicants', a significant number of respondents recommended a more expansive and interactive support system, such as the introduction of training sessions at the beginning of the monitoring phase and the use of detailed case studies within the templates to aid understanding. One project respondent

suggested that the quieter period between the award and first submission would be ideal for projects to familiarise themselves with M&R reporting. Additionally, they recommended that HNES provide case studies in the template format, rather than just the template itself:

"I think my experience is that it would have been nice to have had a bit of a preparation prior to the first report, where they put some personal interaction and maybe either coaching or us getting that right to begin with, but we have managed to produce figures now and present them in a way which I believe is acceptable. The form itself does not make it easy." – Capital Project

In contrast, revenue projects reported a more straightforward experience with monthly data submission, attributed to the less complex nature of the data required. Revenue projects involve less activity regarding physical infrastructure and more analysis of existing systems, which simplifies the data collection process. However, challenges persist in gathering comprehensive historical data, critical for conducting optimisation studies. The lack of consistent data in previous years has sometimes meant that project consultants have had to make numerous assumptions and estimates, highlighting the need for improved data management practices within these projects.

One revenue project suggested that, given the incremental changes that occurred each month in their optimisation study, it might make sense to shift to a quarterly timing. Overall revenue projects were split in views around the optimum frequency for submitting monitoring data. 47% preferred submitting M&R reports *"less than monthly and up to quarterly"* and 41% preferred *"up to monthly"*.

Learning for improvement of monitoring data

The feedback from projects suggests several strategies to improve the process of data collection and reporting:

- **Provision of Clear Guidelines and Examples:** Several participants suggested that including case studies or examples within the monitoring templates could facilitate a better understanding of the requirements, thereby speeding up the learning curve for new projects.

"Perhaps the spreadsheets, there could have been some case examples provided with example evidence and how that evidence should be formulated and how that evidence should be described. Perhaps if there was a case that we could have used as a template, rather than just the template of the spreadsheet itself, that would have got us to where we are quicker, but I think we've got there now." – Capital Project

- **Training and Preparatory Workshops:** Early training sessions and workshops to familiarise project teams with the monitoring forms and expectations may prevent initial misunderstandings and improve the quality of data submitted.
- **Feedback and Iterative Improvements:** The feedback loop between projects and scheme administrators is a critical component of the monitoring process. Continuous dialogue ensures that projects receive the necessary guidance to meet monitoring

requirements effectively and that administrators can adjust support mechanisms in response to the challenges and needs identified by the projects.

Overall scheme experience

M&R data from July 2023 to February 2024 revealed significant improvements and growing complexities within the HNES, reflecting the experiences of capital and revenue projects.

The data indicated an upward trajectory in project compliance and management, as evidenced by an increase in 'Green' ratings in the Monthly Overview. This suggested that projects are increasingly adhering to guidelines and resolving issues more effectively. However, the emergence of high-risk projects in later months points to persistent challenges, particularly with delivery dates.

Across both project types, there has been a notable increase in project risks, particularly in delivery and stakeholder engagement areas. Financial management has also evolved, moving from stages of no funding disbursement to active financial oversight. This transition was crucial for maintaining budget control and addressing unforeseen costs, which have been more prevalent towards the end of 2023 as material costs rose and budget overruns were observed.

The challenges identified across both types of projects underline a common theme of delay and disruption due to external and internal factors, impacting the delivery and progression of the projects under HNES. These experiences suggest a need for enhanced risk management strategies and more robust project planning to accommodate unforeseen delays and technical challenges. The Department and Gemserv could help to mitigate these risks by providing more specific guidance on risk management, ensuring that projects are better equipped to handle potential disruptions. Moreover, the differences in risk profiles between capital and revenue projects highlights the importance of tailored approaches to project management and stakeholder engagement in ensuring the successful implementation of each project type.

Capital project experience

Capital projects are concerned with physical and infrastructural changes, which include extensive work such as replacing pipework or upgrading heating systems. These projects often encountered unforeseen issues such as inferior pipework quality or unexpected discoveries such as asbestos, which necessitate additional work and can lead to disruptions:

"The pipework... was in a worse condition than we expected, necessitating extensive additional work." – Capital Project

These challenges required robust pre-assessment and contingency planning to minimise impacts on the project timeline and budget. Despite these issues, capital projects have largely remained within budget due to effective management and contingency use:

"It is on budget, yes. We are having to draw upon contingency. There's a contingency element in the budget, and there have been some extra pieces of work that needed to take place." – Capital Project

Several capital projects reported that they were able to deal with emerging challenges due to high levels of expertise within their teams. This included technical and non-technical (project management) aspects. For one interviewee, an effective skills and resource analysis and ongoing resourcing reviews have supported strong team capability.

“The project is being managed by our delivery and construction project team...where we have a lot of strong project management capabilities already in the business.” – Capital Project

Revenue project experience

All revenue impact survey respondents reported satisfaction with the work conducted by contracted consultants for the optimisation studies. Additionally, 95% of survey respondents agreed that the consultant conducting the optimisation study delivered work to the agreed scope. The biggest challenge that revenue consultants had to overcome while delivering the optimisation studies was insufficient and inaccessible longitudinal data. The profile of heat networks participating in HNES meant that after decades of operating and the evolving policy and heat market regulation landscape, most schemes struggled to maintain consistent data monitoring across the years. Consultants had to derive estimates and assumptions in some cases to overcome the lack of data.

“We have a lot of workarounds, internal resources, tools, and experience that we can use to fill in gaps where we need to.” – Revenue Consultant

As such, consultants highlighted that the management of data and its monitoring will be key for heat networks schemes moving forward.

“For newer schemes, now we’re aware of the importance and how data should be saved and shared.” – Revenue Operator

Project Outcomes, Outputs and Next Steps

This section explores the differences in outcomes across projects, examining the factors that contribute to these variations, and assesses the intentions of projects to apply to the GHNF in order to decarbonise the project heat source (either individually or as part of an aggregated application), including how the outputs of HNES can be optimised to better support and encourage these applications.

Relevant Process Evaluation Questions:

15. How do outcomes differ between projects and what are the causes of those outcomes?

19. Are projects intending to apply to GHNF either individually or as part of an aggregated application? Can the outputs of HNES be better designed to facilitate/encourage this?

Project outcomes

The outcomes of projects within HNES varied, influenced by factors such as project management, technical challenges, funding, and procurement delays. Revenue projects showed varying results driven by the scope of the project, stakeholder engagement levels, procurement strategies, and the expertise of project participants.

Projects with strong stakeholder support and clear alignment with Net Zero targets often experienced smoother mobilisation and fewer implementation challenges. Conversely, projects struggling with sector competence or regulatory requirements frequently encountered operational delays and challenges. A revenue operator highlighted the challenges within the housing sector:

“What I’m starting to understand is that the competence and capacity in the housing sector could be challenging, but that’s just based on the sector understanding. If they are running and no one is complaining, it is classified as ‘successful’. The regulators are coming from the other direction, where they want to make sure that the customers aren’t ripped off. It’s in the interest of both of us (housing sector and regulators) to improve efficiency and improve the quality of the systems.” – Revenue Operator

Key technical issues identified within optimisation studies included inefficient heat control systems, inadequate insulation, and oversizing of equipment. Consultants diagnosed these problems and suggested viable improvements. The effectiveness of these recommendations often depended on the capability of contractors and the availability of consultants to implement the changes correctly, as explored in more detail in the phase 2 report.

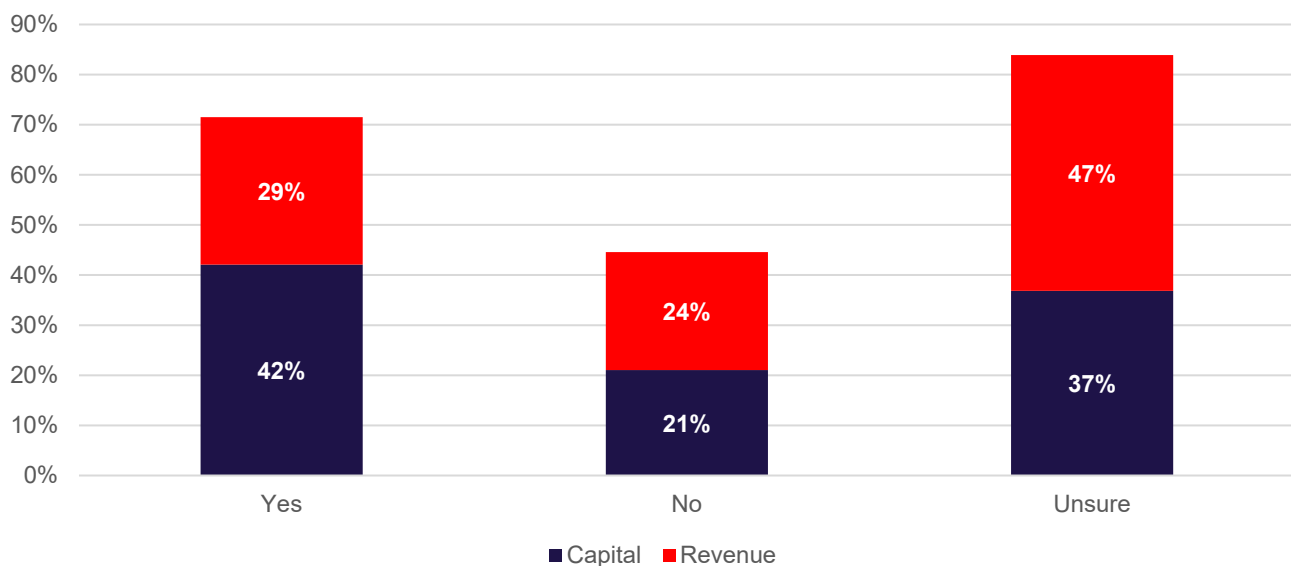
Intent to apply to GHNF

Interest in further funding through the GHNF was mixed among participants. Capital projects expressed their intention to seek additional funding, highlighting collaborative opportunities with newly aligned organisations:

“We’re looking at putting in future applications for other sites within our group, but now we’ve recently joined with another trust as part of a group, and they’ve not accessed this funding before, so we’re looking at opportunities for them to be able to access it. Both of us [are] looking at the Green Heat Network Fund as well.” – Capital Project

As Figure 4 illustrates, 29% of revenue survey project respondents confirmed their intention to apply for GHNF, while 47% remained undecided, reflecting ongoing strategic discussions. This decision-making process often hinges on securing match funding and weighing the benefits against potential payback periods of proposed improvements.

Figure 4: Percentage of survey respondents intending to apply to the GHNF



Source: HNES Phase 3 Procurement and Monitoring Survey

Lessons for the Future

This section details the evaluation team's views on how project-level learning from HNES can be applied to other projects within an operator's portfolio and how these insights can be coherently communicated and applied across the wider heat network sector, enhancing overall sector efficiency and effectiveness.

Relevant Process Evaluation Questions:

18. How can project-level learning from HNES be applied to other projects within an operator portfolio, and coherently communicated/applied to the wider heat network sector?

Integration of learned insights into broader operations

- Documentation and formalisation of learnings:** Projects have developed a wealth of knowledge through HNES, which can be systematically documented and formalised. This would involve creating detailed case studies and guidelines that illustrate both successful strategies and areas of difficulty. For example, practical learnings about managing subcontractor delays, specific technical solutions for heat loss and HIU issues, and monitoring data best practice can be turned into standard operating procedures.
- Development of training modules:** Using the detailed documentation, operators can develop training modules to upskill their workforce. These modules would focus on specific challenges identified in the projects, such as the management of technical risks or tenant communications during retrofitting activities. This approach would ensure that

learnings are not just shared but are actively used to enhance skills across the organisation.

- **Cross-project application:** Many learnings from HNES are broadly applicable to other heat network projects. For example, strategies for effective risk management, such as expecting worse-than-anticipated conditions in buried pipework, can be generalised and applied to similar projects within the portfolio. Operators should evaluate each project's specific context to adapt these learnings effectively.

Coherent communication to the wider sector

- **Workshops and seminars:** Gemserv and the Department could organise workshops and seminars for operators to share insights with the wider sector. These events would allow stakeholders to discuss common challenges and solutions, fostering a collaborative approach to improving industry standards.
- **Publishing papers and research:** Gemserv and the Department should encourage operators to publish detailed analyses of the projects, their challenges, and their successes in industry journals or through white papers, where operators can contribute to the sector's knowledge base. This helps in setting benchmarks for best practices and provides a reference for other operators facing similar challenges.
- **Collaborative platforms for knowledge exchange:** Establishing or participating in collaborative platforms such as online forums, regular webinars, or annual conferences can facilitate ongoing dialogue between operators, consultants, and other stakeholders. This continuous exchange helps in refining approaches based on collective experiences.
- **Engaging with regulatory bodies:** Operators can work with regulatory bodies to inform policy-making processes based on the practical insights gained from HNES projects. This could help in shaping regulations that are supportive of efficient and sustainable heat network operations.

The transfer of project-level learning to other projects and the wider sector requires a structured approach to documentation, training, and communication. The Department, Gemserv and operators can all facilitate the embedding of learnings into operational practices and active engagement in sector-wide knowledge sharing so operators can enhance their own projects and contribute to the advancement of the entire heat network industry. This would ensure that the benefits of HNES extend beyond individual projects, leading to broader improvements in efficiency, sustainability, and customer satisfaction across the sector.

Revenue Projects Impact Evaluation Findings

This chapter synthesises insights from qualitative and quantitative analysis to provide findings on the impact of HNES. It covers the perceived value and anticipated impact and next steps for the revenue projects⁴¹, what improvements can be made and how, and the potential savings across the measures proposed. It also explores whether operators are delivering similar works across their portfolios outside of HNES funding, and whether the optimisation studies are supporting any internal business cases or investment decisions for improvements. Findings are presented thematically, referencing the relevant evaluation questions, using the evaluation number that corresponds to the list of questions in Annex 1.

Introduction

Revenue projects conducted optimisation studies to identify and recommend measures for enhancing the efficiency and effectiveness of their heat networks. This section explored the overall outcomes and impacts of the optimisation studies for revenue projects as outlined in the ToC in Annex 3.

Impacts on Beneficiary Decision Making and Effectiveness of Optimisation Study Recommendations

Relevant Impact Evaluation Questions:

6. Did the optimisation study allow operators to make an informed decision on whether they should improve the heat network?
7. What improvements can operators make to improve their networks?

External consultants conduct optimisation studies to identify areas of sub-optimal heat network performance and propose measures for enhancing the efficiency and effectiveness of these networks for operators. The optimisation assessment includes three phases⁴²:

⁴¹ For this evaluation we had set out to report on the translation of HNES Main Scheme revenue projects to HNES Main Scheme capital funding, however at this stage it is too early to conduct this analysis.

⁴² The Department for Energy Security and Net Zero. (2023). Heat Network Optimisation Guide from <https://assets.publishing.service.gov.uk/media/649567a0831311000c296255/heat-network-optimisation-guide.pdf>

1. **Initial investigation** - which aims to achieve a comprehensive qualitative understanding of the system's performance, identifying critical information gaps, reviewing data, analysing root causes, and proposing initial interventions.
2. **Techno-economic options appraisal** - which quantitatively assesses system performance and the potential impacts of interventions, comparing these against initial costs to establish a business case. It includes a detailed root cause analysis, KPI evaluations, operational impact modelling, and preliminary cost estimations.
3. **Implementation plan** – involving production of a scoped work outline, detailed cost analysis, updated KPIs and models, and a project delivery plan.

The cost-benefit analyses included in the optimisation studies should meet all HNES minimum requirements, covering capital and operational costs of proposed measures, replacement costs, indirect/social cost savings, and possible funding support mechanisms such as HNES capital funding, GHNF, or the Public Sector Decarbonisation Scheme (PSDS). Additionally, financial metrics such as simple payback, Net Present Value (NPV), and Internal Rate of Return (IRR) for each proposed work package are provided, offering a solid foundation for financial viability assessment.

Effectiveness of optimisation studies

At this interim stage, operators were still in the process of deciding whether to implement the suggested changes outlined in the optimisation studies. However, 84% of survey⁴³ respondents felt the study increased their confidence in their heat network's operation.

Operators particularly valued the insights gained on the current performance of their heat networks. All revenue impact survey respondents agreed that the optimisation study provided them with sufficient information to make informed improvements. The studies were seen as *"helpful"* in exposing issues and highlighting the complexities in managing these systems. One operator noted, *"the recommendations so far have been accessible to non-technical – I can follow their arguments,"* with the use of schematics being especially helpful in simplifying complex technical details.

Survey results reinforce this, 65% of respondents found that the optimisation studies made the improvement measures more understandable and feasible than they would have been without HNES. Additionally, 69% of respondents stated they had been able, or would be able, to implement improvements sooner than they would have done as a result of being part of HNES.

When asked if they would have conducted an optimisation study in the absence of HNES, 49% of survey respondents said no, primarily due to a lack of funding (79% of this group).

Overall, the optimisation studies have been significantly *"beneficial"* for operators, as they provided sufficient information to make necessary improvements to their heat networks, with all

⁴³ All survey results in this chapter are from the revenue impact survey.

survey and interview respondents affirming the studies' positive impact on their decision-making processes.

Key decision-making factors

Operators indicated that the cost of proposed improvements was the most important factor in their decision-making process, stressing the importance of *“weighing up the benefits and the payback periods”*.

“Obviously, the cost was a main consideration.” – Revenue Operator

Operators also consider the prioritisation of recommendations, preferring low-cost and minimally disruptive measures (i.e., requiring little to no building evacuation over a period longer than a day), to more capital-intensive improvements with more disruption to residents.

“I think we've got a good range of measures that can and will be implemented, some low cost, quick payback ones, and some longer-term ones” – Revenue Consultant

Operators also cited other key contributing factors that influence their decision making, including the following:

- Several operators highlighted **the benefit of seeing the “carbon footprint differentiation between the various options and the payback”**, as this is key evidence when contemplating applying for capital funding. This is pertinent for operators as the HNTAS is due to be introduced and will require heat networks to reduce carbon emissions.
- **The resident impact** was a key contributing factor for operators, specifically the level of disruption to residents caused by improvements **and the customer detriment** as operators *“want to ensure that [they] are providing heat and hot water at a very affordable price... So, the more [they] can do to reduce the affordability issue the better.”*
- Operators appreciated **suggested improvements detailing how to manage the daily operations of the heat networks** as these allowed them to better identify inefficiencies in the future.

Applying learnings from HNES to other heat networks

Operators and consultants acknowledged that the lessons learned from the optimisation studies are applicable across their wider portfolio of networks due to the replicable nature of issues; 21% of survey respondents have already disseminated learnings across their portfolios. In many cases operators with multiple heat network schemes note that the main improvements highlighted earlier in the report can be assumed for schemes with similar profiles:

“What we've found actually is that a lot of the issues across these schemes is that there's a lot of consistency between them. Which means that for schemes of a certain age and certain profile, we should be able to extrapolate these findings with some confidence to show that this

scope of works is likely what's going to be required across a section of the portfolio.” – Revenue Consultant

Consultants stressed however, the importance of assessing heat networks individually to avoid applying recommendations that may not be transferable. They emphasised that bespoke approaches would still be needed to deal with site-specific issues:

“I think I’d be very hesitant to implement measures from one scheme without something else being looked at, and I think what you might be doing is a putting a sticker plaster on something that requires amputation.” – Revenue Consultant

Furthermore, some interview respondents highlighted the potential for learnings to help prepare heat network schemes for upcoming zoning and technical standards. One consultant emphasised the importance of disseminating HNES findings to prevent potential information asymmetries in the market. To address this directly, 5% of survey respondents have disseminated learnings to the wider sector. Heat networks that have not received government support to decarbonise may struggle to meet the new technical standards and therefore, operators who apply transferrable learnings from HNES across their portfolios may be better positioned when the new regulations are introduced:

“The trick is how you take that information then and apply it in a meaningful way to these technical standards to make sure that, going forwards, what we end up with is a standardized approach, really, of scheme deployment or retrofit where they’re falling short” – Revenue Consultant

Suggested improvements

Common issues and their suggested improvements in the optimisation studies are the following:

- **HIU bypassing⁴⁴ issues which result in heat losses in the system:** Recommission bypasses to balance the heating circuits and ensure that the bypass control is working efficiently to control flow and return temperatures.
- **Poor or inadequate insulation for current building regulations:** Reinsulate pipework and relevant equipment e.g., the dosing pot⁴⁵ to meet current insulation standards.
- **Poorly performing plant room equipment e.g., boilers, heat exchangers⁴⁶, water pumps:** Replace equipment or recommission the failing components in equipment.

⁴⁴ Bypassing refers to the valve that provides an alternative flow path when there is no demand from the HIUs to maintain flow temperatures. As the HIU control valves close, the head pressure increases, causing an increase in the pressure difference between the flow and return pipes. The bypass valve opens to compensate and directs the flow into the return, bringing the pressure difference back to the set value. This process helps maintain balance in the heat network, ensuring efficient and effective operation under varying conditions.

⁴⁵ A dosing pot is an essential part of a heat network that helps maintain the system’s efficiency and longevity by controlling the introduction of necessary chemicals.

⁴⁶ These devices transfer heat from one medium to another, often used in systems with a central heating.

- **High boiler flow temperatures e.g., 80°C and above:** Re-sequence set flow and return temperatures to reduce and maintain cooler temperatures.
- **Maintenance issues e.g., those maintaining older systems may be unaware of the latest technology that could improve efficiencies:** Upskill those who maintain heat networks to better identify inefficiencies and be aware of improvement options / high-quality consultants and contractors in the sector who can provide them with assistance.

Survey results highlight the following issues as most pertinent to operators:

- High heat losses in the primary, secondary, and tertiary networks (91%, 94%, and 66% of respondents respectively).
- High pumping energy consumption (80% of respondents).
- High bypass flow in the secondary network (80% of respondents).

Other issues identified include high carbon content of delivered heat, high operator cost of delivering heat to end customers, high end customer heat tariffs, long hot water delivery times, and poor water quality. Additional issues shared in interviews by revenue consultants and operators include a lack of hydraulic break substations, high temperature water in residential kitchen taps, oversized pumps, insufficient pump control, and incorrectly sized radiators.

The recommendations aiming to address these issues largely relate to replacing or recommissioning HIU equipment. Survey results indicate that if operators implement these improvements, a large portion of respondents expect to see:

- Improved network efficiency (97%)
- Greater reduction in carbon emissions (94%)
- Cost savings by enhancing operational performance (94%)

Proposed Next Steps and Future Funding Arrangements

Relevant Impact Evaluation Questions:

8. How do operators intend to fund identified improvements? Will this be done through HNES funding?

9. If operators have decided not to go ahead with improvements, why? What were the barriers to implementing changes and how can these be overcome?

Capital funding for improvements

HNES was designed to facilitate the transition from revenue to capital projects, encouraging operators to secure capital funding following their optimisation studies. Despite a high level of demand, with £29.21m awarded across 54 capital projects in the initial five rounds, the

progression from revenue projects to capital investments remains limited at this stage of the scheme, although this is expected due to the scheme having only completed five funding rounds at the time of this report, and the time needed for operators to make decisions following their optimisation studies. While the progression from demonstrator revenue to capital funding suggests projects will go on to fund improvements via HNES, currently many operators are still finalising their investment decisions, so it is too early to draw any conclusions.

Of the small number of revenue projects who had already started implementing improvements, the majority had done so using HNES capital funding, however some did say they had already self-funded or planned to self-fund improvements. For those who had not started to implement recommendations, a lack of funding was the main reason cited

Looking forward, half of the operators interviewed expressed interest in applying for HNES capital funding. For survey respondents who stated that they were planning to take further actions on recommendations provided, 80% plan to use a combination of HNES capital funding and other sources, and 20% plan to self-fund their improvements. Additionally, 47% of survey respondents stated that the optimisation studies have influenced their plans beyond HNES, including *“[reviewing] other sites and considering funding both revenue and capital projects while also looking for quick wins with their repairs and maintenance contractor.”*

Next steps

The next steps for projects still in the ‘decision-making’ phase will include:

- reviewing and discussing the optimisation studies alongside business cases (where optimisation studies were not used as the sole business case); and
- making a final decision with key stakeholders, including the key senior strategic partners of the heat network, the owners of the heat network and the operators. These discussions will assess various aspects of the optimisation studies such as cost, implementation timelines, and potential customer benefits.

The decision-making process will involve key stakeholders, including senior strategic partners and network owners. Additionally, respondents implied that their decisions around funding source depends predominantly on whether they can source match funding in time for HNES capital funding or the GHNF.

Once final decisions are made, 84% of survey respondents plan to take various actions regarding their heat networks. These plans include implementing identified improvements, including through HNES capital funding, switching to low carbon heat sources, replacement of old elements of their HN, expansion of their HN, and upskilling workforces.

Barriers to implementing changes and how they can be overcome

Most projects are currently evaluating which improvements to implement based on the optimisation study findings. 63% of survey respondents said they have not started to take forward any actions recommended in the optimisation study. Of this group 33% indicated this

was due to awaiting senior-level sign-off and 50% indicated this was due to a lack of budget/funding⁴⁷. Despite this, 16% of survey respondents said they had already started to take forward all actions recommended by their optimisation study, and 21% said they had taken forward some. For those that answered they had either not started taking forward the recommendations, or had only taken some, 50% said they planned to take all recommendations forward, and 44% said they planned to take forward some.

A significant barrier to implementing more extensive, capital-intensive improvements is the associated cost. Operators emphasised that cost is a major barrier to implementing changes:

“[We] will be looking at when we could deliver some of the recommendations because some of the bigger recommendations, we would struggle to fund them momentarily.” – Revenue Operator

“Implementing some recommendations could be a few years away and depending on the value of the recommendations, it takes more time to plan for that.” – Revenue Operator

To navigate these financial hurdles, operators are considering phased approaches. This strategy involves initially implementing cost-effective improvements and gradually planning for more substantial upgrades. The phased approach allows time for arranging adequate funding and preparing comprehensive applications for HNES, GHNF, or other governmental support.

“Some of the smaller recommendations we might do it as part of the normal servicing elements.” – Revenue Operator

Survey results illustrate additional barriers beyond high costs, including lack of time and resources (42%), lack of government support (21%), and a lack of suitable installers and non-installer workforce (5%).

Operators are prioritising recommendations to effectively manage both customer impact and financial constraints. Immediate, less disruptive measures may include optimising heat control in residences and updating plant room controls. More disruptive, capital-intensive actions, such as major pipework and valve replacements, will be scheduled as part of long-term strategic plans.

Interim Contribution Claims

An initial assessment of the HNES Revenue projects' impact has been conducted using contribution analysis and process tracing. This analysis is structured around the ToC and its causal pathways. The evaluation has gathered evidence to assess the plausibility of each hypothesis or contribution claim and determine if outcomes align with the given hypothesis, if evidence is weak or needs more support, or if alternative explanations better fit the outcomes.

⁴⁷ Note: these responses were coded from an open text question and are not mutually exclusive.

As this is an early-stage assessment, data and supporting evidence are limited. Detailed claims and evidence will be presented in later evaluation phases.

The following gives a summary assessment of each contribution claim, further detail is provided in Annex 4.

CC1: HNES revenue funding provides a pipeline of projects for HNES capital funding

Initial assessment:

There is some evidence to support the causal hypothesis, however at this early stage it is **inconclusive**. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

- The optimisation reports generated through HNES revenue funding have been instrumental in providing detailed analyses and recommendations, which support the decision-making processes for applying to HNES capital funding. These reports typically contain comprehensive data and proposed interventions that convincingly demonstrate the need and potential for further funding.
- Operators indicate that insights from these studies significantly aid in building strong cases for capital improvements, highlighting the direct pathway from revenue-funded explorations to capital project applications.
- The evidence gathered so far suggests a positive impact of HNES revenue funding in creating a prepared pipeline for capital funding applications. The detailed and targeted recommendations provided in the optimisation reports are crucial in enabling operators to pursue and justify the need for capital investments.
- The phase 2 evaluation revealed that, of the 73 HNES Demonstrator revenue projects, 17 successfully transitioned to secure HNES capital funding across the first three rounds.

Plan for collating further evidence:

- Further interviews, surveys and capital application data analysis will be conducted in the forthcoming phases to assess the impacts of the Main scheme revenue projects.

CC2: HNES revenue funding enables most impactful improvements to be identified.

Initial assessment:

There is some evidence to support the causal hypothesis, however at this early stage it is **inconclusive**. Further evidence will need to be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

- HNES optimisation studies have provided comprehensive reviews of heat network systems, highlighting specific performance issues and proposing targeted interventions. These reports offer a holistic view of network performance, crucial for identifying the most impactful improvements.
- Operators appreciated the detailed analysis provided, which included cost-benefit considerations, helping to prioritise interventions that offer the best returns on investment. The studies' ability to detail each aspect of the system's performance - from energy efficiency to operational setbacks - supports the hypothesis that these insights are critical for choosing impactful improvements.
- Operators reported that the studies helped in making informed decisions by providing a structured and quantifiable analysis of potential improvements, which contrasts with the counterhypothesis that suggests operators could independently identify the most cost-effective and impactful improvements without these studies.

Plan for collating further evidence:

- Further interviews, surveys, optimisation reports and capital application data analysis will be conducted in the forthcoming phases to assess this contribution claim.

CC3: HNES enables reduction of carbon emissions

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this early stage of the scheme. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- The impact of HNES on carbon emissions reductions will be assessed through quantitative data on fuel savings, carbon emissions reductions, and efficiency improvement metrics from funded projects, as well as interview consultations in the forthcoming phases of the evaluation.

CC4: Experience of HNES encourages future network improvements and decarbonisation

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this stage. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- To provide evidence on whether the experience of HNES encourages future network improvements and decarbonisation, a comparative analysis of GHNF applications from HNES and non-HNES operators will be undertaken. This will be analysed alongside qualitative insights from operators on the influence of HNES on their plans and insights from applicants on their next steps, to allow for a definitive assessment of contribution claim 4 in subsequent phases of the evaluation.

CC5: Improved customer confidence in heat networks.

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this stage. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- To assess this contribution claim, analysis of surveys and interviews, as well as performance metrics and cost of heat will be analysed in future phases of the evaluation.

CC6: Improved public perception of heat networks.

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this stage. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- Future phases of the evaluation will include customer surveys and interviews with applicants and policy officials to gain insights into changing public perceptions. We will also consider using media analysis to evaluate the change in public perceptions of heat networks since HNES was launched. This data will enable an assessment of the impact of heat networks on public perception and the validity of the causal hypothesis.

Implications

This chapter presents the findings of both the process and impact evaluation, detailing what areas worked well and what did not work so well. It also outlines the key lessons learned for potential future rounds of HNES. These findings are then translated into a review of, and update to, the HNES contribution claims.

Key Impacts and Findings

The HNES process evaluation offers valuable insights into delivery, project experience and outcomes of the scheme. The following tables identify key positives, challenges, and areas for future improvements by theme.

Table 7: Scheme Delivery

What Worked Well	
• Most projects reported an efficient transition from application success to project mobilisation, with a significant majority experiencing no procedural issues, highlighting effective initial setup processes. • The majority of participants reported positive interactions with the scheme's administration, praising the clarity and supportiveness of communications from Gemserv and its partners. • There were continuous improvements to the scheme's administration, including refinement of guidance documents and support mechanisms such as webinars which helped projects to comply with reporting requirements.	
What could be improved	Lessons
• 64% of capital and all surveyed revenue projects experienced delays in delivery due to internal factors such as resourcing and contract negotiations. • Delays in capital project delivery were frequently attributed to a scarcity of contractors with the expertise required to complete the building work. This impacted on project timelines and increases the risk of non-compliance with funding deadlines. • Numerous projects highlighted the challenges of aligning project	• While communication from Gemserv is generally positively received, feedback suggested a need for more personalised interactions to clarify project-specific queries and ensure a better understanding of complex requirements. • Communications from Gemserv could benefit from being more specific about which project they refer to as many consultants manage multiple projects • There is a valuable opportunity in facilitating knowledge exchange on common challenges like contract

mobilisation with funding deadlines, often necessitating extensions and adjustments to meet operational realities.	negotiations, through webinars or collaborative sessions, which could significantly benefit both new and ongoing projects by sharing lessons learned and best practices across the scheme.
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Table 8: Project Experience

What Worked Well	
• The majority of capital and revenue projects effectively utilised their allocated funds within the fiscal year, with a high percentage of projects spending their total funding, demonstrating effective financial management under tight timelines. • Projects with strong stakeholder support, such as from local authorities, relevant housing associations and tenants, and those well-aligned with broader organisational goals such as Net Zero targets, generally experienced smoother project mobilisation and fewer implementation challenges. • Projects were generally successful in mobilising the necessary resources, including expertise and workforce, particularly where there was a proactive approach to procurement and team formation, which allowed for flexibility and responsiveness in project execution.	
What could be improved	Lessons
• Despite effective financial management, projects faced ongoing challenges in bringing together funding, expertise, and other resources effectively, especially for capital projects. These challenges were compounded by financial management complexities, such as the need to spend allocated funds within the fiscal year. • Difficulty in securing technical expertise and necessary supply chain engagements often delayed project mobilisation and execution, particularly for capital projects where 42% reported difficulties in procuring supply chain organisations. • Capital and to a lesser degree, revenue projects faced challenges in data collection and management, with a substantial proportion of projects finding the collection of necessary monitoring	• Initially, frequent financial risks, such as rising material costs, highlighted the need for more rigorous financial planning from projects to stay within budget and ensure adequate funding throughout the project lifetime. Over time however, project-level financial management has increasingly evolved to become more proactive, allowing for more successful financial management. • Developing stronger networks and support mechanisms for engaging supply chain partners and technical experts may mitigate delays and improve project execution efficiency, particularly for capital projects. • The Department and Gemserv are currently working on how data collection can be improved. This could be through the introduction of more structured and

data difficult due to its detailed and highly technical nature.	clear guidelines for data collection, possibly through training sessions and the use of detailed case studies may help project teams manage the complexity of data requirements more effectively. This approach would mitigate against initial misinterpretation of reporting requirements and improve the overall quality of monitoring data submissions.
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Table 9: Project Outcomes, Outputs and Next Steps

What Worked Well	
• The optimisation studies were effective in identifying key technical issues such as inadequate insulation and inefficient heat control systems. • Having clear project objectives that align with organisational goals and strong stakeholder engagement enables projects to achieve successful outcomes.	
What could be improved	Lessons
• There was significant variability in the level of outcomes achieved, particularly among revenue projects. Factors such as project management quality, technical challenges, stakeholder engagement, and the effectiveness of procurement strategies affect these outcomes. • Projects were asked whether they will apply to GHNF and many expressed uncertainty. This indecision was often due to difficulties in securing match funding and uncertainties about the economic feasibility and payback periods of proposed improvements.	• Simplifying and clarifying the funding application processes could reduce uncertainties and aid projects in planning and securing funding. This includes providing detailed guidelines on eligibility, application procedures, and expected timelines. • Future rounds of funding could support ensuring the availability and capability of relevant contractors and maintenance professionals. This could include creating a pre-qualified contractor list or providing additional support and training to enhance the technical capabilities of teams involved in project implementation.

The impact evaluation has considered what benefits and outcomes can be directly attributed to HNES. In particular, it has **assessed whether optimisation studies allowed operators to make informed decisions** on: whether they should improve their heat network; what improvements they should make; the cost and best means of funding required to implement

improvements; whether HNES capital funding should be sought; and, why improvements have or have not proceeded.

Table 10: Impact Evaluation Findings

Effectiveness of Optimisation Study Recommendations • Operators appreciated the depth of analysis provided by the optimisation studies. These reports were crucial in identifying specific enhancements needed to improve the efficiency of heat networks. The detailed assessments enabled tailored recommendations which were instrumental for planning upgrades and interventions. • 84% of survey respondents felt the optimisation studies increased their confidence in their heat network's operation. Operators valued recommendations that were communicated clearly and were accessible to non-technical staff. • The perceived usefulness of recommendations varied, with some seen as easy to implement and cost-effective, while others were deemed to be too costly or technically demanding.
Decision-Making Factors • The decision to implement changes was heavily influenced by the cost of improvements and the expected return on investment. Operators needed to balance the upfront costs with long-term benefits, such as energy savings and carbon reductions. • Operators prioritised recommendations based on cost-effectiveness and the level of disruption to residents. Low-cost and minimally disruptive measures were preferred, highlighting the need for strategic planning in the application of more extensive, capital-intensive recommendations. • Other important considerations included the potential to reduce carbon emissions, which aligns with upcoming regulations such as HNTAS, and the impact of improvements on resident welfare and operational costs. Operators indicated that they were more likely to implement improvements if the benefits were clear to residents.
Next Steps for HNES Revenue Projects • While most operators that were interviewed are still deciding whether to implement the improvements, one project has decided to self-fund recommendations. Respondents emphasised how essential cost-effective solutions are, as cost and funding are the biggest barriers for operators to implement changes. • While this is a challenge, consultants ensured that the optimisation studies prioritised improvements from low-cost and least disruptive to residents, to costly and disruptive to residents. This has allowed operators to identify immediate actions and phase capital-intensive changes. Although demand has been high for HNES capital funding, projects are still deciding if and how they will proceed with capital works.

- 84% of survey respondents indicated that they have plans regarding their heat networks, including applying for HNES capital funding, implementing improvements, switching to low carbon heat sources, and upskilling their workforces.

Next Steps

This chapter summarises the next steps of the evaluation of HNES, setting this report in its wider context.

The next and fourth phase of the evaluation, scheduled from July to October 2024, will focus on the Final Process Evaluation and Interim Impact Evaluation of the HNES projects. This phase will incorporate:

Final Process Evaluation (Phase 4a):

- An examination of post-upgrade activities for capital projects from the first two funding rounds, observed one year after funding delivery, alongside a review of post-optimisation for revenue projects.
- Updates to the ToC and evaluation plans based on the developments and learnings so far.
- A review of programme level reporting from Gemserv to understand risk management effectiveness.
- Conducting circa 18 post-upgrade virtual interviews with a mix of applicants and operators to assess their experiences and outcomes.
- Engaging with DESNZ policy officials and delivery partners through four interviews to discuss the resolution of challenges previously identified.

Interim Impact Evaluation for Capital Projects (Phase 4b):

- Utilisation of baseline and monitoring data provided by Gemserv to evaluate primary fuel savings, carbon emissions reductions, network efficiency, cost of heat, and service interruptions.
- Analysis of potential reductions in heat tariffs using application and monitoring data.
- Implementation of customer surveys and interviews to capture insights on customer detriment, including billing accuracy, information provision, overheating, and impacts on tariffs.
- Customer surveys to assess the outcomes experienced by end-users of the capital projects.

Impact Evaluation – Demonstrator Scheme (Capital) (Phase 4c):

- Review of pre- and post-application/monitoring data to evaluate the realised benefits of the capital projects within the HNES Demonstrator.

This phase will also set the stage for the next steps in the evaluation process, ensuring that the insights gathered contribute to refining future interventions and supporting continuous improvement in the HNES framework.

Annex 1: Evaluation Questions

The following evaluation questions have been agreed with the Department at the evaluation planning stage.

Process Evaluation Questions

Pre-Award Stage

1. How do potential applicants hear about the scheme and what model is HNES being applied through⁴⁸? What is the market appetite for the HNES offer? What is the spread of applicants applying for funding relative to all those who could apply?
2. What are the barriers/enablers that determine whether applications are made, and whether they are successful in achieving support?
3. What types of projects are successful/unsuccessful at the application stage, and why? At what points are applicants dropping out and why?
4. Are the eligibility and scoring criteria suitable, is there any evidence of gaming, and if so, how does this impact the delivery of HNES?
5. Have the baseline requirements for capital projects created any difficulties for projects, or changed the type of projects that are successfully applying?
6. What types of measures/interventions are applied for and supported?
7. What are applicants' experiences of the overall application process and of providing baseline and target data, and how does this vary by applicant (i.e., revenue or capital) or project type and why?
8. Was the process easier for Main scheme applicants who had been part of the HNES Demonstrator versus those who had not?
9. How did the funding and drawdown process work in practice?

Post Award Stages

10. What happens between application success and project set up, and are there any recurrent procedural blocks or delays?

⁴⁸ Potential typologies include: operators hear about the opportunity and apply; operators bring in a consultancy to help them apply and manage that process; consultancies approach existing operators to present them with the opportunity and manage it for them.

11. How effectively is the scheme being delivered and what improvements can be made?
12. How do projects manage to bring together the funding, expertise, workforce, resources, and wider stakeholder buy-in to make them a success? What were the barriers and enablers?
13. What are the experiences of projects of providing monthly monitoring data? Has the monitoring created any difficulties for projects during the procurement and upgrade phases? What learnings can be applied to ensure robust and proportionate data is collected?
14. What has the overall experience of HNES been for projects and decision makers, and how does this vary by project type and why?
15. How do outcomes differ between projects and what are the causes of those outcomes?
16. Are there any procedural or process problems inhibiting delivery of benefits?
17. How effective have the post-award communications, guidance and support for operators been in ensuring projects efficiently move through Optimisation Study delivery (revenue grants) or procurement, build, and initial operation stages (capital projects)?
18. How can project-level learning from HNES be applied to other projects within an operator portfolio, and coherently communicated/applied to the wider heat network sector?
19. Are projects intending to apply to GHNF either individually or as part of an aggregated application? Can the outputs of HNES be better designed to facilitate/encourage this?

Impact Evaluation Questions

Overarching Questions

1. To what extent did the HNES scheme deliver against its objectives?
2. How do scheme impacts vary by different types of projects and stakeholders?
3. Which improvements have greatest impact, taking account of cost?

Impacts on Specific Benefits

4. What benefits can be attributed to HNES, and did they occur as initially intended?
 - 4a. Primary fuel savings
 - 4b. Carbon emissions reductions
 - 4c. Network efficiency
 - 4d. Cost of heat

4e. Service interruptions

5. Where and how are benefits passed through to network customers? (Considering: Improved accuracy of billing, improved provision of information, impacts on tariffs, reduced overheating.)

Impacts to Revenue Schemes

6. Did the optimisation study allow operators to make an informed decision on whether they should improve the heat network?

7. What improvements can operators make to improve their networks?

8. How do operators intend to fund identified improvements? Will this be done through HNES funding?

9. If operators have decided not to go ahead with improvements, why? What were the barriers to implementing changes and how can these be overcome?

Economic (VfM) Questions

1. What is the emerging cost-benefit analysis position of the scheme ex-post?

2. What are the quantifiable costs and benefits that have been realised that are attributable to the scheme?

3. How does this compare to the ex-ante view of the cost-benefit analysis of the project?

4. Are supported projects providing good value for money?

5. Can we say anything ex-post about whether alternative support models would have delivered better value for money?

Annex 2: Evaluation Methodology

The following chapter presents the methodology for the HNES evaluation.

The evaluation of HNES has adopted a theory-based approach, structured around the HNES's Theory of Change (outlined in Annex 3) and incorporating Contribution Analysis (Annex 4). This methodology will synthesise evidence from various sources to examine what works, how, for whom, and crucially, what underpins different types of outcomes at different stages across the typology of funded projects.

Evidence sources include interviews conducted across three process and four impact evaluation workstreams, beneficiary and customer surveys, analysis of monitoring and baseline data, Value for Money (VfM) modelling, and quasi-experimental analysis using Interrupted Time Series Analysis (ITSA).

The Contribution Analysis (CA) allows the evaluation to synthesise, test, and weigh up quantitative evidence (e.g., ITSA results, survey findings, pre/post comparisons) with qualitative evidence (interviews) to provide an overall view of impact and attribution, understanding how HNES has led to observed outcomes. The CA framework will also establish the validity of the refined Theory of Change by testing a series of contribution claims linked to HNES outcomes and impacts. CA will examine whether and how the activities in HNES can be seen as bringing about desired outcomes and impacts.

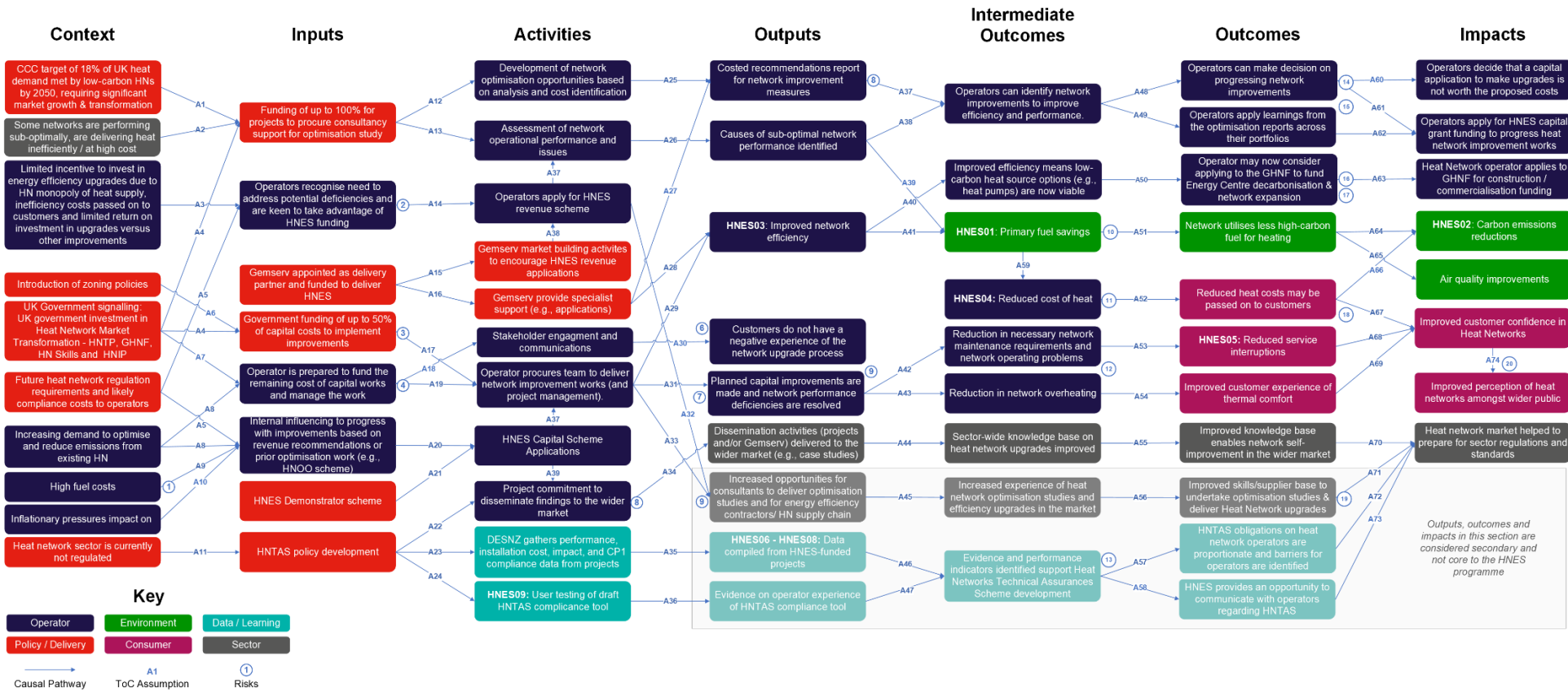
The key components of the evaluation include:

- **Impact of the HNES Demonstrator scheme (capital and revenue projects):** to understand and quantify the impact in relation to key metrics.
- **Interim and final process evaluation (capital and revenue projects):** to understand how the HNES application and project initiation stages are working, what emerging impacts HNES is having, and what improvements can be made for projects in later funding rounds.
- **Interim and final impact evaluation (capital and revenue projects) and value for money evaluation for HNES and HNES Demonstrator (capital projects):** to assess the impact of HNES and the extent to which it contributed to the targeted outcomes. To quantify the economic benefits and outcomes based on final application data and emerging monitoring data – focused primarily on the benefits given below.

Annex 3: Theory of Change

This Annex includes the HNES Theory of Change (ToC) that was tested as part of the Contribution Analysis.

Figure A3.1: HNES Theory of Change



Annex 4: Contribution Analysis

We have adopted a **theory-based approach** to the evaluation of HNES, using **Contribution Analysis** as a framework, structured around a ToC and responding to the evaluation questions and objectives. Contribution Analysis (CA) is the most appropriate method for this evaluation, given that it affords the evaluation team the ability to synthesise, test and weigh up quantitative evidence (e.g., ITSA results, survey findings, pre/post comparisons) with qualitative evidence (interviews) to provide an overall view of impact and attribution, understanding how HNES led to observed outcomes. Our CA will synthesise evidence from: interviews conducted in three process and four impact evaluation workstreams; beneficiary and customer surveys; analysis of monitoring/baseline data, and quasi-experimental analysis using Interrupted Time Series Analysis (ITSA).

Contribution analysis⁴⁹ aims to establish the validity of a programme's logic model by testing the theories underpinning each causal link; the assumptions that are made that imply that the funded activities will bring about the desired impacts. The approach rests on the creation of a 'contribution story', providing an initial narrative of what it is reasonable to expect that HNES itself will contribute toward the intended goals, relative to other inputs and activities and contextual factors. A series of sequential steps are required aiming to build the 'contribution story' that is then verified through primary quantitative and qualitative research and secondary data. Through collecting evidence to either prove or disprove the established contribution story, this approach enables evidence-based judgements to be made on the impact of HNES.

Contribution Analysis for HNES will allow the evaluation team to establish the validity of the refined ToC by testing a series of contribution claims linked to HNES outcomes and impacts. CA will do this by examining whether and how the activities in HNES can be seen as bringing about desired outcomes and impacts. CA helps mitigate the problem of attributing impacts in complex settings by identifying other plausible explanations of outcomes and assessing evidence to discount these (or not). Through the CA framework, we will be able to strengthen the argument for HNES' impact as captured in our causal hypotheses and ToC or, alternatively, to update these materials to reflect the mechanisms by which impact has occurred in practice.

Contribution Analysis Methodology

- **Testing Contribution Claims:** CA enables testing of contribution claims linked to HNES outcomes. It examines the role of HNES activities in achieving desired outcomes and mitigates attribution problems in complex settings by considering alternative explanations.
- **Synthesising Evidence:** The CA will integrate evidence from multiple sources: interviews, beneficiary/customer surveys, monitoring data, and ITSA. This synthesis

⁴⁹ J. Mayne. (2001). Addressing Attribution Through Contribution Analysis: Using Performance Measures Sensibly from *Canadian Journal of Program Evaluation*, 16 (1),1-24.

helps to construct an economic impact assessment, including Cost-Benefit Analysis (CBA) and value-for-money assessments.

- **Developing the Contribution Story:** CA iteratively builds a narrative about HNES's contribution relative to other factors. This includes defining a theory, testing it through fieldwork, and collecting evidence to validate or revise the initial contribution story.
- **Assessing Impact and Evidence Strength:** We will aggregate evidence across evaluation activities, assessing the strength of each contribution claim. This process will occur throughout the evaluation, with more in-depth assessment in later phases.
- **Framework Steps:**
 - Populating the framework with quantitative and qualitative data.
 - Critically assessing causal hypotheses, considering the plausibility of alternative explanations.
 - Evaluating the strength of causal pathways and the credibility of the overall story.
 - Revising the contribution story based on evidence and stakeholder agreement.
- **Refining Contribution Claims:** Initial contribution claims (refer to the table overleaf), derived from the scheme's ToC, include causal hypotheses, counterhypotheses, expected evidence, and related ToC aspects. These claims will be refined as evidence is gathered, and new claims may be added.
- **Iterative Assessment:** The CA will be conducted across all evaluation phases, with a focus on refining the contribution story. This includes an initial assessment of causal hypotheses, identifying areas for focused data collection in subsequent rounds.
- **Developing a Live Framework:** As the evaluation progresses, additional contribution claims may be added to reflect new insights and understanding of the programme's practical impact.

Interim Contribution Claims

As part of the contribution analysis and process tracing approach, an initial assessment of the contribution of the HNES Revenue projects has been carried out based on data obtained during this phase of the evaluation. This is structured around the Theory of Change, capturing hypotheses of how causal pathways outlined in the Theory of Change (Annex 3) delivered intended outcomes. These claims are based on the ToC, HNES outcomes and desk-based evidence review. Contribution claims were composed of:

1. A causal hypothesis (to be tested);
2. An alternative hypothesis (which provides an alternative explanation of outcomes);
3. The evidence expected (if the hypothesis is true);
4. And the link to the evaluation question these will address.

Through evidence gathering as part of an evaluation findings, the plausibility of each hypothesis, or contribution claim, is assessed to determine if outcomes are best explained by the given hypothesis, the evidence available is weak or needs supplemented, or if alternative explanations of the outcome better explain causality. **This assessment is being carried out at a very early-stage and therefore, data and supporting evidence is very limited.** These claims, along with supporting evidence will be presented in more detail in the forthcoming phases of the evaluation.

The following assesses the casual hypothesis for the key themes and looks at the counterhypothesis:

CC1: HNES revenue funding provides a pipeline of projects for HNES capital funding

Causal hypothesis: HNES revenue funding optimisation reports provide compelling evidence to operator decision makers to make the case for investment in identified improvements. As a result, internal stakeholders are willing to make an application for HNES capital funding (up to but not including 50% of capital costs) for delivery of works.

Counterhypothesis: Operators are already aware of network performance issues and see HNES capital funding as an important opportunity to receive grant funding for upgrades or suggested improvements are too costly and therefore operators decide against making changes to their networks.

Expected Evidence: Revenue applications and conversions to capital applications; qualitative evidence from operators on decision making; review of optimisation reports, survey evidence.

Initial assessment:

There is some evidence to support the causal hypothesis, however at this early stage it is **inconclusive**. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

- The optimisation reports generated through HNES revenue funding have been instrumental in providing detailed analyses and recommendations, which support the decision-making processes for applying to HNES capital funding. These reports typically contain comprehensive data and proposed interventions that convincingly demonstrate the need and potential for further funding.
- Operators indicate that insights from these studies significantly aid in building strong cases for capital improvements, highlighting the direct pathway from revenue-funded explorations to capital project applications.
- The evidence gathered so far suggests a positive impact of HNES revenue funding in creating a prepared pipeline for capital funding applications. The detailed and targeted recommendations provided in the optimisation reports are crucial in enabling operators to pursue and justify the need for capital investments.

- The phase 2 evaluation revealed that, of the 73 HNES Demonstrator revenue projects, 17 successfully transitioned to secure HNES capital funding across the first three rounds.

Plan for collating further evidence:

- Further interviews, surveys and capital application data analysis will be conducted in the forthcoming phases to assess the impacts of the Main scheme revenue projects.

CC2: HNES revenue funding enables most impactful improvements to be identified.

Causal hypothesis: HNES optimisation reports give operators a holistic view of network performance issues across the network infrastructure from one single contractor, allowing specific targeted interventions to be identified which are the most impactful and cost effective.

Counterhypothesis: Operators are already aware of critical network deficiencies and can therefore make assumptions as to the most impactful and cost-effective improvements.

Expected Evidence: Review of optimisation reports; qualitative evidence from operators on decision making and from Gemserv on conversion of revenue to capital projects.

Initial assessment:

There is some evidence to support the causal hypothesis, however at this early stage it is **inconclusive**. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

- HNES optimisation studies have provided comprehensive reviews of heat network systems, highlighting specific performance issues and proposing targeted interventions. These reports offer a holistic view of network performance, crucial for identifying the most impactful improvements.
- Operators appreciated the detailed analysis provided, which included cost-benefit considerations, helping to prioritise interventions that offer the best returns on investment. The studies' ability to detail each aspect of the system's performance - from energy efficiency to operational setbacks - supports the hypothesis that these insights are critical for choosing impactful improvements.
- Operators reported that the studies helped in making informed decisions by providing a structured and quantifiable analysis of potential improvements, which contrasts with the counterhypothesis that suggests operators could independently identify the most cost-effective and impactful improvements without these studies.

Plan for collating further evidence:

- Further interviews, surveys, optimisation reports and capital application data analysis will be conducted in the forthcoming phases to assess this contribution claim.

CC3: HNES enables reduction of carbon emissions

Causal hypothesis: HNES capital funding enables works to address network inefficiencies that lead to distribution losses. Networks can meet the same heat demand from less fuel, meaning the carbon emissions that would have resulted from the unused fuel are saved.

Counterhypothesis: Current high fuel prices will by itself drive network operators to make efficiency improvements and upgrades.

Expected Evidence: Quantitative evidence on fuel savings, carbon emissions reductions and efficiency improvement metrics; qualitative evidence from operators and consultants on network efficiencies, heat demand, fuel use and carbon emissions.

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this early stage of the scheme. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- The impact of HNES on carbon emissions reductions will be assessed through quantitative data on fuel savings, carbon emissions reductions, and efficiency improvement metrics from funded projects, as well as interview consultations in the forthcoming phases of the evaluation.

CC4: Experience of HNES encourages future network improvements and decarbonisation

Causal hypothesis: Works funded by HNES on upgrading network efficiency mean that networks that are of a sufficient efficiency standard to utilise low-carbon heating sources, are working as per their design intent, and some networks will meet GHNF application requirements. Experience and skills gained from applying for and managing HNES upgrades gives operator confidence and resources to apply to GHNF (or self-fund) for further network improvements and decarbonisation.

Counterhypothesis: Organisational low-carbon ambitions and the opportunity of grant funding means that organisations will make network improvements to meet GHNF eligibility criteria (i.e., working as per design intent) regardless of HNES funding. However, given cost of network improvements, applicants might also choose not to improve their heat networks.

Expected Evidence: Applications to GHNF from HNES operators; qualitative evidence on future network intentions.

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this stage. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- To provide evidence on whether the experience of HNES encourages future network improvements and decarbonisation, a comparative analysis of GHNF applications from HNES and non-HNES operators will be undertaken. This will be analysed alongside qualitative insights from operators on the influence of HNES on their plans and insights from applicants on their next steps, to allow for a definitive assessment of contribution claim 4 in subsequent phases of the evaluation.

CC5: Improved customer confidence in heat networks.

Causal hypothesis: HNES capital works offset network performance issues that negatively impact customers, and efficiency upgrades lead to reductions in the cost of heat. Improved network reliability and potential reductions in cost to customers reduce negative perceptions of heat networks to improve customer confidence in heat networks as a heat source.

Counterhypothesis: Communications relating to upcoming heat network regulations provide assurance to customers that networks must meet a certain standard of performance and cost, giving confidence in the reliability and price of heat networks as a heat source.

Expected Evidence: Findings from customer survey and interviews; metrics on reduction in performance deficiencies and cost of heat.

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this stage. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- To assess this contribution claim, analysis of surveys and interviews, as well as performance metrics and cost of heat will be analysed in future phases of the evaluation.

CC6: Improved public perception of heat networks.

Causal hypothesis: Reduction in heat network issues (and/or potential cost reductions) and resultant improved consumer experience and confidence leads to a reduction in negative media / social media reports on heat networks, improving general perceptions and beginning to remove reputational barriers.

Counterhypothesis: The shift in public perception (i.e., towards recognising the advantages of heat networks) is primarily driven by factors over and above direct experience with heat

networks, such as media coverage and public discourse. This includes ongoing discussion of climate change, rising awareness of sustainable living practices, government information campaigns, and the broader trend towards eco-friendly heating solutions (e.g. UK heat decarbonisation policy). These broader factors, rather than specific improvements to heat network operations or cost reductions, are the main catalysis for the change in public perception of heat networks.

Expected Evidence: Findings from customer survey and interviews; metrics on reduction in performance deficiencies; qualitative evidence from interviews with policy officials.

Initial assessment:

Inconclusive as there is no evidence to support the causal hypothesis at this stage. Further evidence will be evaluated in the forthcoming phases of the evaluation to draw conclusions for this contribution claim.

Further evidence required:

- Future phases of the evaluation will include customer surveys and interviews with applicants and policy officials to gain insights into changing public perceptions. We will also consider using media analysis to evaluate the change in public perceptions of heat networks since HNES was launched. This data will enable an assessment of the impact of heat networks on public perception and the validity of the causal hypothesis.

Contribution Claim	Causal Hypothesis	Counterhypothesis	Expected Evidence	Links to ToC
Revenue Funding				
CC1: HNES revenue funding provides a pipeline of projects for HNES capital funding.	HNES revenue funding optimisation reports provide compelling evidence to operator decision makers to make the case for investment in identified improvements. As a result, internal stakeholders are willing to make an application for HNES capital funding (up to but not including 50% of capital costs) for delivery of works.	Operators are already aware of network performance issues and see HNES capital funding as an important opportunity to receive grant funding for upgrades or suggested improvements are too costly and therefore operators decide against making changes to their networks.	Revenue applications and conversions to capital applications; qualitative evidence from operators on decision making; review of optimisation reports, survey evidence.	Impact node: <i>“Operators apply for HNES capital grant funding to progress heat network improvement works”.</i>
CC2: HNES revenue funding enables most impactful improvements to be identified.	HNES optimisation reports give operators a holistic view of network performance issues from one single contractor across the network infrastructure, allowing specific targeted interventions to be identified which are the most impactful and cost effective.	Operators are already aware of critical network deficiencies and can therefore make assumptions as to the most impactful and cost-effective improvements.	Review of optimisation reports; qualitative evidence from operators on decision making and from Gemserv on conversion of revenue to capital projects.	Intermediate outcome node <i>“Operators can identify network improvements to improve efficiency and performance.”</i>
Carbon Emissions Reductions				
CC3: HNES enables Carbon emissions reductions.	HNES capital funding enables works to address network inefficiencies that lead to distribution losses. Networks can meet the same heat demand from less fuel, meaning the carbon emissions that would have resulted from the unused fuel are saved.	Current high fuel prices will in and of themselves drive network operators to make efficiency improvements and upgrades.	Quantitative evidence on fuel savings, carbon emissions reductions and efficiency improvement metrics.	Impact node <i>“Carbon Emissions Reductions”</i>

Contribution Claim	Causal Hypothesis	Counterhypothesis	Expected Evidence	Links to ToC
CC4: Experience of HNES encourages future network improvements and decarbonisation.	Works funded by HNES on upgrading network efficiency mean that networks are of a sufficient efficiency standard to utilise low-carbon heating sources, are working as per their design intent, and some networks will meet GHNF application requirements. Experience and skills gained from applying for and managing HNES upgrades gives operator confidence and resources to apply to GHNF for further network improvements and decarbonisation.	Organisational low-carbon ambitions and opportunity of grant funding, mean organisations will make network improvements to meet GHNF eligibility criteria (i.e., working as per design intent) regardless of HNES funding. However, given cost of network improvements, applicants might also choose not to improve their heat networks.	Applications to GHNF from HNES operators; qualitative evidence on future network intentions.	Impact node <i>“Operator applies to GHNF for construction or commercialisation funding”</i>
Customer Perceptions / Experience				
CC5: Improved Customer Confidence in Heat Networks.	HNES capital works offset network performance issues that negatively impact customers, and efficiency upgrades lead to reductions in the cost of heat. Improved network reliability and potential reductions in cost to customers reduce any negative perceptions of heat networks to improve customer confidence in heat networks as a heat source.	Communications relating to upcoming heat network regulations provide assurance to customers that networks must meet a certain standard of performance and cost, giving confidence in the reliability and price of heat networks as a heat source.	Findings from customer survey and interviews; metrics on reduction in performance deficiencies and cost of heat.	Impact node <i>“improved customer confidence in heat networks”</i> .
CC6: Improved Public Perception of Heat Networks.	Reduction in heat network issues (and/or potential cost reductions) and resulting improved consumer experience and confidence lead to a reduction in negative media / social media reports on heat	Upcoming regulations, high gas-prices and increasing awareness of need to decarbonise heat	Findings from customer survey and interviews; metrics on reduction in performance	Outcome node <i>“Improved perception of</i>

Contribution Claim	Causal Hypothesis	Counterhypothesis	Expected Evidence	Links to ToC
	networks, improving general perceptions and beginning to remove reputational barriers. As a result, more of the public will consider living in a house that is connected to a heat network.	encourage more individuals to consider the benefits of heat networks and consider connection.	deficiencies; qualitative evidence from interviews with policy officials.	<i>heat networks amongst wider public</i> ".
Preparing the Market for Heat Network Regulations				
CC7: Preparation of Heat Network sector for upcoming regulations	Evidence from HNES-funded projects (e.g., on costs, improvements, quick wins) is used by wider networks which did not receive HNES funding (either other networks within a supported operators portfolio, or non-supported operators) to identify and make improvements that will improve standards across the market, in preparation for heat network regulations or to make general network improvements.	Due to HNTAS, operators will look at undertaking network improvements anyway to prepare for the new standards, outside of HNES lessons learned.	Qualitative evidence from applicants and non-applicants on application of HNES lessons. Evidence from optimisation reports showing improvement measures that are non-specific and could be applied more widely.	Impact node <i>"heat network market helped to prepare for sector regulations and standards"</i> .
CC8: Improved Evidence for Heat Network Regulations	HNES provides policymakers with evidence from optimisation reports and data collected from HNES capital projects on performance, cost and impact, which will be used to ensure that HNTAS regulations are proportionate and fair in the requirements they place on operators.	HNTAS regulations and standards will be introduced anyway, and policymakers will seek to ensure they are appropriate, including through consultation with operators.	Qualitative evidence from policymakers of HNTAS policy development.	Outcome node <i>"HNTAS obligations on heat network operators are proportionate and barriers for networks are identified."</i>

Annex 5: Policy response following HNES Phase 3 evaluation

Introduction: Heat Network Efficiency Scheme

The Heat Network Efficiency Scheme (HNES) is a £77m grant support programme that opened to applicants in February 2023. It provides funding to public, private and third sector applicants in England and Wales, to support improvements to existing district heating or communal heating projects for customers and operators. HNES follows on from the HNES Demonstrator which ran from October 2021 to March 2022. The aim of the HNES is to improve heat network performance in existing/operational projects where customers and/or operators are experiencing sub-optimal outcomes. In particular, the HNES focuses on addressing customer detriment as a way of supporting heat network consumers impacted by cost-of-living and cost-of-energy pressures, with focus on where customer need is greatest.

The HNES objectives are to:

- Reduce carbon emissions by making heat networks more efficient.
- Reduce customer detriment to improve consumer confidence.
- Help prepare the heat network market for sector regulation and technical standards.

This policy response follows the Phase 3 report of the independent evaluation of HNES. It is important to note that the figures included in those reports represent the period of time corresponding to the Phase 3, i.e. January - June 2024. Therefore, figures do not represent the current status of HNES, which has had additional funding allocated and further funding rounds since the report was written.

Policy response to key evaluation findings

Finding

Numerous projects highlighted the challenges of aligning project mobilisation with funding deadlines, often necessitating extensions and adjustments to meet operational realities.

Policy response

- The evaluation report suggested that operators could work with regulatory bodies to inform policy-making processes based on the practical insights gained from HNES projects. This could help in shaping regulations that are supportive of efficient and sustainable heat network operations. HNES applicants are required to submit a delivery

Phase 3 Evaluation of the Heat Network Efficiency Scheme – Policy Response

programme as part of their application, which is reviewed by Delivery Partner assessors, who highlight any elements deemed unrealistic or over-optimistic. Gemserv Relationship Managers are also available to provide pre-application support with this element of supporting evidence. HNES remains flexible in the face of genuine and unavoidable changes, allowing applicants to request adjustments to their spend profile, provided these do not affect the intended outcomes and are within the available budget.

Finding

Optimisation studies were instrumental in identifying inefficiencies and informing investment decisions, with 84% of survey respondents saying the optimisation studies increased their confidence in their heat network's operation. However, a lack of funding is the main reason cited by 50% of revenue survey respondents for not starting to implement recommendations.

Policy response

- HNES capital funding can provide up to (but not including) 50% of eligible project costs (including non-recoverable VAT) for capital grant applications to fund improvements. As noted in the Phase 2 policy response, the HNES Optimisation Study scope has been designed to require assessment of a range of different interventions and/or intervention packages, including technical, cost and cost-effectiveness appraisal. This approach gives applicants/operators a rounded assessment of low/medium/high interventions and costs, allowing an informed decision on potential investment that aligns with budgetary and other considerations, preventing situations where no viable improvement action is possible.

Finding

Delays in delivering capital projects were often linked to a shortage of skilled contractors capable of executing the construction work. This led to extended project timelines and heightened the likelihood of missing funding deadlines.

Policy response

- HNES establishes funding deadlines aligned with each financial year, and projects are expected to indicate their intended claim schedule from the start. While the scheme maintains clear timelines, it allows for some flexibility - if delays are communicated in advance, funding can potentially be rescheduled through a formal project change request (subject to budget availability and review/assessment of the impacts of the change). Guidance has also been updated recently to encourage funded projects to use the [Heat Network Exchange](#) to sign-post the supply chain to procurements they intend to run for HNES-funded works. This approach will attract new entrants to the sector, drive innovation and improve competition, with longer term benefits for projects and supply chain.

Finding

Capital projects have encountered substantial difficulties in data management, primarily due to the detailed and technical nature of the data required. Capital project delivery often involves intricate modifications to infrastructure, necessitating precise and granular data collection. Survey feedback indicates that 42% of capital project respondents found data collection to be

challenging, citing issues with data access, conversion, and the granularity needed for effective monitoring. This complexity often led to initial misinterpretations of reporting requirements, suggesting a gap in preparatory guidance provided to project teams.

Policy response

- Data requirements for M&R can be found in the 'HNES Guidance for Applicants', which have been updated throughout the scheme lifetime as part of continuous improvements. More recently, the HNES Delivery Partner has introduced training sessions/webinars aligned to the beginning of projects monitoring phase to provide guidance and information to applicants regarding expectations around monitoring requirements. The Delivery Partner has also developed a bespoke M&R guidance document to support funded projects understand and complete their M&R returns.

Finding

Communications from Gemserv, especially around project updates and reminders, could benefit from being more specific about which projects they refer to so as to avoid confusion among consultants who manage multiple projects.

Policy response

- Through continuous improvement activities, Gemserv have regularly adapted their communications to ensure they are clear in referencing the project the communication refers to. Many participants reported positive interactions with the scheme administration, praising the clarity and supportiveness of communications from Gemserv and its partners.

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