Oldham Low Carbon Heat Network

Outline Business Case

29 September 2023

Revision P01

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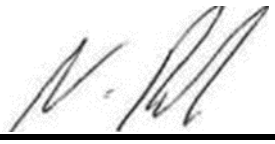
signature	
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Glossary

Term	Definition
ASHP	Air Source Heat Pump
BAU	Business as Usual
BCR	Benefit Cost Ratio
BH	Buro Happold
CAPEX	Capital Expenditure
CCC	Committee on Climate Change
CCL	Climate Change Levy
CHP	Combined Heat and Power
CLS	Company Limited by Shares
COP	Coefficient of Performance
CSF	Critical Success Factors
D&B	Design & Build
DESNZ	Department for Energy Security and Net Zero
DHN	District Heat Network
DPD	Detailed Project Development
ESCO	Energy Service Company
FCHO	First Choice Homes Oldham
FY	Financial Year
FM	Financial Model
FTS	Find a Tender
GHNF	Green Heat Network Fund
GMCA	Greater Manchester Combined Authority
GSOP	Guaranteed Standard of Performance
HNDU	Heat Network Delivery Unit
HoTs	Heads of Terms
IRR	Internal Rate of Return
JV	Joint Venture
KPI	Key Performance Indicators
LA	Local Authority
LAPWF	Less Ambitious Preferred Way Forward
LHD	Linear Heat Density
M&B	Metering & Billing
MAPWF	More Ambitious Preferred Way Forward
NPV	Net Present Value
NPSV	Net Present Social Value
O&M	Operation and Maintenance
OBC	Outline Business Case

OGND	Oldham's Green New Deal
OMBC	Oldham Metropolitan Borough Council
OPEX	Operating Expenditure
PHEX	Plate Heat Exchanger
PWF	Preferred Way Forward
PWLB	Public Works Loan Board
REPEX	Replacement Expenditure
RHI	Renewable Heat Incentive
SBCR	Social Benefit Cost Ratio
SCOP	Seasonal Coefficient of Performance
SIRR	Social Internal Rate of Return
SPF	Seasonal Performance Factor
SPV	Special Purpose Vehicle
TEM	Techno-Economic Model
TOMs	Themes, Outcomes and Measures
WSHP	Water Source Heat Pump

1 Executive Summary

This Outline Business Case (OBC) for the Oldham Low Carbon Heat Network (OLCHN) has been compiled with input from Buro Happold (BH), FWS Consultants Ltd, QMPF LLP, Womble Bond Dickinson and Oldham Metropolitan Borough Council (OMBC).

Report purpose – to develop an OBC that identifies a clear strategy for the delivery of OLCHN which can be used to apply for capital investment.

Report audience – a wide audience of internal and external stakeholders including OMBC, councillors, MPs and prospective investors.

Challenges addressed – the OLCHN looks to decarbonise council, public, commercial and residential buildings within Oldham town centre and support the goal to reach carbon neutrality across council buildings by 2025 and for the metropolitan borough by 2030.

1.1 Understanding the project

OMBC have set an ambitious goal to reach carbon neutrality across council buildings and for the metropolitan borough by 2025 and 2030, respectively. These targets are set within the context of the 2038 carbon neutrality target set out in the Greater Manchester Five Year Environment Plan. OMBC are currently reliant on natural gas to provide heating and hot water to council buildings. If the council are to meet their own target and the national target of net zero by 2050, alternative low carbon sources of heat must be identified and delivered.

An opportunity for a low carbon heat network has been identified (Figure 1—1) that delivers heat to council, public, commercial and residential (including social housing) buildings in Oldham. The network is an extension of the existing St Mary's Heat Network, operated by First Choice Homes Oldham (FCHO).

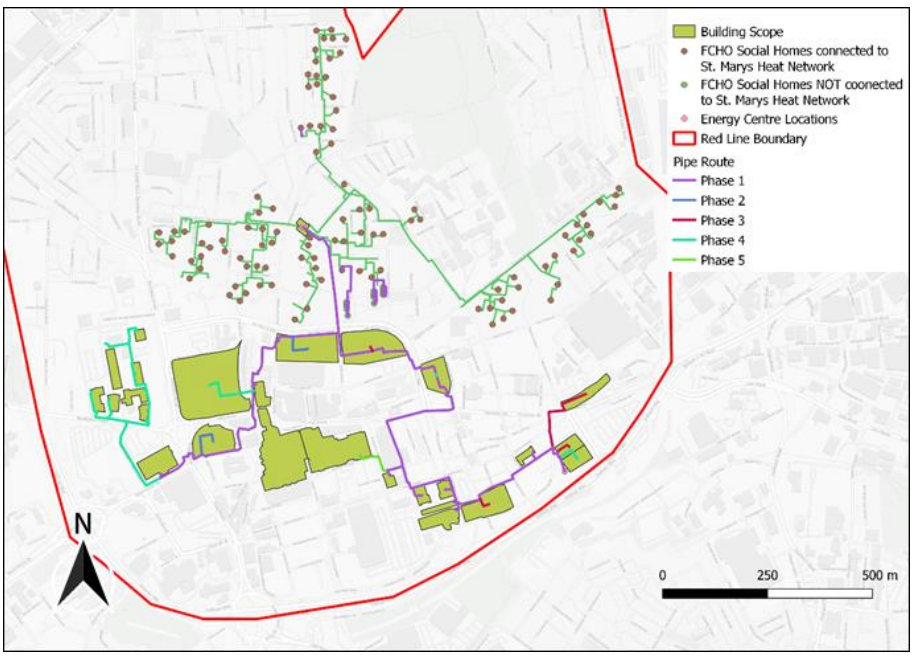

Figure 1—1 Oldham Low Carbon Heat Network Proposal

The existing St Mary's Heat Network was initially designed to serve 1,285 social housing homes, as well as additional commercial connections including the former Oldham Leisure Centre. The base load heating technology was intended to be a 3.5MW wood chip biomass boiler, which was commissioned in 2018 and was accredited for Renewable Heat Incentive (RHI) in 2017. However, no connection was made to the Leisure Centre and other commercial buildings, meaning the installed biomass boiler was oversized for the network load requirements, becoming a stranded asset and has never been utilised. The existing St Mary's Heat Network therefore relies on gas boilers to meet all demand.

An extension of the St Mary's network is required to reinstate the biomass boiler and move away from gas boilers, as the base load demand for the network would enable efficient and constant operation of the biomass boiler

1.2 Key report outcomes

- **Technological solution** – expansion of an existing heat network with additional new energy centre. Reinstatement of a currently redundant 3.5MW biomass boiler at the existing St Mary's energy centre. 1.8MW air source heat pumps located at new Rhodes Bank energy centre. Top-up gas boilers (11MW already operational at the existing heat network) and 250m^3 of thermal storage.
- **Connections** – 27 total connections across five phases comprising of new and existing council, public, commercial and residential (including social housing) buildings for a total of 30 GWh/annum heat demand incorporating ~4.7km of new pipework. This encompasses the developments included in the Oldham Town Centre regeneration.
- **Commercial delivery** - OMBC wish to procure a delivery partner to support in the delivery of their Oldham Green New Deal (OGND) strategy[1], forming a Joint Venture (JV) company. The delivery partner would support with the delivery of various decarbonisation projects across the borough including the heat network project.
- **Grant funding** – through the Green Heat Network Fund (GHNF) the scheme is applying for the £1m commercialisation and £7.78m construction funding (total £8.78m or 31% of total CAPEX). The grant fund sought is equivalent to 2.41p/kWh of heat delivered over the first 15 years of operation.
- **Financial delivery** – the financial model assumes that all additional funding is provided by a third party in the form of 70% shareholder loan and 30% pure equity. With grant funding the project delivers a real pre-tax project IRR of 10%, meeting the required project hurdle rate (10%). This hurdle rate was confirmed through a soft market testing engagement exercise with various third parties.[2]
- **Carbon reduction** – the scheme delivers an average carbon factor of 32 gCO2e/kWh across the project lifetime (40 years). Compared to business as usual the scheme is expected to deliver 80% carbon savings. This equates to 3,700 tCO2e/annum and 143,000 tCO2e over the project lifetime
- **A biomass boiler** is the main low carbon heating technology for the initial project period from 2027-2033. The existing St Mary's energy centre has a currently unutilised 3.5MW biomass boiler that has been accredited with RHI. The project proposes to use the biomass boiler until its end of life before transitioning to heat pump technology.
- **Minewater** as a low carbon source of heat has been explored within this study by independent technical consultants. The recommendation from the study is to carry out a pre-design investigation at Rhodes Bank.

[1] Oldham Green New Deal Strategy, https://www.oldham.gov.uk/gnds [Accessed 27/09/2023]
[2] Real pre-tax project IRR is 9.99% excluding working capital and is the IRR figure that can be found within the TEM and GHNF Application From. The real pre-tax IRR within the financial model is 9.81% with the inclusion of working capital.

Costs for the investigative boreholes have been included within the commercialisation funding application, demonstrating the ambition to determine a suitable low carbon heat source to replace the biomass boiler.

- **Expansion potential** – Oldham is part of the Advanced Zoning Programme (AZP) and as such the DPD study has engaged with AECOM, who are carrying out the AZP study for this zone. As part of the DPD a future expansion zone has been identified in-line with potential future zoning legislation. An expansion network has been assessed that is double in size by connecting future mandatable buildings. Furthermore AZP work has identified an indicative heat network zone with approximately 200GWh/a of heat demand and a peak heat load of 195MW.

1.3 Next steps

- Apply for grant funding to the GHNF in Round 6 – deadline 29 September 2023
- If success with GHNF funding award progress from the Detailed Project Development (DPD) stage to the Commercialisation stage of the project including:
    - Conducting relevant surveys
    - Completed pre-design investigation works at Rhodes Bank to assess minewater viability
    - Relevant planning applications and approvals
    - Procuring consultants and developing design
    - Agree customer supply and bulk heat supply agreements
    - Agree existing network asset transfer agreement with FCHO
    - Develop DHN agreement and contract
    - Procure infrastructure delivery contracts
- Review and address risk register with appropriate mitigation throughout the project process

1.4 Strategic case summary

An opportunity for a low carbon heat network has been identified that initially delivers heat to council, public, commercial and residential (including social housing) buildings in the Oldham town centre. The following project spending objectives were defined during the development of the strategic case for this project:

1. **Net zero carbon –** *Meet OMBC's net zero policy requirements by 2025 for council buildings and 2030 for the metropolitan borough by implementing low-carbon technologies and onsite interventions. In areas where decarbonisation is challenging, consider the use of fossil fuel technology while exploring alternative solutions. Additionally, prioritising community decarbonisation efforts to ensure a comprehensive and sustainable reduction in carbon emissions across the borough.*

2. **Cost of heat to customers -** *Maintain a slight flexibility to increase the cost of heat to council/public buildings if needed, not exceeding a pre-defined amount agreed within the business case assessment. This flexibility will be assessed during financial modelling, where any necessary cost adjustments will be implemented to ensure that the network is financially viable, whilst ensuring that social housing costs remain at or below current pricing levels to limit any increase in fuel poverty.*

3. **Reliable heat to customers -** *Main heat supply >85% will be from low-carbon sources. If minewater is selected as the main source of heat additional low-carbon resilience e.g. air source heat pumps are required for resilience. Additional top-up electric/gas boilers can be included to ensure uninterrupted heat supply throughout the project lifetime (40 years).*

4. **Social value -** *Achieve a social IRR of at least 3.5% over the project's lifetime of 40 years and actively targeting specific council-defined social values (see above), while ensuring that associated risks to project viability are maintained at an acceptable level.*

5. **Future proofing -** *Prioritise low-carbon heating solutions for the heat network coupled with combination of retrofitting/energy efficiency measures over the schemes lifetime to reduce heating demand.*

6. **Economic / Financial –** *Procurement of an Oldham Green New Deal joint venture delivery partner prior to heat network construction (2025/2026) that would enable the delivery of the heat network, bringing skills and expertise, whilst allowing the Council some elements of involvement and control. Aim of the heat network scheme is to not provide a revenue opportunity for the Council. There is greater importance in maintaining a cost of heat for customers equivalent or lower versus a defined counterfactual and investigating ways to minimise consumer cost.*

An assessment of current arrangements highlights the business need for a heat network solution. Such a solution would provide useful benefits (Table 1-1) and help achieve the above project objectives, with appropriate mitigation strategies for the main risks, constraints, and dependencies.

Table 1-1 Preliminary project benefits register

Benefit	Benefit Category	Beneficiary	Benefit Classification
Reduction in carbon emissions and decarbonisation of heat	ALL	ALL	Quantifiable
Bringing low carbon heating skills to the area	ALL	ALL	Quantifiable
Creating jobs in district heat networks and low carbon heating	ALL	ALL	Quantifiable
Offering low-cost (equivalent to the counterfactual) low carbon heat to customers	ALL	ALL	Cash releasing
Offering more resilience to heating price through improved heating efficiency	ALL	ALL	Cash releasing
Expanding and re-utilising existing resource of St Mary's heat network e.g. Biomass Boiler.	ALL	FCHO/ Heat network operator	Non-cash releasing/ Cash releasing

1.5 Economic case summary

A techno-economic modelling (TEM) analysis has been completed for the low carbon district heating network in Oldham. Three optimised scenarios have been assessed:

1. Preferred Way Forward (PWF) – Core Network
2. More Ambitious Preferred Way Forward (MAWF) – Expanded Network
3. Do minimum (DM) – Core Network

Figure 1—2 shows the network routes and connections for the three scenarios. Appendix A.1 also provides a summary breakdown of the building demand and connections for the three scenarios. Both Core Network schemes would deliver 27.4 GWh/a of heat and the Expanded Network schemes would deliver 56.6 GWh/a.

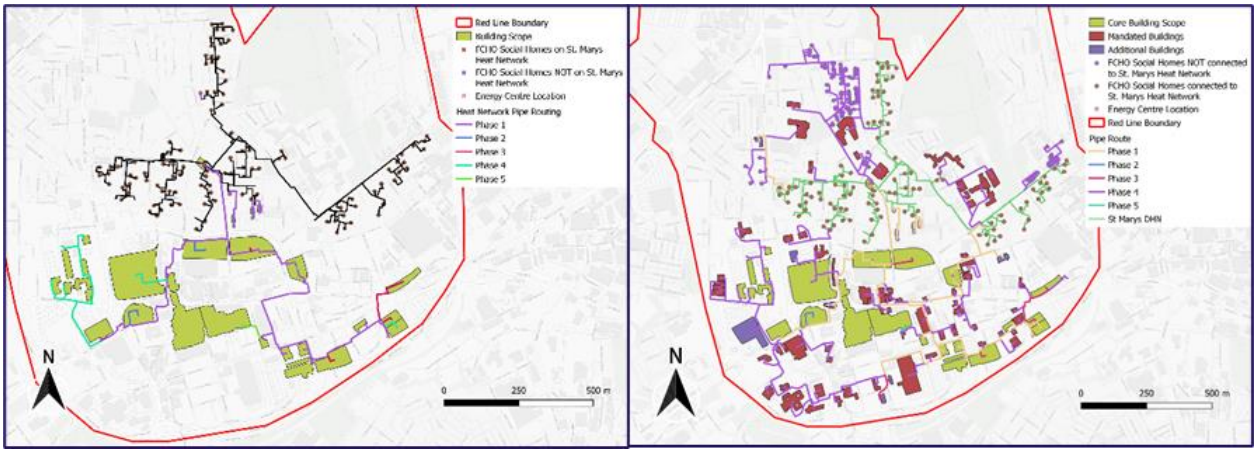

Figure 1—2 Do minimum/PWF Core heat network scheme (left) and MAWF Expanded heat network scheme (right)

Following the detailed TEM assessment, the final recommended solution was the DM core heat network option. This option involves re-instating the stranded biomass boiler asset at St Mary's as a base load technology and extending the network to the wider Oldham area to connect to core buildings with a high likelihood of connection and engagement. Utilising the biomass boiler is a cost-effective method of delivering low carbon heat in the short term, especially with RHI income (2.6 p/kWh).

The proposed solution interconnects with a new ASHP energy centre which would provide secondary low carbon heat and serve as the primary heat source in summer when ASHPs would deliver heat at a lower cost. The proposed solution also plans to transition away from the biomass towards the end of the asset lifetime (2033) and replacing it with a ASHP of the same capacity to limit associated air quality damage impacts.

Key reasons for recommendation:

- Best aligns with Oldham's project objectives for this project including net zero carbon, reliable and low cost of heat
- Meets all GHNF gated metrics including social IRR
- Delivers the highest NPV and IRR due to favourable efficiencies and lowest capital investment versus minewater schemes.
- Requires the lowest funding to achieve a TEM IRR of ~10% - deemed attractive to an ESCo and GHNF application
- Deliverable first phase network by 2026
- Large heat density of buildings with limited stakeholders – high likelihood of connection
- Opportunity to develop the network as part of future phases – list of mandated buildings and social housing identified
- Substantial carbon reduction of **140,367 tCO2e** over 40 years **(80% reduction)**
- Opportunity to investigate alternative low-carbon heat sources during biomass operational period e.g. minewater

Figure 1—3 shows the cash flow curve for the optimised DM network scenario with grant funding. With £8.78m of grant funding (£1.00m commercialisation and £7.78m of construction grant funding), the NPV at 40 years is positive and shows approximately a 10% IRR making this an economically attractive low carbon scheme to progress.

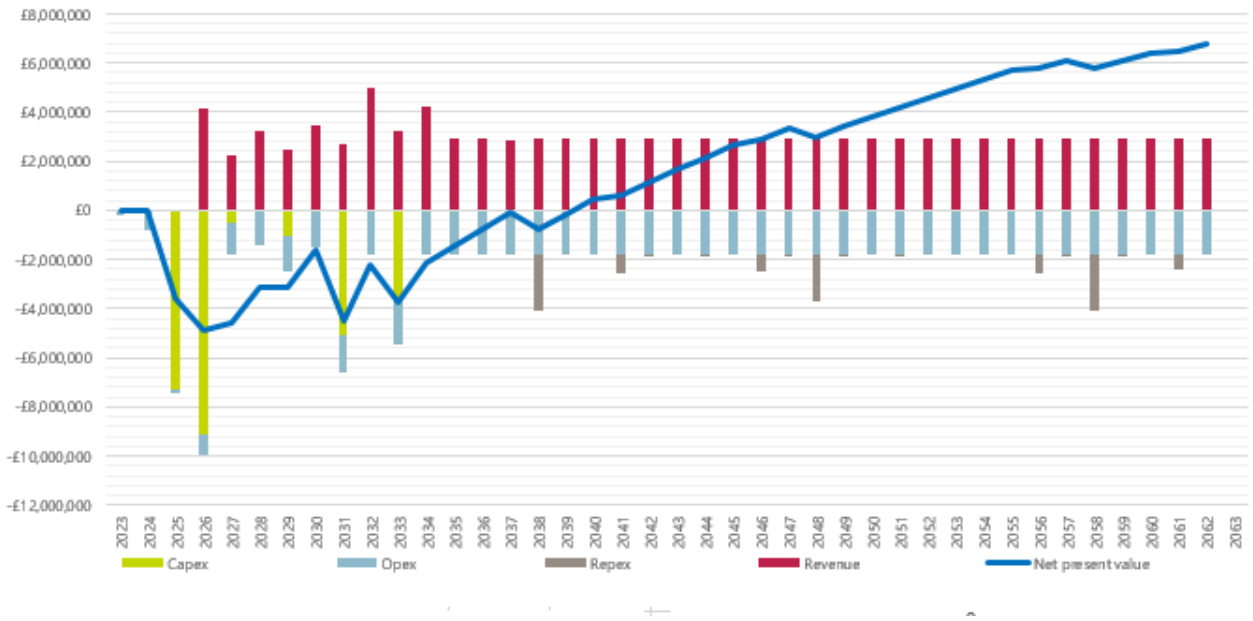

Figure 1—3 Cash flow curve for Do Minimum scenario with funding

Table 1-2 TEM Summary for Do Minimum network

Metric		DM
Capital Cost (discounted) (£M)		(22.8)
Lifetime Cost (discounted) (£M)	(6.18)	(6.18)
	(5.08)	(5.08)
	(21.85)	(21.85)
Connection charge revenue (discounted) (£M)		5.56
Lifetime revenue (discounted) (£M)	31.07	31.07
	20.34	20.34
RHI income (£M)		2.17
NPV at 40 years (£M)		(1.10)
IRR at 40 years (%)		3.0%
Benefit cost ratio at 40 years		0.98
Social NPV at 40 years		0.09
Social IRR (%) at 40 years*		3.52
Social Benefit cost ratio at 40 years		1.04
Funding from GHNF (£M)		**8.78**
NPV at 40 years with funding (£M)		**6.76**
IRR at 40 years with funding (%)		**9.99**

* Social IRR has been calculated using the GHNF application form to assess if scheme meets the gated metrics

To improve social value of the scheme and air quality abatement costs it has been recommended to replace the biomass boiler in 2033 with an ASHP or other low-carbon technology at end of its economic life. Rhodes Bank energy centre is designed for flexible connection to a potential minewater heat pump in future dependent on further testing, which could provide to be cost effective if ground water is available at shallower depths.

The reccommended shared heat network solution is illustrated in Figure 1—4 which considers connecting to core buildings deemned to have a high likelihood to connect.

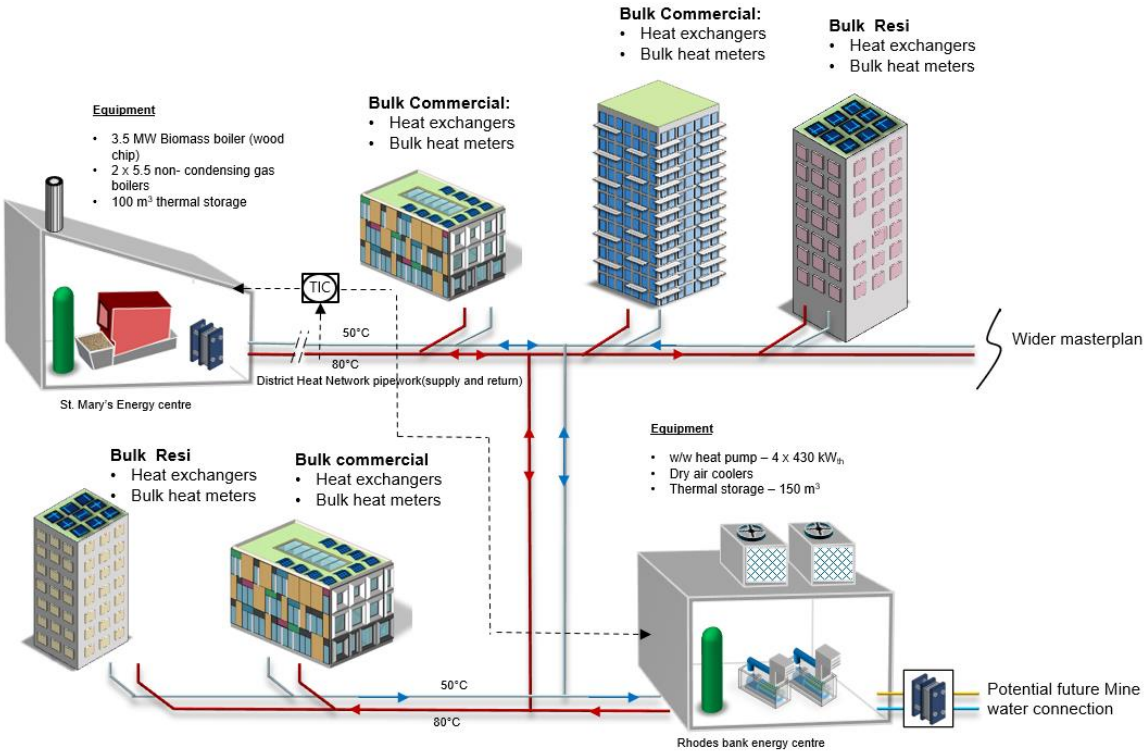

Figure 1—4 Proposed low carbon heat network solution

1.6 Commercial case summary

procurement approach. This commercial case also establishes the risks associated with the delivery of the network, as well as measures for mitigation through various contracts.

OBMC wish to deliver the OLCHN and satisfy the project objectives set out within the strategic case, however they recognise the associated technical, commercial and legal complexities related to heat networks.

For this reason, **OMBC wish to procure a delivery partner to support in the delivery of their OGND strategy**. OMBC would partner with a private sector entity through a shareholder's agreements in a Public-Private Shared Leadership arrangement.

This partnership would form a OGND JV Company, which would contract with a OLCHN Delivery Partner to deliver the OLCHN. The current proposal for the OLCHN delivery structure is expected to be in the form of a JV SPV between OMBC and a OLCHN Delivery Partner.

The delivery model and contractual relationship are shown in Figure 1—5.

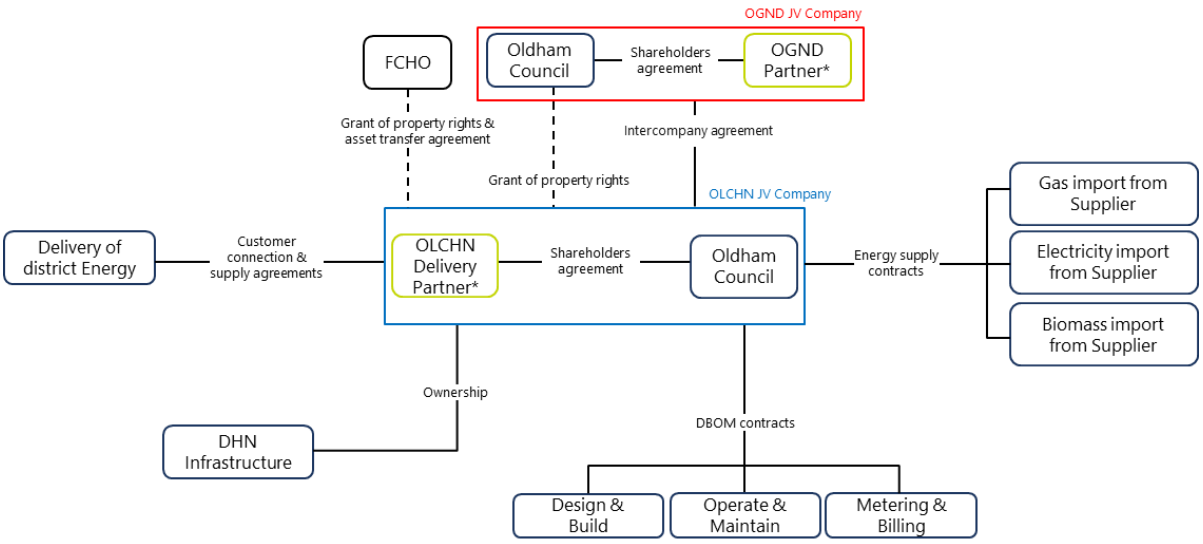

Figure 1—5 Proposed delivery and operational structure including contractual relationships between stakeholders[3]

The OLCHN Delivery Partner can be the same or a different entity to the OGND Delivery Partner. The arrangement between the OGND JV Company and the OLCHN Delivery Partner will be finalised during the procurement of the OGND Delivery Partner.

Under a JV SPV delivery structure for the OLCHN project, the OLCHN Delivery Partner would be expected to deliver the following activities:

- Provision of capital to finance the network
    - OMBC will provide capital to the network via the GHNF.

[3] *The OGND Partner and the OLCHN Delivery Partner can be a single entity.

- The OLCHN Delivery Partner will provide capital through their internal sources (e.g., debt, equity, etc.,)

- Purchase of power from energy suppliers
- Design, Build, Operate and Maintain heat network infrastructure
- Generation of low carbon heat for network customers
- Sale of heat to customers
- Provision of services, including metering and billing
- Future expansion and decarbonisation of the network

The recommended **delivery vehicle** is for a **Company Limited by Shares** legal form to be adopted as it allows for flexibility and for the Company members to divest / invest in the OLCHN if required.

The delivery of DHNs include complex technical, commercial, and legal aspects. OMBC would benefit from dialogue with the tenderers during the procurement process to ensure that tendering OGND Partners understand what is required of the project, but also to provide an opportunity for the bidders to present their offer to OMBC.

It is also seen as advantageous that **Competitive Dialogue** will enable, if necessary, limited negotiations to take place after the bidder with the most economically advantageous offer has been identified. OMBC's Commercial Procurement Unit is in agreement with a Competitive Dialogue approach, which is also indicated as the market's preferred procedure in initial market engagement. The recommended procurement approach to appoint an OGND Partner is PCR compliant.

1.7 Finance case summary

The finance case considers the financial viability of the OLCHN, the potential funding route and robustness of the business case to material changes in forecast assumptions. It is underpinned by a financial model which forecasts the financial performance of the project over a 40 year period using the assumptions detailed throughout the financial case. Sensitivity analysis was conducted to assess the robustness of the scheme and identify the financial implications of the realisation of potential project risks.

The finance case has been assessed on the basis that OMBC, due to lack of available cash reserves, will not provide any capital to the project. The funding from the project is assumed to be provided by developer/investor, for modelling purposes this has been on an unlevered basis, so assumes no third-party debt, and the equity invested in the form of 70% shareholder loan and 30% pure equity. The financial modelling indicates that the returns available if the project was 100% funded by the developer/investor would be below 5% which is unlikely to be sufficient to attract investment.

An alternative case was assessed where OMBC secures a grant award from the GHNF to help make the project financially viable. The grant funding award was sized based on satisfying the following GHNF application gated criteria while maintaining an attractive return for a 3rd party investor to develop the project. A summary of the metrics and financial model outputs are outlined below:

- Commercialisation grant funding is available on up to commercialisation costs to a maximum reward of £1m. The model assumes that the maximum £1m commercialisation grant is awarded.
- Construction grant funding is available on up to 50% of total construction (CAPEX) costs. The model assumes an award of £7.78m in construction grant, equating to 31.1% of the total capex.
- The total grant funding award should not be more than 4.5p of grant per 1kWh of heat delivered to customers over the first 15 years of operation. **The grant funding sought for the Network is equivalent to 2.41p per 1kWh.**
- The project must achieve a social IRR in excess of 3.50%. The OLCHN social IRR is 3.50%.
- The project must not exceed a real pre-tax post-grant project IRR deemed to be excessive by GHNF, for the purpose of this business case it is assumed a 10% IRR is appropriate and not excessive. An IRR significantly below this level may not attract sufficient investment from the market to support investment in the OLCHN. The OLCHN real pre-tax project IRR in the financial model is 9.81%.

In summary, with a GHNF grant the scheme is robust and falls within the GHNF application criteria (as interpreted in the analysis) while providing a suitable return to attract a 3rd party developer. Without a GHNF grant however (assuming that the developer provides all capital), project returns would be too low to attract a development partner.

The sensitivity analysis indicated that the project remains robust under the assumptions tested and is reasonably well hedged against inflation, however an incoming development partner will need to monitor CAPEX spend as increasing CAPEX had a large impact on the project returns. If only the first phase was completed with no subsequent phases, the project may not generate sufficient revenue to cover operational expenditure and subsequently generate an investor return.

1.8 Management case summary

The proposed delivery timeline for the project has been assumed to commence construction by the end of Q1 2025 to allow for a potential heat on date in 2026. Prior to Q1 2025 a funding application to the GHNF and a commercialisation phase needs to be completed. Key commercialisation milestones include:

- Development of heat network ITT specification
- Procuring consultants
- Minewater pre-design investigation borehole drilling and testing
- Pipework routing access approvals
- Ownership/lease secured for energy centre location
- Core customer supply agreements agreed
- Any bulk heat sale agreements to heat network
- Planning approval achieved
- Infrastructure delivery contracts agreed
- Commitment of non-GHNF funding.

An indicative timeline for the delivery of the heat network project is shown in Figure 1—6.

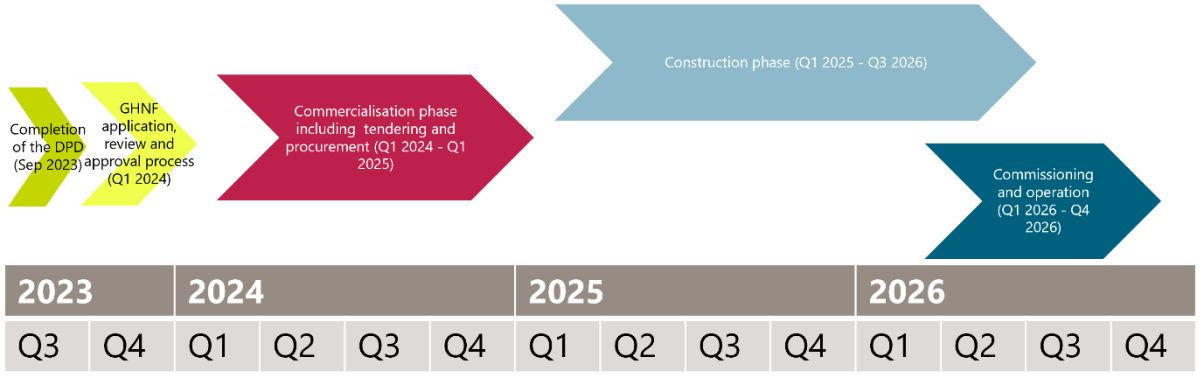

Figure 1—6 Indicative high-level timeline for the Oldham Low Carbon Heat Network project

An overview of the key risks associated with the heat network development have been identified with proposed mitigation in Table 1-3. A full risk register including scoring and action owners is provided within the management case.

Table 1-3 Summary of key risks and mitigation

Risk	Mitigation
Technical	
Failure of the biomass boiler to re-start upon re-commissioning	• Engagement with biomass suppliers and operators during the project to understand re-commissioning requirements of biomass boiler. • Start-up tests and recommissioning to be carried out well before heat network delivery comes online
Unable to deliver biomass fuel requirement suitable for existing biomass	• Engagement with fuel chip suppliers to assess the availability and compatibility of delivery of sustainable woodchip.
Heating generation equipment does not perform as well as anticipated	• Heat network modelled for high temperature with compensated heating. Heat pump efficiencies modelled for high temperature heating (80/50 F/R). Engagement with manufactures to provide confidence on efficiencies. In reality lower temperatures could be possible which would improve the network efficiency and benefit network economics. For the biomass boiler manufactures specification was utilised for efficiencies and expected performance.
Heat network distribution losses greater than expected	• Performance report for existing network has been reviewed and shows good current network performance • Transfer risk to DBOM contractor - specify high performance as per CP1 guidance and ensure detailed approval, inspection, testing and acceptance process including penalties for under performance. Minimise route lengths where possible in route proving process.
Planning / Construction	
DHN planning approval not granted for network	• Instigate pre-application as early in the design process as is possible. Maintain regular dialogue with planning department and highways in relation to the scheme design.
New build connections are not developed or energy strategy development for new developments does not consider a heat network	• Regular engagement and continuous dialogue with planning department and developers to ensure all parties are aware of the DHN, the design considers the DHN and is suitable to connect to a DHN • Planning policy developed that means DHN connection has to be considered for the area
Financial / Economic	
Scheme not awarded grant funding	• Scheme developed in accordance with GHNF metrics • Frequent contact with funders (GHNF) to verify scheme eligibility and incorporate feedback into project design • Frequent contact with alternative funding opportunities • Investigation completed to optimise network further with energy centre location change and reduction in CAPEX
Procurement costs higher than expected	• Conservative approach to budget • Manage uncertainty in the design and build costs through carrying out surveys in the commercialisation stage • Cost consultant engaged to review costs • DNO cost received for connection requirements
Rising energy prices lead to high operational costs and an uneconomically viable scheme	• Heads of terms and heat supply agreements detail future pricing indexation for heat sales is tracked to import prices- enabling prices to be adjusted as necessary to maintain revenue

Risk	Mitigation
Construction period takes longer than expected leading to loss of funding commitment from GHNF	• Scheme selected that is deliverable within the time frames • Potential to expand as part of future phases
Strategic / Commercial	
Limited capacity within OMBC to own and operate DHN	• Commercial case identified acceptable delivery model that would include a DHN Delivery Partner with experience in the industry
Commercialisation fails to produce a project financially acceptable to OMBC and the DHN Delivery partner	• Regular engagement with OMBC financial officers during financial and commercial case • Market testing for technical and financial private sector partner completed • Completion of commercial and financial case with relevant OMBC parties
Buildings decide not to connect or do not want to connect at an economically viable price for the heat network	• Regular engagement with connections and ongoing communication regarding progress and timelines • Letters of Support and Heads of Terms issued as part of the GHNF application and commercial case

2 Introduction

The Outline Business Case (OBC) developed follows the "Guide to Developing the Project Business Case" within the Green Book supplementary guidance, following a Five Case Model (Figure 2—1). Figure 2—2 shows the methodology followed to deliver the project objectives and create an OBC for the Oldham Low Carbon Heat Network (OLCHN) project.

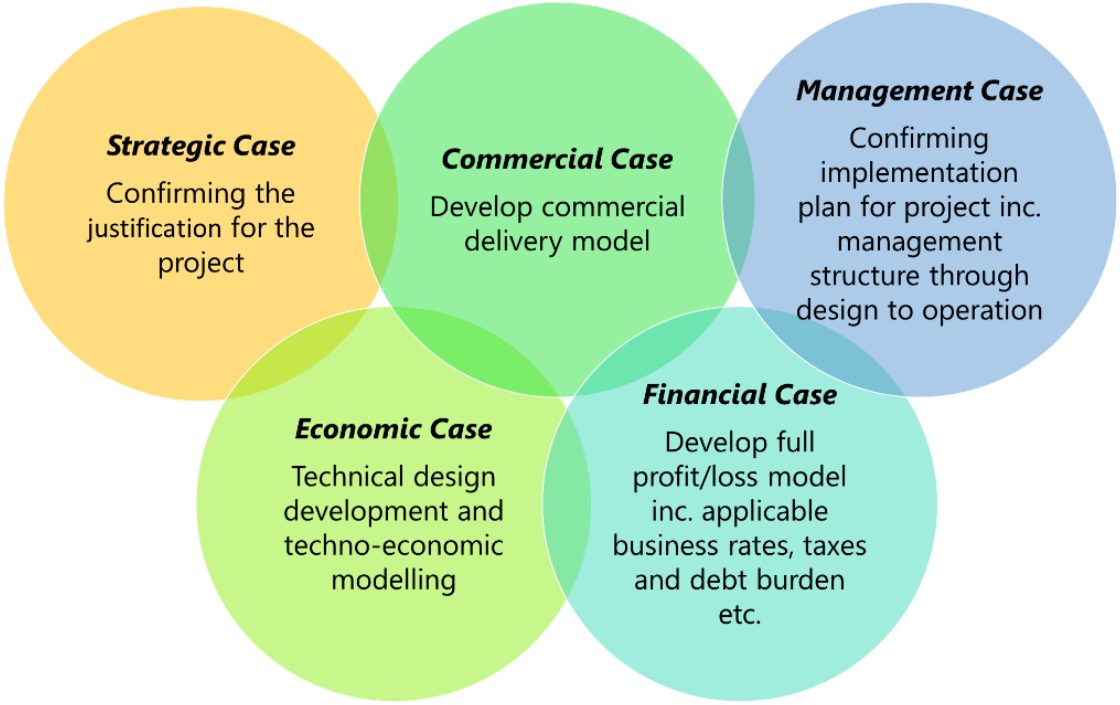

Figure 2—1 Green Book Five Case Model

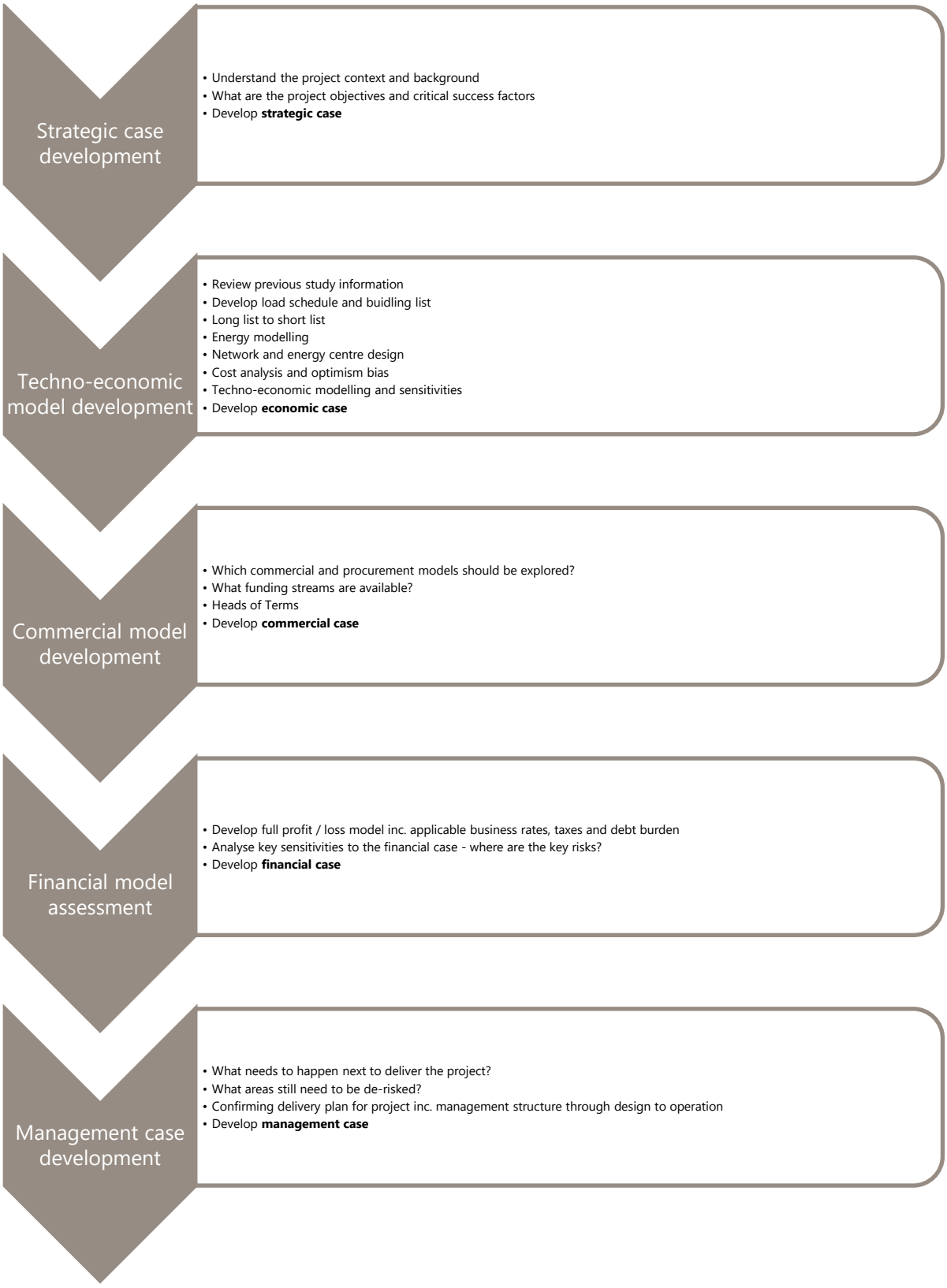

Figure 2—2 Oldham Low Carbon Heat Network OBC methodology

3 Strategic Case

3.1 Purpose

The purpose of the strategic case is to define the strategic context and fit of the project, make the case for change and to understand the projects business need, challenges, and opportunities.

Demonstrating the strategic context requires an overview of the relevant national, regional and local policies, targets and strategies. Within this strategic context UK government and specific council policy is considered in relation to the project proposed.

Defining a case for change requires an understanding of the rationale, drivers and objectives of the proposal. Additionally, it is important to understand the following:

- Existing arrangements
- Potential scope and service requirements
- The business needs – both current and future
- Potential benefits and risks
- Potential constraints and dependencies

3.2 Background

Oldham Metropolitan Borough Council (OMBC) have set an ambitious goal to reach carbon neutrality across council buildings and for the metropolitan borough by 2025 and 2030, respectively. These targets are set within the context of the 2038 carbon neutrality target set out in the Greater Manchester Five Year Environment Plan. OMBC are currently reliant on natural gas to provide heating and hot water to council buildings. If the council are to meet their own target and the UK government's legally binding target of net zero greenhouse gas emissions by 2050, alternative low carbon sources of heat must be identified and delivered.

An opportunity for a low carbon heat network has been identified that delivers heat to council, public, commercial and residential (including social housing) buildings in Oldham. The network is an extension of the existing St Mary's Heat Network, operated by First Choice Homes Oldham (FCHO).

The existing St Mary's Heat Network was initially designed to serve 1,285 social housing homes, as well as additional commercial connections including the former Oldham Leisure Centre. The base load heating technology was intended to be a 3.5MW wood chip biomass boiler, which was commissioned in 2018 and was accredited for Renewable Heat Incentive (RHI) in 2017. However, no connection was made to the Leisure Centre and other commercial buildings, meaning the installed biomass boiler was oversized for the network load requirements, becoming a stranded asset and has never been utilised. The existing St Mary's Heat Network therefore relies on gas boilers to meet all demand.

An extension of the St Mary's network is required to reinstate the biomass boiler and move away from gas boilers, as the base load demand for the network would enable efficient and constant operation of the biomass boiler

In addition to the biomass boiler, there is potential of utilising minewater from abandoned coal seams at three sites in the southern part of Oldham town centre as a source of low-carbon heat. The heat extracted from these seams, which

is initially low-grade, can be upgraded through the use of heat pumps to provide heat to customers connected to a heat network.

3.3 The case for change

The purpose of the Strategic Case is to establish the case for change. In order to make the case for change the following actions were required:

- Agree the strategic context
- Determine the project objective, existing arrangements and business needs
- Determine the potential scope for the project
- Determine project benefits, risks constraints and dependencies

3.3.1 Strategic context

3.3.1.1 International context

The Paris Agreement in 2015 pledged all nations would come together under a common cause to limit the global average temperature rise to below 2°C compared with pre-industrial levels by the end of the century and there would be an effort to limit the temperature increase even further to 1.5°C.[4]

However, in the 2018 report by the Intergovernmental Panel on Climate Change (IPCC) it is evident that without unprecedented economic shifts away from fossil fuels it is "extremely unlikely" the Paris agreement goal of keeping global warming below 1.5 °C versus pre-industrial levels will be met, especially as the temperature increase is 1 °C already[5].

The report goes into detail about the consequences of not meeting the targets set out, highlighting the importance of reducing global warming as much as possible. In comparison to 2 °C, limiting warming to 1.5 °C would:

- Significantly reduce the risk of extreme and severe weather events
- Halve the number of humans exposed to water scarcity
- Prevent the submersion of many of the world's islands and low coastal regions which two-thirds of the population inhabit
- Prevent the total loss of the world's coral reefs
- Protect economic growth due to future potential expense and economic destabilisation.

The unambiguous reality of this report means major intervention is required and at record speed to help avoid these devastating results.

[4] United Nations Convention on Climate Change, Paris Agreement, 2015
[5] IPCC, Global Warming of 1.5 °C, 2018. http://www.ipcc.ch/report/sr15/ [Accessed 10/08/23]

3.3.1.2 National context

Heating accounts for over a third of the UK's greenhouse gas emissions[6]. Household emissions from heating and hot water must be reduced by 95% to reach the UK Government's legally binding target of net zero by 2050.[7] Along with the electrification of heat and potential use of hydrogen for heating, district heat networks (DHNs) are a key component of the heat decarbonisation journey in the UK. DHNs are technologically agnostic and have a strong track record of successful, low-regret implementation. Consequently, they provide an opportunity for rapid decarbonisation of many connected buildings through centrally generated low carbon heat.

Sixth Carbon Budget

The Climate Change Committee's Sixth Carbon Budget[8] identified four priorities over the coming decades for decarbonising buildings within the "Balanced Net Zero Pathway":

1. Deliver on the Government's energy efficiency plans to upgrade all buildings to EPC C over the next 10-15 years
2. Scale up the market for heat pumps as a critical technology for decarbonising heating
3. Expand the rollout of low-carbon heat networks in heat dense areas utilising anchor loads. Prepare to shift current heat network supply source from using fossil fuel combined heat and power (CHP) towards low-carbon and waste heat from the mid-2020s
4. Prepare for a potential role for hydrogen in heat through building trials and an innovation programme.

By 2050 the Sixth Carbon Budget "Balanced Net Zero Pathway" estimates all heat demand is met by low-carbon sources. Of which 52% is heat pumps, 42% is DHNs, 5% is hydrogen boilers and around 1% is new direct electric heating.

The electrification of heat via heat pump technology is viewed as a key pathway to decarbonisation, applicable to both centralised and decentralised settings. This is primarily due to the present and forecasted decarbonisation of the UK power grid related to the deployment and integration of substantial large-scale renewables such as wind and solar.

National carbon reduction policy

The Climate Change Act 2008[9] established a legal duty on the UK to achieve an 80% reduction in carbon emissions by 2050 against a 1990 baseline. On 27 June 2019, this was superseded by the UK Government's legally binding target of net zero greenhouse gas emissions by 2050[10].

This target was set following the recommendations of the Committee on Climate Change (CCC), the UK's independent climate advisory board. The CCC report[11] also recommends that to meet this target, no new homes must be connected to the gas grid by 2025. To achieve this, low carbon heating systems will replace the natural gas boilers that are used in most homes today. The replacement technology is dependent on location and heat density. DHNs are most feasible in urban, high heat-dense areas.

[6] Department for Business, Energy & Industrial Strategy, 2018. Clean Growth –Transforming Heating, Overview of Current Evidence
[7] Energy Savings Trust, 2019. Significant changes are coming to the UK heating market
[8] Climate Change Committee, The Sixth Carbon Budget the UK's path to Net Zero, 2020.
[9] UK Government, Climate Change Act 2008, https://www.legislation.gov.uk/ukpga/2008/27/contents [Accessed 08/08/23]
[10] Department for Business, Energy & Industrial Strategy, UK becomes first major economy to pass net zero emissions law, https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law [Accessed 08/08/23]
[11] Committee on Climate Change, Net Zero The UK's contribution to stopping global warming, https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf [Accessed 08/08/23]

Central government heat network funding support

Since 2013, central government has supported local authorities with funding through the Heat Network Delivery Unit (HNDU) for feasibility studies into opportunities to implement district heating schemes in their area.[12] HNDU also provides financial assistance for Detailed Project Development (DPD) studies, which corresponds to the current phase of this project, as seen in Figure 3—1.

Recognising the barrier that high upfront costs bring to the implementation of a project, government grants are available to support the delivery and construction phases via the Green Heat Network Fund (GHNF)[13].

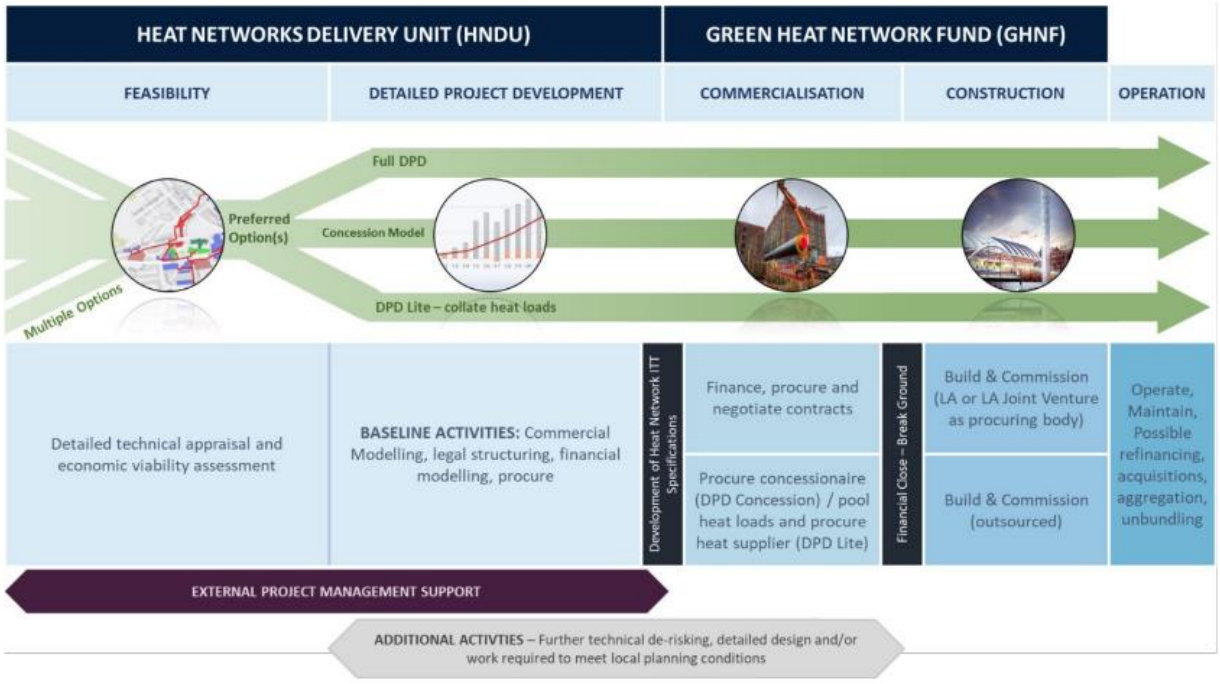

Figure 3—1 Heat network development stages

Heat Network Regulation

The Heat Networks Regulation and Zoning framework[14] introduced by the Energy Security Bill[15] aims to address the heating needs of the UK, as an essential component of achieving net-zero targets. Currently, there is no sector-specific protection for DHN consumers, but the framework seeks to rectify this by appointing Ofgem as the regulator.

[12] Department for Energy Security and Net Zero, heat Networks Delivery Unit, https://www.gov.uk/guidance/heat-networks-delivery-unit [Accessed 08/08/23]
[13] Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy, Green Heat Network Fund (GNF), https://www.gov.uk/government/publications/green-heat-network-fund-ghnf [Accessed 22/09/2023]
[14] Energy Security Bill factsheet: Heat networks regulation and zoning, Department for Energy Security & Net Zero, https://www.gov.uk/government/publications/energy-security-bill-factsheets/energy-security-bill-factsheet-heat-networks-regulation-and-zoning#why-are-we-legislating--heat-networks-regulation [Accessed 22/09/2023]
[15] Energy Security Bill, Department of Energy Security and Net Zero, https://www.gov.uk/government/collections/energy-security-bill [Accessed 22/09/2023]

Heat network regulation is expected to come into effect in early 2024, with Ofgem ensuring fair pricing, reliable heat supply, and market growth by granting powers equivalent to those of gas and electricity utilities. The framework also provides for potential price regulation, including a price cap, to safeguard consumers.

The framework also grants powers for the government to establish heat network zoning (see below), including a nationwide methodology, a Zoning Coordinator role (likely to be the local authority), and requirements for particular buildings to connect to DHNs in designated zones.

Heat Network Zoning

Previous government strategies and policies have affirmed their commitment to introducing heat network zoning in England by 2025. This commitment was further reinforced with the introduction of the Heat Networks Regulation and Zoning framework (as discussed above). These designated zones are strategically chosen to offer consumers the most cost-effective and low-carbon heating solutions, and this objective will be realised through a combination of regulatory measures, mandated powers, and comprehensive market support.

In pursuit of these objectives, a zoning pilot program has been executed to develop a methodology for identifying these strategic zones. The insights gained from this pilot program will inform future heat network zoning policies. Notably, OMBC as a member of the Greater Manchester Combined Authority (GMCA), stands as one of the 28 local authority partners actively participating in this zoning program. Consequently, OMBC is well-positioned to be among the first movers in implementing these heat network zones once the legislation comes into effect.

Minewater

The Coal Authority have been working with partners to explore the opportunity of using minewater as a low carbon source of heat. Groundwater flowing through previously worked coal mines (minewater) can provide a relatively stable source of low-grade heat (at temperatures of 10-20 °C) which can be pumped to the surface and upgraded to higher temperatures (60-80 °C) using heat pumps. An example, is the Gateshead Minewater scheme[16], currently under the ownership of the council and fully operational. This scheme integrates into an established DHN, and ranks among the largest systems in Europe, providing a heat capacity of 6MW.

[16] Mine water heat, Coal Authority, https://www.gov.uk/government/collections/mine-water-heat#:~:text=The%20heat%20from%20mine%20water,pipes%20more%20than%205km%20long. [Accessed: 22/09/2023]

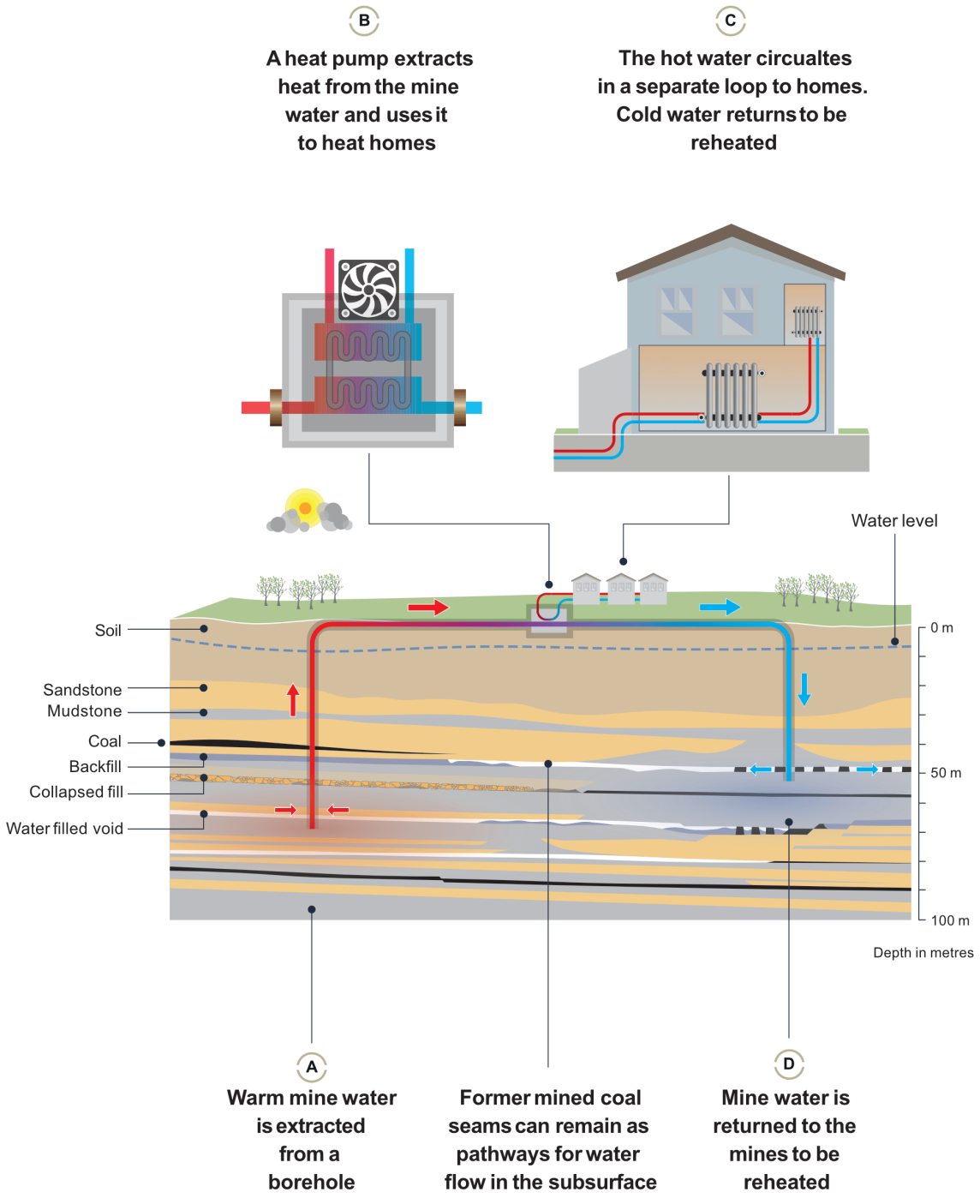

Figure 3—2 Minewater heat abstraction process for district heating. Figure reproduced from[17]

[17] UK Geoenergy Observatories, Glasgow Observatory, https://www.ukgeos.ac.uk/glasgow/mine-water-thermal-energy [Accessed 12/05/23]

3.3.1.3 Regional policy context

Place for Everyone

Place for Everyone is a long-term joint development plan adopted by the GMCA, which aims to jointly address strategic matters such as economic growth and infrastructure. The aim is to ensure such strategic goals are reflected within local plans. Relevant policies to energy and heat networks are based on the policies proposed in "*Greater Manchester Spatial Framework (GMSF) Publication Plan Draft for Approval October 2020*" and include the following:

1. **Policy GM-S 2 'Carbon and Energy'**: Establishes an ambitious target of achieving carbon neutrality by 2038, accompanied by a strategic measures to attain this objective. A number of these measures are related to heat networks.

    a. "Promoting the retrofitting of buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling;"

    b. "Taking a positive approach to renewable and low carbon energy schemes;"

2. **Policy GM-S 3 'Heat and Energy Networks':** Outlines a commitment to bolster the advancement of decentralised energy networks, particularly within regions designated as "Heat and Energy Network Opportunity Areas." In these specified zones, upcoming residential projects and large non-domestic developments are encouraged to explore the feasibility of connecting to an established or planned heat networks, or consider constructing new ones themselves.

Greater Manchester Five-Year Environment Plan

The Greater Manchester Five-Year Environment Plan defines five objectives which are to be realised through the implementation of suitable measures and actions aimed at addressing environmental challenges in the region. Notably, two relevant objectives among these are:

- *"Mitigating climate change: For our city region to be carbon neutral by 2038 and meet carbon budgets that comply with international commitments"*
- *"Air quality: To improve our air quality, meeting World Health Organisation guidelines on air quality by 2030 and supporting the UK Government in meeting and maintaining all thresholds for key air pollutants at the earliest date".*

Relevant actions highlighted in the plan include:

- Increasing the diversity and flexibility of our energy supply
- Decarbonising heat in buildings
- Reducing the heat demand from existing homes, new buildings and existing commercial and public buildings
- Establishes a directive for local policy to concentrate on the following:
    - Mandating a minimum of 20% renewable energy generation for new developments
    - Identifying zones designated as "Heat and Energy Opportunity Areas" and enforcing an evaluation of the feasibility of integrating new developments with heat networks within these zones
    - Enforcing zero carbon developments by 2028.

Greater Manchester Local Industrial Strategy

This strategy outlines the path to carbon-neutral living and economic growth. Key relevant goals include:

- Developing innovative technology and financial mechanisms to support energy-efficient homes, buildings, and low-carbon transport, aiming for net-zero carbon in all new properties.
- Accelerating local renewable energy generation, storage, and efficiency models across the city-region, adopting a holistic approach, and testing a local energy market.

3.3.1.4 Local policy context

Oldham Green New Deal Strategy 2020-2025

Following OMBC's declaration of a climate emergency in 2019, the Oldham Green New Deal (OGND) presents the overarching structure to fulfil the council's ambitious carbon neutrality goals, encompassing:

1. Achieving net-zero status for council operations by 2025.
2. Attaining net-zero status for the metropolitan borough by 2030.

This framework will also align with other objectives highlighted in the council's vision of "*Making Oldham a greener, smarter, more enterprising place*".

Relevant objectives include:

- *"Deliver a sustainable economy, tackling fuel poverty and generating training and employment opportunities in the growing green business sector"*
- *"Keep Oldham at the forefront of development and deployment of cutting-edge environmental technologies, and ensure that the benefits are kept locally"*
- *"Future-proof the regeneration of the borough by establishing Oldham as an exemplar Green City on energy, carbon, water and green infrastructure"*.

The framework is built on three overarching strategies, of which the first two are relevant to this report:

1. **Green Economy:** Promote the growth of green businesses by attracting enterprises, creating jobs, and encouraging investment. Additionally, OMBC will foster economy-wide sustainability initiatives and provide targeted skills training, particularly for youth, while utilising public sector procurement to reinforce these endeavours.
2. **Low Carbon:** Focuses on energy generation, distribution, and consumption across the council, public sector, businesses, residences, and community structures within the borough, encompassing transportation. This objective will be achieved via inventive market approaches, involving strategic collaborations with key stakeholders and the establishment of Local Energy Markets.

Some key targets and pledges set by OMBC in the OGND are:

- **Pledge 2** – "We will achieve carbon neutrality for the council by 2025 and for the borough by 2030"

- **Pledge 3** – "We will continue to support community energy in Oldham and we will encourage other GM local authorities to work with their own community groups to build the community energy sector across the city region"
- **Pledge 5** – "We will develop a new 'Oldham Code' to reduce carbon emissions from new build homes."
- **Target 1** – "Oldham remains the borough with the lowest carbon footprint in GM."
- **Target 2** – "Oldham to have the most renewable energy generation in community ownership in the city region."
- **Target 3** – "Eradicated fuel poverty in the borough."
- **Target 4** – "Improved air quality in Oldham."

Creating a Better Place Strategy

The 'Creating a Better Place' Strategy is a strategic framework for Oldham Borough. It encompasses the regeneration of Oldham Town Centre, the Housing Strategy, and the utilisation of the council's corporate estate for development and open space needs across the borough. The strategy maintains its focus on building homes, creating jobs, enhancing green spaces, whilst supporting OMBC's carbon neutrality target.

Several notable focal points include:

- The development of over 2,000 new homes within the heart of the town centre.
- The redevelopment of the Spindles Shopping Centre, envisioned to evolve into a multifunctional hub featuring event spaces, workspaces, and a new market.
- The refurbishment of the heritage buildings such as the Oldham Museum & Art Gallery (Old Library) and the Oldham Local Studies & Archive (New Performance Space), paving the way for the creation of a cultural centre in the south Oldham Town Centre, integrated with the Oldham Gallery and Library.

Crucially, these developments must align with regional and local policies, which emphasise sustainability and environmental responsibility. In this context, the implementation of a heat network emerges as an opportunity to ensure these new developments achieve net-zero status.

3.3.2 Project objectives

A Case for Change workshop was held with key stakeholders of OMBC on the 15th of March 2023. The objectives of the workshop were to:

- Identify and rank key drivers
- Determine the project objective - the objectives are intended to be made SMART (specific, measurable, achievable, relevant and time constrained).

Six key drivers were identified and ranked as follows:

1. **Net zero carbon** – The degree of carbon emissions reduction and the approach employed, whether through a concentration on efficiency enhancements or the adoption of low-carbon technologies.
2. **Cost of heat to customers –** The extent of affordability in heat sales pricing and its resilience against fuel price volatility.

3. **Reliable heat to customers –** The level of a steady and uninterrupted heat supply, along with the appropriate redundancy measures to ensure this reliability.

4. **Social value –** The level at which the project should augment social values, extending beyond those expressed by the GHNF gated metric of a 3.5% SIRR. These encompass council defined values as highlighted a suite of Themes, Outcomes and Measures (TOMs) utilised in procurement exercises by the council. Such values include:

   a. **Local Employment and Inclusivity:** Prioritise hiring local residents whilst promoting diversity.

   b. **Training and Skills Development:** Provide training opportunities for local residents, support education initiatives for schools and colleges and offer apprenticeships and skill development programs.

   c. **Fair Work Practices:** Encourage fair work practices in the supply chain.

   d. **Supporting Disadvantaged Residents:** Address long-term unemployment and create opportunities for young people and disadvantaged groups.

   e. **Local Supply Chain and Business Support:** Invest in the local supply chain and local micro, small and medium enterprises

   f. **Social Innovation and Environmental Impact:** Promote innovation that benefits the community while reducing the carbon footprint.

5. **Future proofing –** The extent of adaptability for future considerations, including network expansion, prospective technological adjustments, and resilience against emerging energy trends.

6. **Economic / Financial –** The degree of council engagement in the initiative and the suitable financial metric for evaluating economic achievements.

Using the key drivers the following project objectives were defined:

1. **Net zero carbon –** *Meet OMBC's net zero policy requirements by 2025 for council buildings and 2030 for the metropolitan borough by implementing low-carbon technologies and onsite interventions. In areas where decarbonisation is challenging, consider the use of fossil fuel technology while exploring alternative solutions. Additionally, prioritising community decarbonisation efforts to ensure a comprehensive and sustainable reduction in carbon emissions across the borough.*

2. **Cost of heat to customers -** *Maintain a slight flexibility to increase the cost of heat to council/public buildings if needed, not exceeding a pre-defined amount agreed within the business case assessment. This flexibility will be assessed during financial modelling, where any necessary cost adjustments will be implemented to ensure that the network is financially viable, whilst ensuring that social housing costs remain at or below current pricing levels to limit any increase in fuel poverty.*

3. **Reliable heat to customers -** *Main heat supply >85% will be from low-carbon sources. If minewater is selected as the main source of heat additional low-carbon resilience e.g. air source heat pumps are required for resilience[18]. Additional top-up electric/gas boilers can be included to ensure uninterrupted heat supply throughout the project lifetime (40 years).*

[18] The viability of minewater has been assessed as part of a supplementary scope of works. Please refer to section 4 for a summary of the assessment.

4. **Social value -** *Achieve a social IRR of at least 3.5% over the project's lifetime of 40 years and actively targeting specific council-defined social values (see above), while ensuring that associated risks to project viability are maintained at an acceptable level.*

5. **Future proofing -** *Prioritise low-carbon heating solutions for the heat network coupled with combination of retrofitting/energy efficiency measures over the schemes lifetime to reduce heating demand.*

6. **Economic / Financial –** *Procurement of an Oldham Green New Deal joint venture delivery partner prior to heat network construction (2025/2026) that would enable the delivery of the heat network, bringing skills and expertise, whilst allowing the council some elements of involvement and control. Aim of the heat network scheme is to not provide a revenue opportunity for the council. There is greater importance in maintaining a cost of heat for customers equivalent or lower versus a defined counterfactual and investigating ways to minimise consumer cost.*

3.3.3 Existing arrangements and business needs

The table below highlights the existing arrangements and business needs following the *"Guide to Developing the Project Business Case"* within the Green Book supplementary guidance.

Table 3-1 Existing arrangements and business needs

Spending Objective	Existing Arrangement	Business Need
Net Zero Carbon	Currently, most existing buildings in the area are heated using gas. New developments planned for the area will adhere to local and regional planning regulations and relevant approval processes. Consequently, it is likely that these new developments will not include any gas boiler capacity as per net zero targets and policies identified in Places for Everyone and Oldham Green New Deal (Section 3.3.1.3and 3.3.1.4). As of now, there is a likelihood that new constructions beyond 2028 will be obligated to undergo a feasibility study to determine their eligibility for connection to heat networks in the vicinity. A significant concentration of social housing, managed by FCHO, receive heat supply from the St Mary's heat network. Presently, this network is powered by 2 No. 5.5 MW gas boilers. Additionally, there is a currently unused 1 No. 3.5 MW biomass boiler located in the St Mary's energy centre. This is not utilised due to it being oversized for the existing scheme.	As demonstrated within the section 3.3.1 (strategic context) there is a need and desire to decarbonise heating within Oldham Metropolitan Borough. Heat networks are seen as a key enabler to decarbonisation, particularly in urban areas. Heat networks offers a quick route to decarbonise multiple buildings and unlock additional heat sources such as low grade minewater heat, due to potential scale of abstraction. Heat networks could act as solution for new developments to meet regulatory and policy requirements. A low carbon heat network could be built upon the existing biomass boiler, which would decarbonise the heat supply to St Mary's heat network and other surrounding buildings.
Cost of Heat to Customers	Currently, the majority of decentralised buildings incur retail heat supply costs. Social housing linked to the St Mary's heat network pays retail rates to the network operator. Due to heat supply predominantly being derived from heavy gas usage – these prices are typically lower than electrified heat rates. However, these rates tend to lack resilience in the face of global energy price fluctuations. The recent spike in energy prices due to geopolitical and market trends is an example of such volatility. Consequently, the cost of heat for consumers increased rapidly, e.g. the council's variable gas rate has increased over 350% within 3 years from ~1.6p/kWh in 2021/22 to ~7.9p/kWh in 2023/24. The same trend is seen with FCHO customers.	As demonstrated within the section 3.3.1 (strategic context), there is a need and desire generate of affordable low-carbon heat. This is driven by the need for resilience against recent global energy price fluctuations and the high rates of fuel poverty in the region. Achieving this involves curbing heat demand and opting for efficient heating solutions, like heat pumps. In the long term, an expansive Oldham-wide district heat network could provide lower-cost low-carbon heat for the entire region through use of efficient technology and economy of scale. Low carbon heat network could be established by leveraging the existing biomass boiler, a standard asset, enabling the production of economical low-carbon heat.

Spending Objective	Existing Arrangement	Business Need
Reliable Heat to Customers	Despite its reliability, the current heating system in St. Marys heat network and potential heat network connections, lacks the incorporation of low-carbon fuel sources, which hinders its alignment with environmentally friendly practices and OMBC's sustainability and net zero goals.	As demonstrated within the section 3.3.1 (strategic context), there is a need for secure heat supply. Due to the opportunity for a diversified fuel mix and heating technology, a heat network provides an opportunity for a secure low-carbon heat supply. Utilising the existing biomass boiler can provide a baseload heat supply, which can be supplemented by ASHP and existing gas boilers.
Social Value	The social value metric identified by GHNF considers both the carbon and air quality costs, in addition to the economic viability associated with a project. Under the present configuration, the air quality costs are likely to be advantageous, primarily due to the relatively lower associated damage costs attributed to natural gas. However, it is important to note that with the ongoing decarbonisation of the grid, this dynamic is expected to evolve in the near future, with electricity damage costs likely to decrease rapidly. Conversely, the current arrangement is likely to incur substantial carbon costs, and provides limited opportunities for economic savings and revenue generation. Heating systems in decentralised buildings have generated limited local job prospects. However, the operation of the St Mary's heat network offers some local employment opportunities due to the large scale of the scheme.	As demonstrated within the section 3.3.1 (strategic context), there is business need to introduce upskilling and training opportunities withing Oldham, specifically those centred around green enterprises. Due to the large-scale nature, a heat network scheme can yield ancillary benefits including job creation and skill enhancement. This would likely be greater than those experienced within the constraints of St Mary's heat network due to it utilising more innovative green technologies. The heat network is expected to perform favourably in terms of the carbon and economic aspects of the GHNF SIRR metric. Nonetheless, the utilisation of the biomass introduces a potential risk of not meeting the SIRR target, mainly due to the relatively high air quality damage costs associated with biomass woodchip.
Future Proofing	OMBC has introduced policies relevant policies (section 3.3.1) that aim to increase energy efficiency measures and low-carbon opportunities within the borough. However, these measures are framed as mutually exclusive endeavours.	As demonstrated within the section 3.3.1 (strategic context) there is a need and strong aspiration to achieve decarbonisation goals through a combination of decarbonisation efforts and energy-efficiency measures. Heat networks present an opportunity to integrate these dual objectives within a singular framework.
Economic/ Financial	The existing decentralised heating operations lack a business-oriented strategy, resulting in expenses without corresponding advantages and a shortage of expertise in adapting heating systems to adhere to net-zero goals. This deficiency underscores the importance of adopting economically and financially sustainable measures to effectively achieve the net-zero goals. While being conducted with an enterprising approach, it's noteworthy that FCHO, the proprietor of the St Mary's heat network, doesn't primarily engage in the	As demonstrated within the section 3.3.1 (strategic context), there is business need to promote the growth of green businesses. A heat network would provide an opportunity for strategic partnerships with OMBC and FCHO. This could propel the expansion of green businesses by attracting enterprises, fostering job creation, and stimulating investment. An opportunity also exists to maximise the economic potential of the St Mary's heat network, such as capitalising on the underutilised asset of the existing

Spending Objective	Existing Arrangement	Business Need
	energy supply business. One key inefficiency is oversizing the biomass boiler, which was never utilised.	biomass boiler to establish a low carbon heat network. The biomass boiler, which was commissioned in 2018, qualifies for RHI payments for the heat it generates. This would effectively leverage an available resource without necessitating additional capital investment.

3.3.4 Potential scope and service requirements

OMBC have embraced the concept of low carbon district heat network in order to achieve their ambitious net zero goals. A low DHN has the potential to service heat and decarbonise a large number of residential buildings (including social housing), council owned buildings, public buildings and new developments. The potential scope is highlighted in Table 3-2. Figure 3—3 shows the potential scope for the core and desirable ranges. The key service requirement across these ranges is furnishing reliable and economical low-carbon heat to the designated buildings within the potential scope.

This OBC has been developed alongside the concurrent heat network zoning pilot for the area (see Section 0) to identify the future scope for the project. It has been identified that the heat zoning could approximately double in size if heat network zoning legislation was actioned.

Table 3-2 Potential business scope and key service requirements

Range	Potential Scope
Core	A heat network encompassing council, public buildings and the existing St Mary's heat networks.
Desirable	A heat network encompassing council buildings, existing St Mary's heat networks, additional social homes operated by FCHO and mandated buildings highlighted by the upcoming heat network zoning legislation.[19]
Optional	An Oldham-wide heat network opportunity containing both mandated and non-mandated buildings highlighted in the upcoming heat network zoning legislation.

[19] Department for Business, Energy & Industrial Strategy, Heat network zoning, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1024216/heat-network-zoning-consultation.pdf [Accessed 12/05/23]

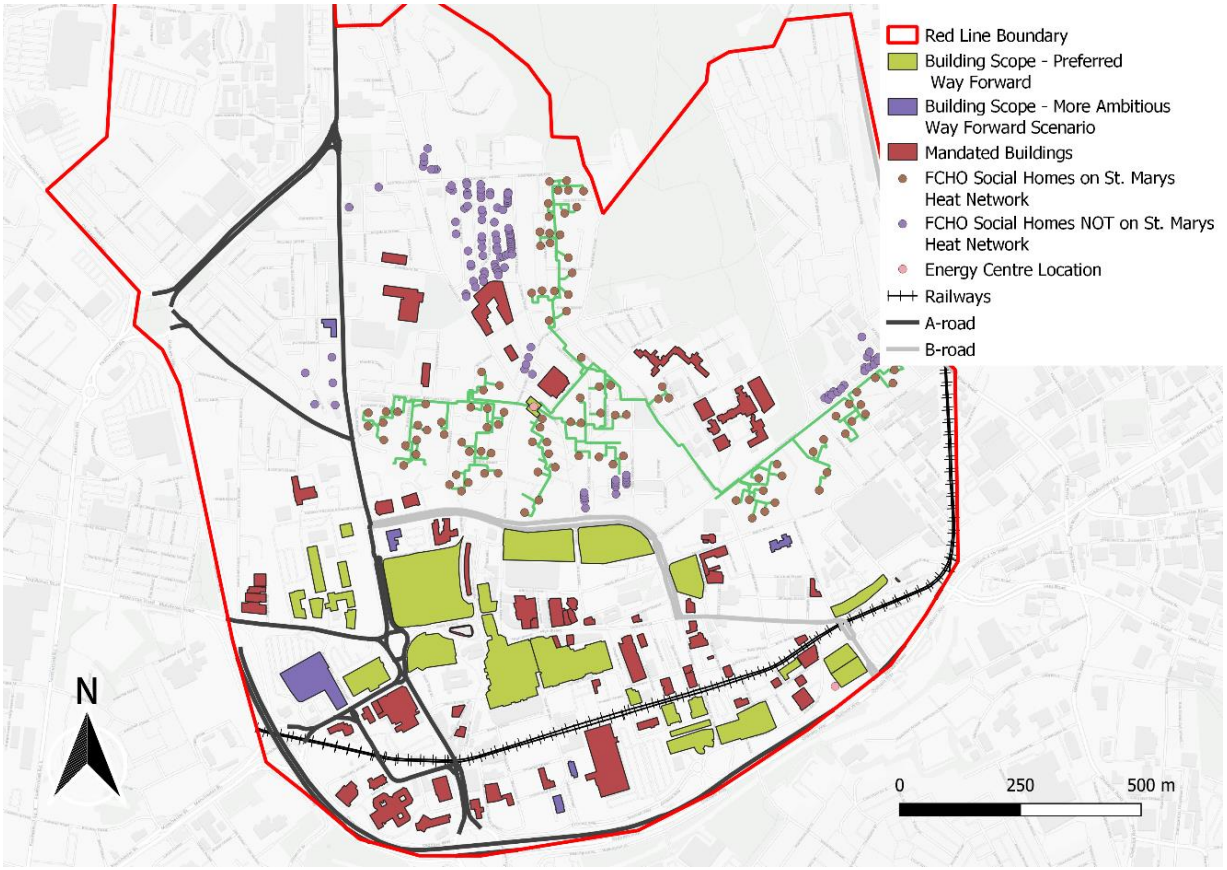

Figure 3—3 The potential building scope for the Oldham heat network

3.3.5 Main benefits

Table 3-3 highlights the main projects benefits following the *"Guide to Developing the Project Business Case"* within the Green Book supplementary guidance. These captured benefits are assumed to be the 20% of benefits which are likely to provide 80% of the projects benefit value.

Table 3-3 Preliminary project benefits register

Benefit	Benefit Category	Beneficiary	Benefit Classification
Reduction in carbon emissions and decarbonisation of heat	ALL	ALL	Quantifiable
Bringing low carbon heating skills to the area	ALL	ALL	Quantifiable
Creating jobs in district heat networks and low carbon heating	ALL	ALL	Quantifiable
Offering low-cost (equivalent to the counterfactual) low carbon heat to customers	ALL	ALL	Cash releasing
Offering more resilience to heating price through improved heating efficiency	ALL	ALL	Cash releasing
Expanding and re-utilising existing resource of St Mary's heat network e.g. Biomass Boiler.	ALL	FCHO/ Heat network operator	Non-cash releasing/ Cash releasing

3.3.6 Main risks

Table 3-4 highlights the main projects risks following the *"Guide to Developing the Project Business Case"* within the Green Book supplementary guidance. These captured risks are assumed to be the 20% of risks which are likely to generate 80% of the project risk value.

Table 3-4 Preliminary project risk register

Risk	Mitigation/ Management	Risk Category
The uncertainty surrounding the heat load poses potential investment risk, as the returns from heat sales may be overstated. This also limits the feasibility of utilising a biomass boiler if the actual heat load falls below anticipated levels.	The heat load modelling is based on available consumption data and industry benchmarks to provide an accurate representation of current and future heat loads. Furthermore, the heat network centres around the St. Mary's heat network, with its established a heat load acting as an anchor load. Additionally, heat network zoning will ensure that a minimum load requirements is effectively connected to the network.	Business Risk
Operational disruption and the potential for low-carbon heating solution failures. This can arise from a multitude of factors e.g. planned maintenance, technical failure, fuel shortage (e.g. biomass woodchip) etc.	Incorporate an element of reliable resilience technology, such as boilers into the heating system solution to ensure the heat supply reliability.	Service Risk
Exposing financially vulnerable customers to high heat sales prices, exacerbating the issue of fuel poverty.	Implement a tiered tariff structure, which ensures vulnerable customers are not at detriment when connecting to the heat network.	Business Risk
Changes in funding regulations	Diversify funding sources and establish flexible financial plans, whilst engaging with stakeholders to advocate for supportive policies. Additionally, maintain contingency reserves and conduct scenario planning to navigate potential regulatory shifts effectively.	External Risk
Energy price volatility, which may impact the operational profitability and financial returns.	Employ hedging strategies and secure long-term fixed-price contracts for fuel imports. Additionally, utilising a diversified low carbon energy source minimise the impact of external fuel volatility.	Business Risk/External Risk
Competition from other energy sources or heating solutions could affect the heat network's market share and financial performance.	Focus on differentiation through environmental benefits and cost savings, prioritise strong customer relationships. Collaborating with stakeholders and ensuring flexible pricing further enhances its competitive edge.	External Risk

3.3.7 Potential Constraints and Dependencies

Below are the key constraints and dependencies as defined by the *"Guide to Developing the Project Business Case"* within the Green Book supplementary guidance.

Key Constraints

1. Availability of supporting utilities – Gas and power are essential for the running of the plant and energy centre. During the completion of the OBC engagement has been completed to ensure capacity and cost for connection to the DNO network.

2. Land ownership and pinch points for entire network routing – The energy centre location was chosen within council ownership, and the routing closely follows council-owned roads and site boundaries. Collaboration with landowners and tram network operators further enhanced the process.

3. Low carbon fuel and energy availability – The heat capacity of the system is contingent upon the chosen technology, with limitations imposed by the quantity of accessible low-carbon fuel sources, such as woodchips for biomass boilers and low-grade heat from the minewater. To mitigate this, a blend of heating technologies should be employed.

4. Funding availability – The project's viability depends on securing grant funding, which attracts external investment by mitigating the substantial initial capital expenditure associated with such projects.

Key Dependencies

1. Key anchor loads – engagement and support from council, public and new development anchor loads are essential for the initial phases of project. These loads include the new housing developments which are in the early stage of design and FCHO social houses.

2. Financial performance – the financial performance of the scheme will dictate the commercialisation route for the heat network opportunity.

3. Partnering with external organisations – The project is reliant on the procurement of a strategic partner, a pivotal component of Oldham's Green New Deal (see Section 3.3.1.4), who will invest and deliver this heat network as a pilot project. Furthermore, it is imperative to work with FCHO to ensure the integration of the existing St. Mary's heat network, as it is a major anchor load for this project.

4 Economic Case

4.1 Purpose

This section examines the economic case for the OLCHN. Detailed techno-economic modelling (TEM) has been carried out to inform the Economic Case. This was an iterative process to optimise the design and operation whilst minimising the carbon output of the proposed OLCHN and identifying constraints. The aspirations of the stakeholders and the site's characteristics and existing infrastructure have been considered throughout.

4.2 Project "Business as Usual"

The business as usual (BAU) is a scenario that reflects the current operation to act as a baseline for comparison. This scenario is agreed with the council to best represent the existing carbon emissions and the benefits that could be achieved by implementing the new system. The BAU scenario for OLCHN is based on the existing or proposed energy strategy:

- **All council buildings** based on **ASHP heating system**. This is due to OMBC policy of having "net zero" compliant buildings to achieve their goals.
- **New residential** units based on **ASHP heating system**. This is due to council policy mandating "net zero" complaint energy systems to potential developers.
- **Existing residential** units based on **individual gas boiler**, due to all being social housing.
- **Mandated Buildings** and **existing non-council commercial** buildings based on **ASHP with gas boiler top up**.
- **New non-council commercial buildings** based on their **energy strategy**. If this not known, then it is assumed to be **ASHP with electric boiler top-up**.

4.3 Energy generation plant appraisal

Heat supply for the network can be generated by several technically viable technologies. Table 4-1 outlines the various technologies assessed against key criteria. Where the technology is deemed to meet the criteria, the box is shaded green. If the technology fails or performs poorly for a given criteria, the box is shaded red.

Table 4-1 Energy generation matrix

Technology	Decarbonisation potential	Capital Cost	Operational Costs	Technology Risk	Security of supply	Local Environmental Impact	Space and works required	Taken Forward
Natural gas CHP	Limited with respect to projected grid decarbonisation	Lower than most other technologies, but higher than the base case gas boilers	Low considering generation of heat and power	Mature technology, with extensive DH precedents	Secure grid gas availability - outlook looks uncertain as government plans decarbonisation of built environment	Reduced NOx emissions generated	Gas-engines requires significant space	Does not align with decarbonisation goals of the project.
Natural gas boiler	Business as usual	Lowest out of all technologies	Lowest out of all technologies	Base case technology	Secure grid gas availability - outlook looks uncertain as government plans decarbonisation of built environment	Reduced NOx emissions generated	Compact technology	Yes – Utilised for top up/ resilience
Electric Boiler	Significant with future grid decarbonisation	Low	High fuel prices	Mature UK technology with ease of installation in most heating systems	Requires a grid connection only.	No local emissions	Compact technology	Yes – Utilised for top up/ resilience
Water source heat pump	Significant with future grid decarbonisation	Significant due to infrastructure requirement for river water abstraction	Relatively high COP enables lower operational costs	UK project experience is growing to offset resource abstraction risks.	No surface water in proximity to site	No local emissions	Abstraction infrastructure required.	Not technically feasible as there is no surface water in proximity to the site
Air source heat pump	Significant with future grid decarbonisation	Capital costs are yet to become competitive against gas boiler counterfactual	Lowest COP out of all HP systems	Most mature HP technology in the UK.	Requires a grid connection only.	No local emissions	Most compact HP technology.	Yes – Utilised as alternative low-carbon option as well as top up/ resilience
Ground source heat pump	Significant with future grid decarbonisation	Significant due to infrastructure requirement for groundwater investigations and subsequent abstraction	Relatively high COP enables lower operational costs	Demonstration projects are being funded by DESNZ to offset technology risk.	Investigations are required to confirm yield level of resource - there is a risk that a sufficient supply is not present	No local emissions	Abstraction infrastructure and high land availability required.	Minewater to be the priority subsurface heat source
Minewater source heat pump	Significant with future grid decarbonisation	Significant due to infrastructure requirement for minewater investigations and subsequent abstraction	COP can be high, but operational requirements of systems are high	Demonstration projects are being funded by DESNZ to offset technology risk.	Investigations are required to confirm yield level of resource - there is a risk that a sufficient supply is not present	No local emissions	Abstraction infrastructure and high land availability required.	Yes – separate study to assess consideration of minewater as heat source

Sewer heat recovery (heat pump)	Significant with future grid decarbonisation	Significant due to infrastructure requirement for heat abstraction from sewer pipe	Relatively high COP enables lower operational costs if resource is available.	Very low number of projects plus coordination with water companies is needed.	Discussions with wastewater company are required to confirm yield level of resource.	No local emissions	Abstraction infrastructure from sewer required.	No
Biomass Boiler	Highly dependent on feedstock provenance	Lowest capital requirement due to already existing boiler in St Mary's energy centre.	Wood chip import rates competitive with HP systems	Mature UK market because of eligibility for RHI incentives in mid 2010s.	High availability of biomass suppliers in local area.	Negative air quality impact.	Significant because of feedstock processing requirements.	Yes - Existing biomass boiler as St Mary's with RHI allows for biomass to be the most economical low-carbon heat source
Biogas CHP	High potential if biogas derived from waste feedstock.	Significant feedstock treatment capital requirements.	High operational costs of procurement and processing of feedstock at this scale.	Potential treatment risks which depend on typology of feedstock.	No landfill site or sewerage plants in vicinity	NOx emissions generated; potential unpleasant smells produced.	Gas-engines requires significant space	No
Bioliquid CHP	Highly dependent on feedstock provenance	Capital premium required with respect to conventional CHP (less mature market)	Relatively high import cost of fuel and low maturity of technology.	Low UK market maturity	Low UK market maturity	Reduced NOx emissions generated	Gas-engines requires significant space	No
Biomass gasification with CHP	Highly dependent on feedstock provenance, but potential enhanced with electricity production	CAPEX is at least an order of magnitude greater than a heat pump-based system due to feedstock treatment requirements	Very high maintenance and processing costs of infrastructure even with free feedstock.	Track record of failed gasification facilities in the UK because of operability risks.	It is understood STC have a free waste wood supply	Very negative air quality impact, flaring.	Significant because of feedstock processing requirements.	No
Solar Thermal	Completely carbon-free technology, but limited impact with available land / roof space availabilities.	Mature technology, but on a £ / kW basis it is still has reduction potential.	Virtually no operational costs	Not the go-to solar technology in the UK, hence much lower replicability.	Sun resource is certain	No local emissions	Low power density yield.	No
Solar PV	Completely carbon-free technology, but limited impact with available land / roof space availabilities.	Mature technology, but on a £ / kW basis it is still has reduction potential.	Virtually no operational costs	Mature UK technology	Sun resource is certain.	No local emissions	Low power density yield.	No – High spatial constraints for required capacity

The following technologies were put forward and assessed further within the techno-economic feasibility study:

- **Minewater source heat pump** due to political factors potentially leading to government funded enabling works, reducing the capital outlay associated to the heat network. Significantly reducing the capital costs make this solution more attractive.
- **Natural gas boilers** and **electric boilers** for top up/ back up use only due to cost, maturity, and ability to transition to hydrogen in the future if available.
- **Biomass boiler** as it presents a potential economic case making it an attractive choice for the project. There is no capital expenditure, as a biomass boiler is installed in St Mary's energy centre, which eliminates upfront costs and financial burden. Additionally, the RHI payments can contribute to the overall profitability and viability of the project.
- **Air source heat pumps** serve as an alternative low-carbon technology, diversifying the energy sources used in the project and enhancing its overall sustainability. Moreover, ASHPs can also serve as a low-carbon top-up choice.

4.4 Minewater options report summary

FWS Consultants Ltd were commissioned to prepare a Site Options Report to assess three potential minewater sites in Oldham:

1. Rhodes Bank
2. Woodstock Street
3. Alexandra Park.

A map showing the considered minewater locations is shown in Figure A- 3.

The sites were assessed on the basis of developing a minewater GSHP system. Please note that this was conducted as a desk-based exercise, and that a key output was a costed scope of works for first intrusive testing. The report concluded:

- No reliable groundwater data exists for the mine workings in the Oldham area. This represents a significant constraint to evaluating the viability of a minewater GSHP system.
- All of the sites have mineshafts and faulting, either onsite or immediately adjacent, which present a significant risk of promoting surface water egress of reinjected minewater, geotechnical instability and mine gas emissions at the surface.
- The mine workings in most of the coal seams below the sites are constrained within small structural blocks interlinked by roadways. Consequently, there is a low potential for large laterally extensive interconnected minewater bodies and most of the mine workings offer only a low primary minewater storage capacity that is significantly less than the volume necessary to sustain one year's pumping and in fact only have volume for between <1 week to around 3 to 4 months. Although workings below the sites may be interlinked to more laterally extensive areas of secondary minewater storage offsite, hydraulic connectivity will be dependent on the condition of interlinking roadways.

- Of the three sites considered, the assessment concluded that abstraction from the Cannel seam (90 to 190 m bgl) below the Alexandra Park site and reinjection into the Little Black Mine (95 m bgl) at the Woodstock Street represented the best technical option for a minewater GSHP scheme.

4.4.2 Minewater option for Rhodes Bank site

Alexandra Park was determined to have the best technical opportunities for the abstraction well, however this site was discounted from further consideration in development of the minewater energy scheme for the following reasons:

- Proximity to the location of the heat network
- Absence of suitable drill site areas
- Operational costs involved in pumping minewater to the heat network location
- Environmental risks involved with transporting minewater.

Whilst it is recognised that Woodstock has been determined to have the best technical opportunities for the reinjection well, as the site is now to be developed as a battery plant, this site was discounted from further consideration.

Therefore, Rhodes Bank remained as the only available minewater drilling site for the heat network project. The mined seams below this site have technical challenges and therefore this technological solution carries substantial risk. Technical challenges include:

- The upper Little Mine seam at 50m bgl and the Cannel seam at 70m bgl may be dry or at / near the water table
- The Higher / Lower Bent (130m bgl) and Arley (320m bgl) seams may be of limited storage capacity.

Table 4-2 provides a summary of the hydrogeological considerations for the proposed minewater solution at Rhodes Bank.

4.4.3 Minewater overall efficiency comparison

Three strategies for delivering a contribution to district heating where compared: minewater source heat pumps; ASHPs and a hybridisation of both ASHP and minewater sourcing. A summary of the assessment is provided below:

- Both minewater and hybrid strategies offer a small energy cost advantage and a substantial carbon saving advantage compared with a base case consisting of gas-fired heating. This is conditional on the minewater source being abstracted with a maximum lift of 100m and a minimum temperature and temperature range of 10°C and 7°C respectively
- In terms of both SPF and SCoP performances, the improvement in adopting a hybrid source strategy over minewater only is negligible.
- The heating temperatures should be compensated in the range 60-75°C and the heat pump should maximise the use of subcooling to achieve best performance
- Whilst there is little advantage in the use of hybrid sourcing over the use of minewater only, it is advisable to incorporate an ASHP top up (which can also be utilised during summer months in order to facilitate planned maintenance on the minewater plant)
- Abstracting minewater at depths consistent with the Arley seam (325m bgl) would not be viable.

- Should minewater abstraction prove unfeasible in Oldham, high temperature ASHP could be operated in the same manner as described above and indicate a very small increase in energy cost over the base case whist offering a substantial carbon saving.
- The special provision of using ASHPS over biomass boilers in summer only would incur higher energy costs and carbon emissions based on current energy tariff prices and GHG reporting factors.

Table 4-3 provides a summary of the efficiency of the different heat pump systems.

Table 4-2 Rhodes Bank site minewater hydrogeological considerations

Hydrogeological Considerations		Pros	Cons
Abstraction Well - Arley Seam 325m bgl	Primary Yield Maximum Worked Thickness 1.2 m. Estimated Extraction ratio 60% Area of mined structural block ~60,000 m^2. Volume of direct inseam connectivity 70,000 m^3	High Minewater temperature 16-170C Significant groundwater head >50m. Abstraction at depth is unlikely to promote geotechnical instability. A well location in north-eastern area may be out with overlying workings that could present a geotechnical risk to borehole stability.	Small mining block area with only small, combined primary and secondary yield potential, which is significantly low than the potential volume accessible from Woodstock or Alexandra Park in the Cannel seam workings. Yield recharge reliant on vertical hydraulic connectivity to workings 200m above. Combined primary and secondary storage capacity represents only 50 days of baseline pumping. Significant depth of drilling required to reach target minewater reservoir.
	Secondary Yield – 20,000m^3		
Reinjection Well – Higher & Lower Bent 120m – 135m bgl	Mine Entries / Faults - 3 mine shafts within 50m of the site. Additional shafts within 150m of the site. Minor faulting through the centre of the site and 150m to the west. Major faulting 470m to the west and 140m to the east.	Whole target reservoir is likely to be flooded, as such low risk of promoting geotechnical instability. Reinjection possible split into two adjacent sets of workings. Shallow depth of drilling required for well installation. Relatively low risk of thermal break through between abstraction and reinjection reservoirs, except via existing mine shafts.	Faulting and mine entries close to the site present a high risk of promoting minewater and mine gas egress at the surface & geotechnical instability due to reinjection waters locally raising the groundwater table. Small mining block areas with only small, combined primary and secondary yield potential may limit sustained reinjection without causing a significant risk of raising groundwater levels. Combined primary and secondary storage capacity represents only 100 days of baseline reinjection. A well location in south-western area may be within mined areas in the overlying Cannel and Little Mine seams that could present a geotechnical risk to borehole stability.
	Direct In-Seam Connectivity – Combined storage capacity 80,000m^3		
	Indirect In-seam connectivity - Combined storage capacity 85,000m^3		

Table 4-3 Heat pump system efficiency comparison

Heat pump system	Seasonal coefficient of performance (SCoP)	Seasonal performance factor (SPF) including parasitic electricity consumption from pumping, defrosting etc
Minewater at 325m (Arley seam)	3.80	2.5
Minewater at 100m	3.5	3.00
ASHP	3.2	2.84
Hybrid – minewater and air source at 100m	3.5	3.00

4.4.4 Minewater assessment conclusions

It is understood from the assessment that the proposed minewater technological solution (abstraction from the Arley seam at 325m and reinjection into the Higher & Lower Bent seam) has a lower overall efficiency seasonal performance factor) compared to ASHPs, using the information currently available.

Therefore, in order to progress the minewater solution any further a pre-design investigation at Rhodes Bank needs to be completed for the Little Mine, Cannel, Higher / Lower Bent and Arley seams to determine the following:

- Saturation of Little Mine seam and Cannel seam at Rhodes Bank – if these seams are saturated, as they are below 100m, the overall efficiency of the minewater solution would be greater than an ASHP solution
- Flow rate possible from/into abstraction and reinjection boreholes
- Temperature and temperature profile with pumping of minewater at each of the seams

The pre-design investigation can be funded through GHNF and following the results of the pre-design investigation the minewater solution can be considered and compared with other low carbon technologies. This consideration should be made by using a full techno-economic model including all relevant capital, operational and replacement costs.

4.5 Long list appraisal

4.5.1 Critical Success Factors (CSFs)

CSFs are the attributes that any successful proposal must have if it is to achieve successful delivery of its objectives. The Green Book 2022 outlines 5 basic CSFs that apply to all proposals which are outlined in Table 4-4.

Table 4-4 Summary of Critical Success factors from the Green Book (Box 9) 2022

Key Critical Success Factor	Description
Strategic fit and meets business needs	How well the option: • meets the agreed project objectives, related business needs and service requirements • provides holistic fit and synergy with other strategies, programmes, and projects
Potential Value for Money	How well the option: • optimises social value (social, economic, and environmental), in terms of the potential costs, benefits and risks
Supplier capacity and capability	How well the option: • matches the ability of potential suppliers to deliver the required services • appeals to the supply side
Potential affordability	How well the option: • can be financed from available funds • aligns with sourcing constraints
Potential achievability	How well the option: • is likely to be delivered given an organisation's ability to respond to the changes required • matches the level of available skills required for successful delivery

CSF's have also been discussed and agreed with OMBC to establish what is important to them in terms of the successful delivery of the scheme. The priority OLCHN-specific CSFs include:

1. **Strategic fit and meets business needs:**
    - Achieving Net Zero Objective: Ensuring that the project aligns with and actively contributes to the overarching goal of achieving net-zero emissions, playing a pivotal role in the OMBCs goals.
    - Establishes OLCHN as the anchor project for a strategic partnership, introducing a collaborative delivery of decarbonisation initiatives across the entire LA.
2. **Potential Value for Money:**
    - Focuses on achieving project objectives, especially in terms of delivering cost-effective heat to consumers, which enhances affordability and reduces risk of fuel poverty.
    - Prioritising the delivery of social value project objectives to benefit the local community.
    - Incorporating financial metrics that make the project attractive to private investors.
3. **Supplier capacity and capability:**
    - Achieving project objectives specifically social value objective

- Minimises the risks associated with supplier constraints
- Most likely to provide on-time and consistent delivery of project milestones, reducing uncertainty and enhancing stakeholder confidence.

4. **Potential affordability:**
   - Focuses on achieving economic and financial project objectives
   - Requires limited input of equity from the LA into both the capital and operational phases.
   - Meets the GHNF metrics to qualify for grant funding, which can provide crucial financial support for project execution.
5. **Potential achievability:**
   - Achieving project objectives specifically economic/financial objective
   - Leveraging a OLCHN solution that reduces supply chain risks and allows for the procurement of an experienced delivery partner.

4.5.2 Options Framework-Filter

The Green Book Options-Framework Filter (shown below in Figure 4—1) is used to generate a list of potential scenarios. This method supports the long list optioneering by breaking each scenario down into a series of components/ criteria to ensure several viable options are proposed. The analysis will be based on the need for all, shortlisted options to meet the SMART objectives, and on how well each option choice meets the "Critical Success Factors" (CSFs) for the project.

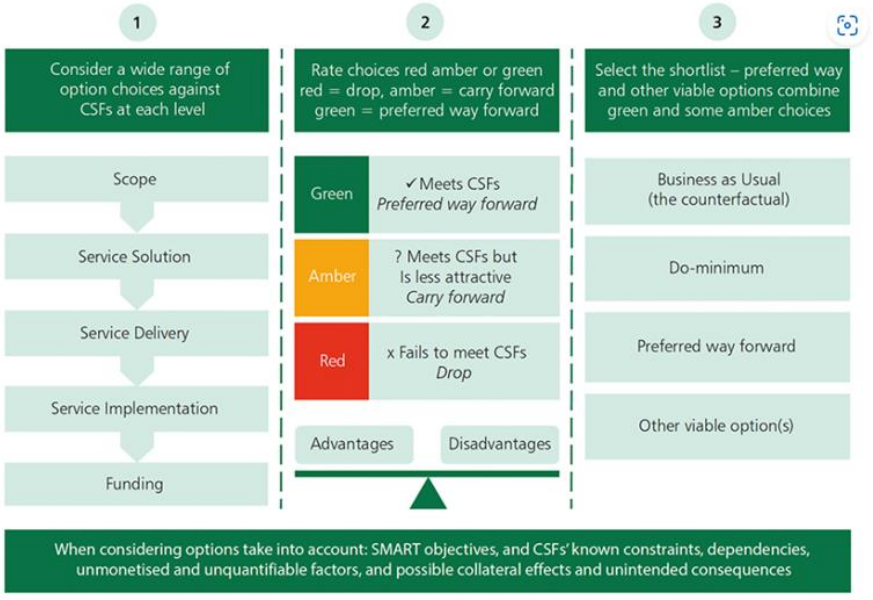

Figure 4—1 Green Book Methodology for Long-List options appraisal

There are five key components in the first step of the long list methodology which are described in more detail below:

1. **Service Scope** – What is the extent of the proposed service. This may be defined by one or more parameters including (but not limited to) geographic, demographic, time limits and other relevant factors.
2. **Service Solution –** How the outlined scoped scenario can be delivered whilst considering the technologies available and best practice.
3. **Service Delivery –** Who is best placed to deliver the scheme. For example, this may be through private sector providers or direct public provisions. Note that the delivery provisions may require higher or lower return on investment.
4. **Service Implementation –** How the proposed scheme will be delivered. I.e., adopting a phased approach, a small-scale pilot scheme or large-scale expansion project.
5. **Service Funding –** Indication on how the project could be funded

For each component, a possible solution is proposed with varying degrees of involvement/ risk/ spending etc. Once complete, each aspect is assessed against the critical success factors and colour coded as follows:

- **Discounted (✗) –** This does not align with the project objectives
- **Carried forward (?) –** Meets the project objectives but there is a more attractive option
- **Preferred way forward (✓)** – Meets the project objectives and is the most attractive option

This process creates a matrix that can be used to generate individual elements that form complete scenarios. Table 4-5 shows the results of this process that reflect a "Do minimum" approach through to a "Do maximum" approach. The greyed out cells are where no further options need to be considered. As a minimum each project objective should include the following options; Do Minimum, Preferred Way Forward, Less Ambitious Options (intermediate) and a More Ambitious (Do Maximum).

Table 4-5 Options Framework-Filter process for long list appraisal

Project	1. Business as usual (BAU)	2. Do Minimum	3. Intermediate Option	4. Intermediate Option	5. Intermediate Option	6. Intermediate Option	7. Do Maximum
1. Service scope	Decarbonise individual council-owned buildings on a case-by-case basis	Council buildings only	Core council buildings+ St. Mary's heat network	Core council buildings+ other core public buildings + St. Mary's heat network	Core council buildings + other core public buildings + new housing developments + St. Mary's heat network	Core council buildings + other core public existing + new housing developments + extended council buildings + St Mary's heat network + all FCHO housing stock in proximity of St Mary's heat network + mandated buildings	All identified connections irrespective of risk including extended private buildings
	×	×	×	×	✓	?	×
2. Service solution	Individual ASHPs with top-up boilers depending on building type	Low-carbon technology ASHP with N+1 redundancy and gas boiler top-up via St. Mary's connection	Minewater heat pump to meet GHNF carbon gate. Top-up and back-up being met by gas boilers via connection to existing St Mary's DHN	Minewater heat pump with connection to St. Mary's 3.5 MW Biomass boiler to meet GHNF carbon gate. Top-up and back-up being met by gas boilers via connection to existing St Mary's DHN	Minewater heat pump with additional low carbon resilience (ASHP/CL GSHP) to meet GHNF gate. Top-up being met by gas boilers via connection to existing St Mary's DHN	Minewater heat pump with additional low carbon resilience (ASHP/CL GSHP) with connection to St. Mary's 3.5 MW Biomass boiler to meet GHNF gate. Top-up being met by gas boilers via connection to existing St Mary's DHN	Minewater heat pump with additional low carbon resilience (ASHP/CL GSHP) with connection to St. Mary's 3.5 MW Biomass boiler to meet low carbon heat fraction (>90%). Top-up being met by electric boilers
	×	?	×	×	✓	?	×
3. Service Delivery	N/A	IRR >12% (council/ESCO delivery)	IRR > 6% < 12% (council/ESCO delivery)	IRR > Discount rate < 6% (council/ESCO delivery)	IRR = Discount rate = 3.5% (council/ESCO delivery)		IRR < Discount rate (council/ESCO delivery)
	×	×	?	✓	?		×
4. Implementation	N/A	Connect each building when plant comes to end of life	Full Network build-out in multiple phases according to plant economic life and ensuring all connections made before LA Net zero target of 2030				Full build-out and connection of all buildings at start of project
	×	×	✓				×
5. Funding	N/A	All private funding	Combination of private and public funding				All public funding
	×	×	✓				?

Using Table 4-5 a combination of components is used to create the complete scenarios for the long list optioneering. The **FOUR** proposed scenarios are categorised by the following:

1. **"Do minimum" –** A scenario that only just meets the business needs required by the objectives set
2. **"Preferred way forward" –** comprises of all components marked with a green tick in Table 4-5
3. **"Less ambitious preferred way forward" –** this option stems from the preferred way forward however may take longer to deliver with less costs incurred or carried less risk
4. **"More ambitious preferred way forward" –** this may incur greater risk (uncertainty with new developments), decreased delivery time or higher cost

A summary of the complete scenarios from the long list process are shown in Table 4-6.

Table 4-6 Long list of scenarios

Project	Business as usual (BAU)	Do Minimum	Preferred Way Forward	Less Ambitious Preferred Way Forward	More Ambitious Preferred Way Forward
Service Scope	Decarbonise individual council-owned buildings case-by-case basis	Core council buildings + other core public buildings + new housing developments + St. Mary's heat network	Core council buildings + other core public buildings + new housing developments + St. Mary's heat network	Core council buildings+ other core public buildings + St. Mary's heat network	Core council buildings + other core public buildings + new housing developments + extended council buildings + St. Mary's heat network + all FCHO housing stock in proximity of St Mary's heat network + mandated buildings
Service Solution	Individual ASHPs with top-up boilers depending on building type	Utilising existing Biomass boiler with additional Low-carbon technology ASHP with N+1 redundancy and gas boiler top-up via St. Mary's connection	Utilising existing Biomass boiler with additional Minewater heat pump with additional low carbon resilience (ASHP) to meet GHNF gate. Top-up being met by gas boilers via connection to existing St Mary's DHN	Utilising existing Biomass boiler with additional Minewater heat pump with additional low carbon resilience (ASHP) to meet GHNF gate. Top-up being met by gas boilers via connection to existing St Mary's DHN	Utilising existing Biomass boiler with additional Minewater heat pump with additional low carbon resilience (ASHP) to meet GHNF gate. Top-up being met by gas boilers via connection to existing St Mary's DHN
Service Delivery	N/A	IRR > Discount rate < 6% (council/ESCO delivery)	IRR > Discount rate < 6% (council/ESCO delivery)	IRR > Discount rate < 6% (council/ESCO delivery)	IRR > Discount rate < 6% (council/ESCO delivery)
Service Implementation	N/A	Full Network build-out in multiple phases according to plant economic life and ensuring all connections made before LA Net zero target of 2030	Full Network build-out in multiple phases according to plant economic life and ensuring all connections made before LA Net zero target of 2030	Full Network build-out in multiple phases according to plant economic life and ensuring all connections made before LA Net zero target of 2030	Full Network build-out in multiple phases according to plant economic life and ensuring all connections made before LA Net zero target of 2030
Service Funding	Public sector funding	Combination of private and public funding	Combination of private and public funding	Combination of private and public funding	Combination of private and public funding

4.6 Short List appraisal

The short-listing process considers the CSFs, Project Objectives, unmonetised factors, constraints and dependencies that have been discussed in detail within the Strategic Case.

The completed scenarios are assessed against these factors and categorised further into the following:

1. Green – Meet's specific criteria
2. Yellow – Partially meets criteria or have the potential to
3. Red – Does not meet criteria

A summary of this process is shown below in Table 4-7.

Table 4-7 Summary of Short List appraisal matrix

Project objectives	Business as usual (BAU)	Do Minimum	Preferred way forward	Less Ambitious Preferred Way Forward	More Ambitious Preferred Way Forward
Meet OMBC's net zero policy requirements by 2025 for council buildings and 2030 for the metropolitan borough by implementing low-carbon technologies and onsite interventions. In areas where decarbonisation is challenging, consider the use of fossil fuel technology while exploring alternative solutions. Additionally, prioritising community decarbonisation efforts to ensure a comprehensive and sustainable reduction in carbon emissions across the borough.					
Maintain a slight flexibility to increase the cost of heat to council/public buildings if needed, not exceeding a pre-defined amount agreed within the business case assessment. This flexibility will be assessed during financial modelling, where any necessary cost adjustments will be implemented to ensure that the network is financially viable, whilst ensuring that social housing costs remain at or below current pricing levels to limit any increase in fuel poverty.					
Main heat supply >85% will be from low-carbon sources. If minewater is selected as the main source of heat additional low-carbon resilience e.g. air source heat pumps are required for resilience. Additional top-up electric/gas boilers can be included to ensure uninterrupted heat supply throughout the project lifetime (40 years).					
Achieve a social IRR of at least 3.5% over the project's lifetime of 40 years and actively targeting specific council-defined social values (see above), while ensuring that associated risks to project viability are maintained at an acceptable level.					
Prioritise low-carbon heating solutions for the heat network coupled with combination of retrofitting/energy efficiency measures over the schemes lifetime to reduce heating demand.					
Procurement of an Oldham Green New Deal joint venture delivery partner prior to heat network construction (2025/2026) that would enable the delivery of the heat network, bringing skills and expertise, whilst allowing the Council some elements of involvement and control. Aim of the heat network scheme is to not provide a revenue opportunity for the Council. There is greater importance in maintaining a cost of heat for customers equivalent or lower versus a defined counterfactual and investigating ways to minimise consumer cost.					
Critical Success Factors					
Strategic fit and business need					
Potential value for money					
Supplier capacity and capability					
Potential affordability					
Potential achievability					

The three scenarios that meet most of the criteria are the **"Do Minimum (DM)", "Preferred way forward (PWF)"** and the **"More Ambitious Preferred Way Forward (MAWF)".** These three scenarios are taken forward to the preferred option modelling.

4.7 Preferred options

4.7.1 Preferred Way Forward (PWF)

This scenario aligns with the project objectives set by OMBC, encompasses critical success factors, and demonstrates significant expansion potential. It proposes the connection of all relevant council-owned buildings, public buildings, upcoming new housing developments, and applicable FCHO social homes. The primary goal is to achieve maximum decarbonisation while ensuring commercial viability. Large thermal storage included to maximise heat pump operation and provide added resilience.

To achieve this objective, the selected technological approach integrates the biomass boiler with minewater WSHP and to address the base demand and is complemented by the existing top-up gas boilers located in St Mary's energy centre. Furthermore, to enhance resilience in instances where the minewater output falls short of target heat capacity, the WSHPs can be connected to dry air coolers, offering an auxiliary air source back-up. Large thermal storage included to maximise heat pump operation and provide added resilience.

4.7.2 More Ambitious Way Forward (MAWF)

This scenario mirrors the service scope of the PWF scenario, whilst including initially excluded council and public buildings, additional social housing, and buildings mandated for heat network zoning. The decision to integrate these into the OLCHN introduces an element of risk, along with uncertainty and heightened costs, all of which are evaluated against the PWF scenario. The chosen technology solution remains aligned with the PWF, employing the same technological approach of Biomass boiler supplemented with WSHP and existing gas boiler top up. However, it's important to acknowledge that the installed capacity of the technology may be different. Large thermal storage included to maximise heat pump operation and provide added resilience.

4.7.3 Do Minimum (DM)

The scope service of this scenario aligns with the PWF. However, a shift in the technological solution involves using ASHP in tandem with a Biomass Boiler instead of minewater WSHP. This alteration enables a financial viability assessment of minewater WSHP for comparison. Note the ASHP will be WSHP combined with dry air cooler (DACs). This would allow for these heat pumps to interface with alternative low carbon heat options such as minewater and wastewater in the future. Large thermal storage included to maximise heat pump operation and provide added resilience.

4.8 Load assessment

After optimisation of the building scope by utilising a Linear heat density (LHD) assessment, a load assessment has been completed for the buildings within the scope of this study. These are summarised in 0.

4.8.1 Linear Heat Density Analysis

LHD is a measure of heat load per meter of district heating pipework. It is a useful approximation for identifying areas where a DHN may be viable. Historically 4MWh/a/m was the density metric used for CHP DHNs however with recent increases in cost of pipework and trenching BH has found in previous projects this metric is no longer stringent enough. Therefore, 8 MWh/m was chosen as the upper bound metric for this analysis.

4.8.1.1 Preferred Way Forward / Do Minimum

Figure 4—2 shows the "bubble map" for the LHD analysis for the PWF buildings. Any bubble areas that overlap and deemed to be considered for a district heating network and anything with significant distance from other radii was removed from the study.

Some key points from the LHD analysis include:

- The analysis reveals the presence of two large, interconnected clusters located in Oldham town centre. These clusters likely offer favourable conditions for the implementation of the OLCHN.
- Certain buildings, such as "New housing development: Metropolitan Place," "University Campus Oldham – Studio," "Rock Street Centre," and "Coldhurst Community Centre," are situated at a significant distance from these clusters. Consequently, these buildings are excluded but will still be considered within the context of the MAWF option.
- Many of the FCHO clusters are situated near the existing St. Marys heat network, yet they do not overlap, hence they are excluded from consideration. The LHD for these buildings represents an optimistic scenario, as connecting them typically entails a higher capital expenditure relative to revenue.

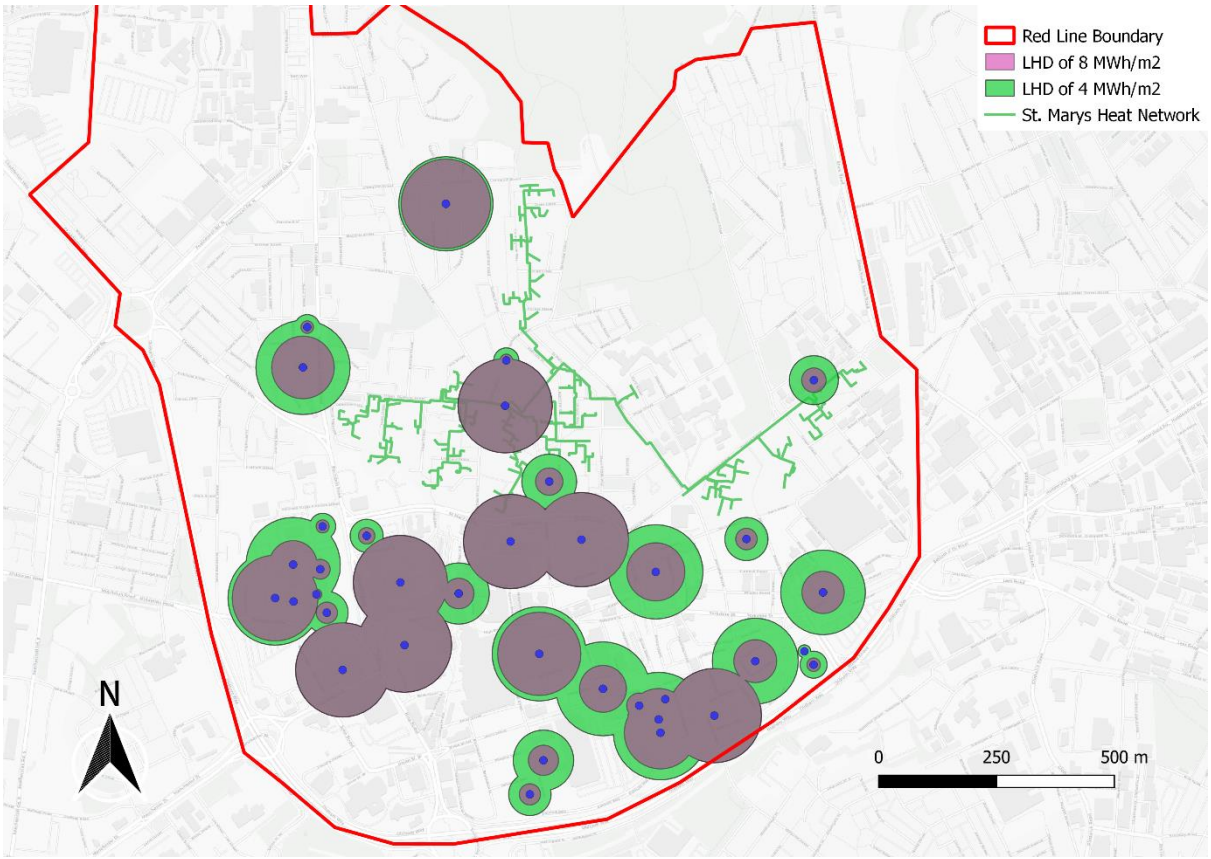

Figure 4—2 Linear heat Density Assessment for the PWF Scenario

4.8.1.2 More Ambitious Way Forward

Figure 4—3 illustrates the "bubble map" showcasing the LHD analysis conducted for the MAWF buildings. Any areas where the bubbles overlap and are deemed suitable for consideration in a district heating network have been identified, while any regions with significant distances from other radii have been omitted from the study.

Key findings from the LHD analysis are as follows:

- A notable concentration of mandated buildings is observed in the north-western boundary, situated at a considerable distance from the other clusters. Consequently, these buildings have been excluded from further consideration.
- In the south-east boundary, there is limited overlap among the mandated buildings, leading to their exclusion from the study.
- To accommodate the additional FCHO social homes, which are also located at a considerable distance from the energy centre or interconnected clusters, it becomes necessary to extend the existing St Mary's heat network.

Figure 4—3 Linear heat Density Assessment for the MAWF Scenario

4.9 Energy modelling

4.9.1 Phasing strategy

The OLCHN build-out is planned to be executed in phases, as described in Table 4-8. The phased connection breakdown follows the following strategy:

- Council buildings to be connected in Phase 1. This is in alignment with the OMBC target of achieving "net zero" for all council buildings by 2025.
- New housing developments will be connected upon completion. The specific build-out date for these developments is currently unknown. However, it is estimated that the load will be distributed between 2026 – 2032.
- All non-council buildings will be connected either at the end-of-life of their existing heating technology or by the year 2030, whichever comes earlier. This approach ensures that stakeholders can choose the most economical option while still meeting the OMBC target of "net zero" by 2030 for the metropolitan borough.
- Mandated buildings will be connected during Phase 4 of the build-out. Section 4.13.7, examines the feasibility of advancing these connections to 2025 in-line with the HNZ scheduled for the same year.
- The Spindle Shopping Centre will be connected in Phase 5. This is estimated to occur at the end-of-life of the proposed air source heat pump heating system.
- Phase 5 also looks to replace the Biomass boiler at end of life with an ASHP of the same capacity (3.5 MWth).

Table 4-8 Phasing breakdown

Phase	Start Year	End Year	Heat Demand (GWh) PWF/DM	Heat Demand (GWh) MAWF
Phase 1	2026	2026	19.5	20.7
Phase 2	2027	2028	21.9	23.1
Phase 3	2029	2030	24.2	25.8
Phase 4	2031	2032	28.5	55.9
Phase 5	2033	2034	29.2	56.6

4.9.2 Energy modelling and system sizing

Energy modelling has been completed considering the hourly heat demand of each building over a year and the year of connection. The capacity of the heat pump and top up plant is sized to keep operating costs as low as possible.

Key assumptions used in the energy modelling as outlined below in Table 4-9. The heat pump and biomass are assumed to have an annual availability of 95% to allow for downtime periods for maintenance.

Table 4-9 key assumptions for energy modelling

Parameter	Unit	Value	Note
Gas boiler efficiency	%	89%	Typical existing boiler efficiency
Biomass Boiler efficiency	%	87%	Specification

Minewater COP	#	2.5[20]	Season Performance Factor (incl. Pumping Power and Defrosting); Analysis of Heat Pump Options Report; FWS
Air Source Heat Pump COP (Supplementing Biomass)	#	2.52	Season Performance Factor (incl. Pumping Power and Defrosting); Analysis of Heat Pump Options Report; FWS
Air Source Heat Pump COP (Primary)	#	2.84	Season Performance Factor (incl. Pumping Power and Defrosting); Analysis of Heat Pump Options Report; FWS
Heat pump turndown	%	40	Conservative assumption based on heat pump datasheets
Minewater DT	K	7	Season Performance Factor (incl. Pumping Power); Analysis of Heat Pump Options Report; FWS
Heat pump/biomass annual availability	%	95%	
Network losses	%	10%	As per CP1.2

Figure 4—4 and Figure 4—5 show an example load duration profiles for the DM scenario for both phases 4 and 5. The load duration profiles have been used for optimising the plant equipment sizes. The equipment has been sized for each scenario such that overall heat fraction of 90% is met through low carbon technologies. Up to phase 4, the biomass boiler would be the lead low carbon technology with summer heating carried out by heat pump technologies. Beyond phase 4 the low carbon heat pump technology would be the lead such that gas boilers are only used to provide winter top up.

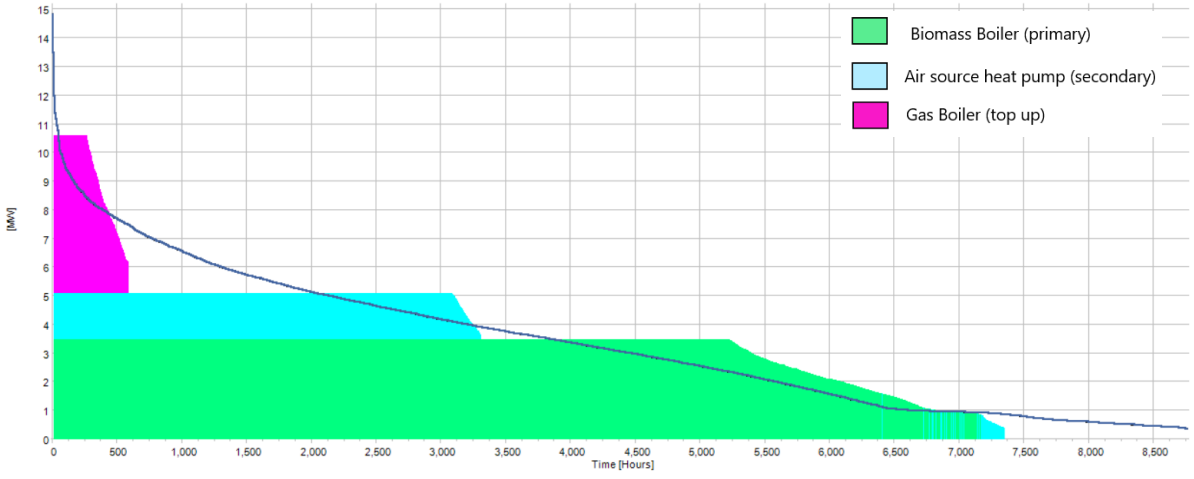

Figure 4—4 Do minimum load duration profile phase 4 (EPRO)

[20] A COP for the heat pump has been calculated for minewater assuming worst case scenario i.e. abstraction from the Arley Seam. If minewater doesn't yield the intended heat capacity or is unable to be used a lower COP would be achieved from the dry air cooler circuit. This would impact the imported electricity requirements and operating cost.

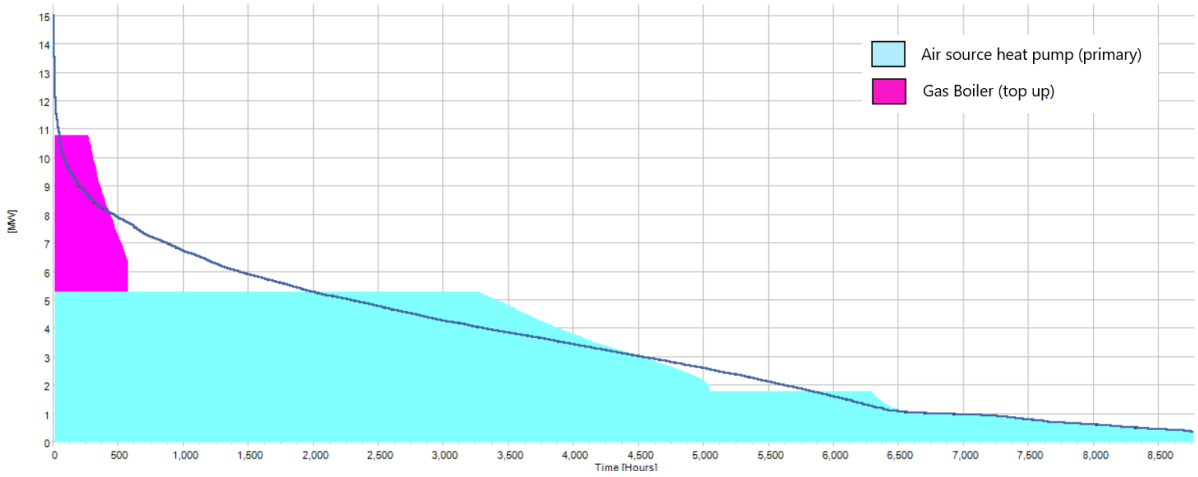

Figure 4—5 Do minimum load duration profile phase 5 – Biomass boiler replacement (EnergyPro)

With the aim to maximise the utilisation of the biomass boiler and heat pump solution, large thermal store is proposed. When demand is lower than the biomass boiler capacity, it will charge the thermal store. During peak periods where demand exceeds the maximum output of the boiler, the thermal store will discharge. This control strategy enables maximum utilisation of the low carbon technology, improved efficiency of the system and lower carbon emissions.

In scenarios where both the thermal store and biomass output fall short of meeting the heat load, the heat pump will serve as a supplementary heat source. This will be further bolstered by the existing gas boilers at the St Mary's energy centre. Notably, the biomass unit will not be replaced at the end of its lifecycle. Consequently, the WSHP/ASHP will transition into the primary heat supply technology, catering to a larger share of the heat demand while contributing to the charging of the thermal store. This transition is anticipated to significantly enhance the overall efficiency of the heat pump system.

Figure 4—6 to Figure 4—8 provides a summary for the optimised system plant sizes for the proposed scenarios. For both DM and PWF, it is anticipated that 1.8 MW_{th} of heat pump capacity and 150 m^3 additional thermal storage at the new Rhodes Bank energy centre is required to deliver a minimum of 90% heat fraction from low carbon technologies at phase 4 (before Biomass boiler replacement). As for the MAWF scenario, 7.7 MW_{th} and an additional 300 m^3 of thermal storage is anticipated to deliver a minimum of 90% heat fraction from low carbon technologies.

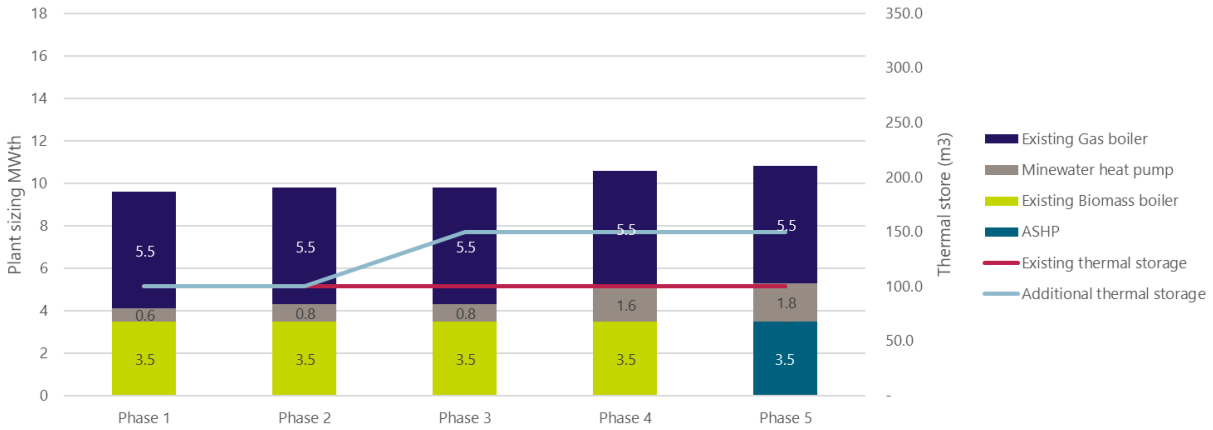

Figure 4—6 PFW plant sizing summary

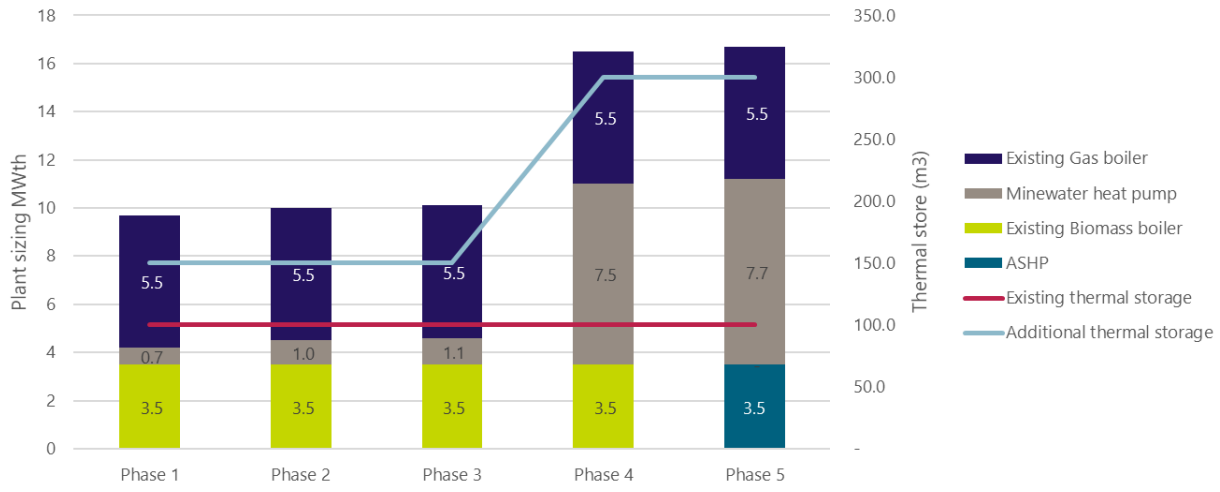

Figure 4—7 MAWF plant sizing summary

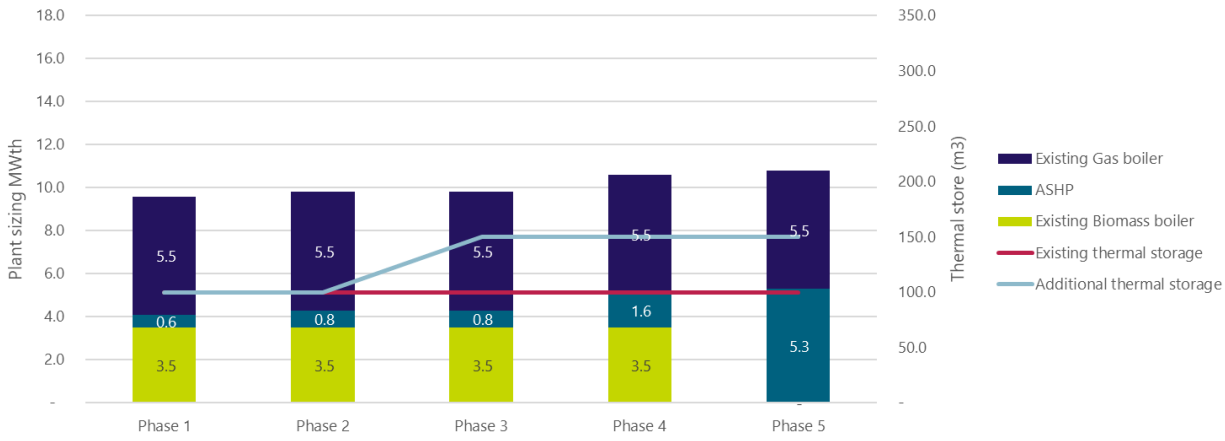

Figure 4—8 DM plant sizing summary

At full build out (Phase 5) both PWF and MAWF scenarios would require ~40 l/s and ~165 l/s of flows from the minewater seams, respectively. The large quantities required from MAWF scenario is deemed high risk in terms of minewater availability.

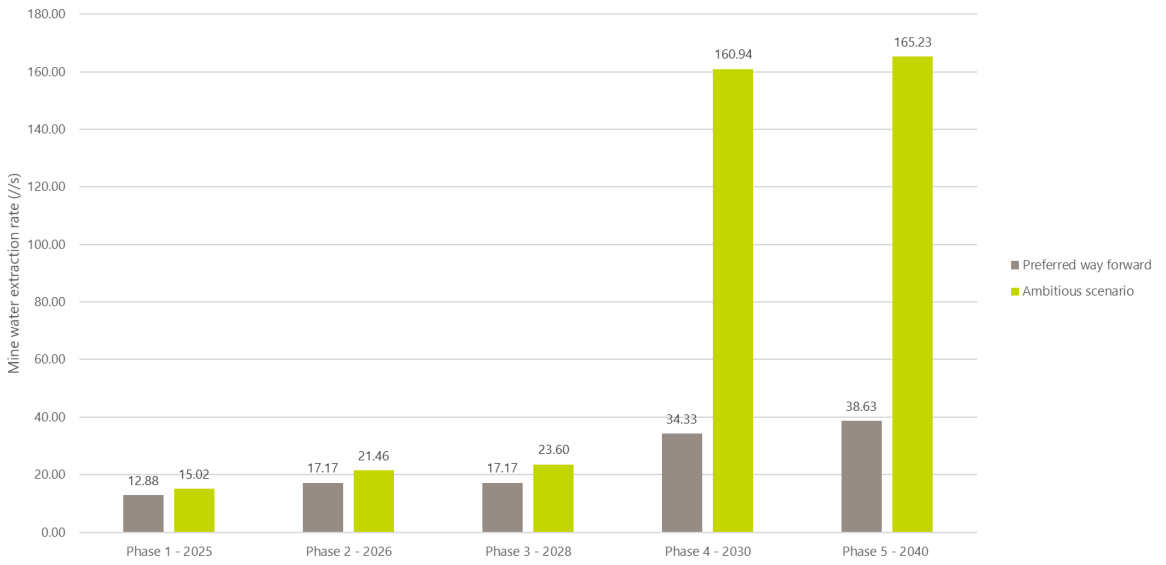

Figure 4—9 Minewater Extraction flow quantities for each phase (PWF and MAWF)

4.10 Heat Network Route

Figure 4—10 shows the proposed OLCHN route for the DM and PWF Scenarios, while Figure 4—11 shows the route for the MAWF scenario. A key objective was to navigate around potential obstructions, such as utilities, infrastructure, and major roads. Moreover, due consideration was given to factors like land ownership and engagement with relevant stakeholders when determining the route. The challenges posed by certain constraints in the proposed routes, along with the corresponding mitigation strategies have been documented in the attached *"Oldham Heat Network Pinch Points"* design note.

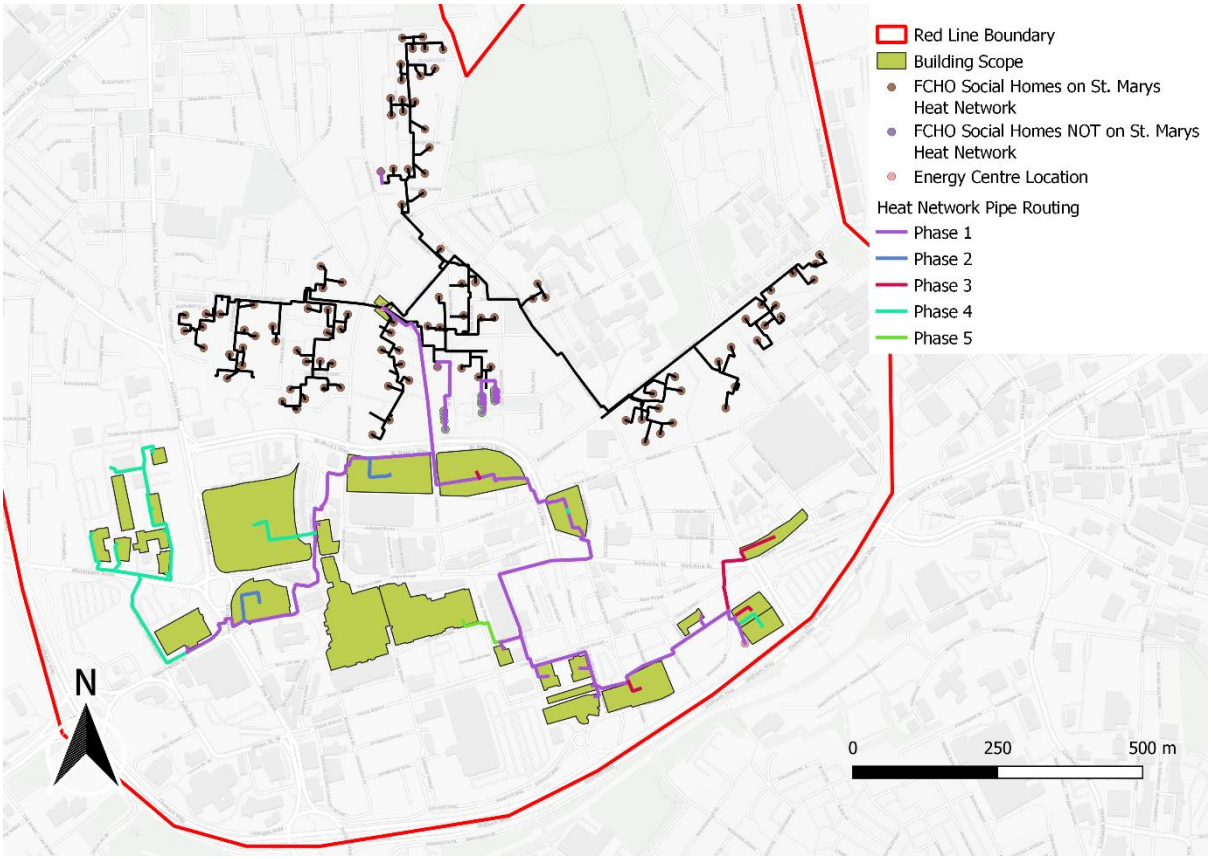

Figure 4—10 Heat network route for the PWF and Do Minimum Scenarios

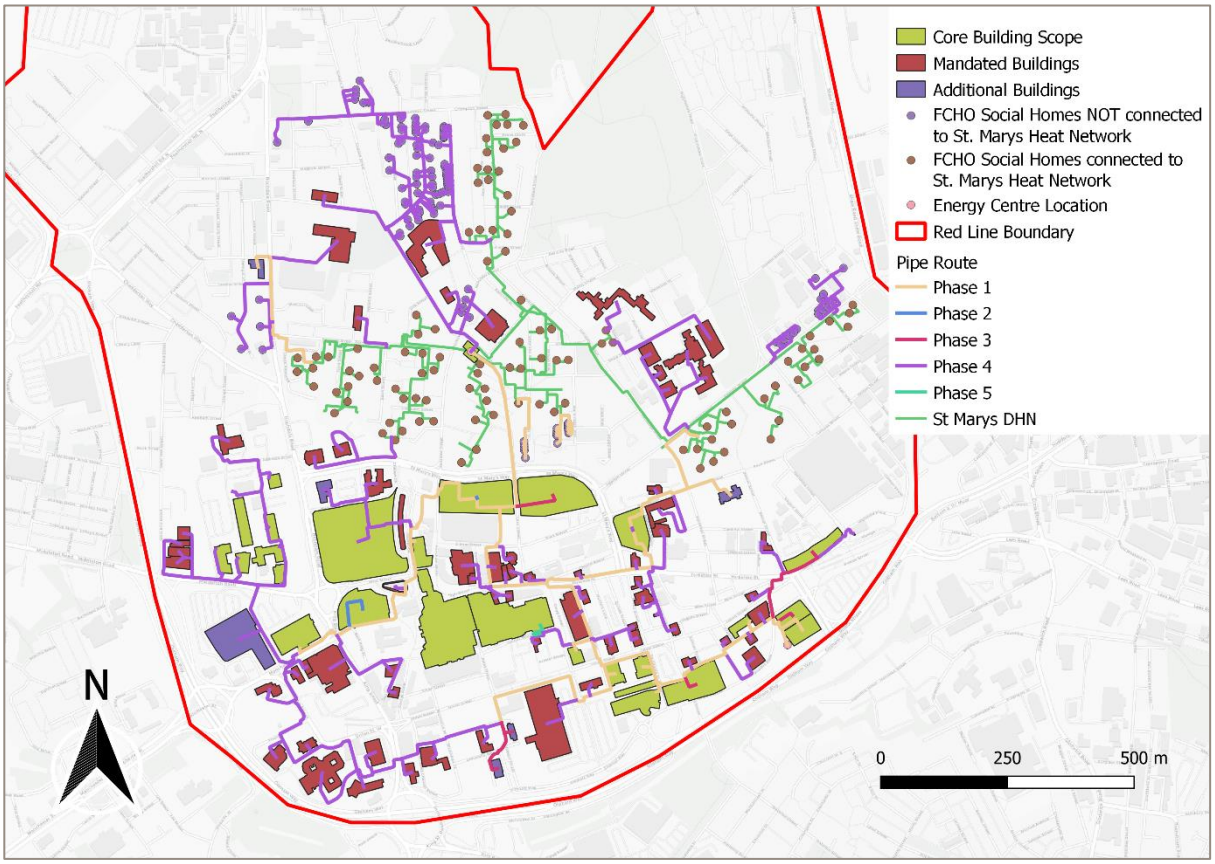

Figure 4—11 Heat network route for the MAWF Scenario

4.11 Energy centre layout and noise considerations

An indicative plantroom layout design was completed for the preferred option design at Rhodes Bank with ASHP (see Appendix A). The total footprint area for the standalone building (Including 33/11kV substation) is anticipated to be 260m^2 with an additional 75 m^2 of space recommended to be safe guarded for external thermal storage. The proposed energy centre footprint includes space for considering extending the OLCHN to connect to suitable mandated buildings by incorporating additional heat pump equipment.

Provisional space for PV panels (10 kWp) for small power is also shown on the roof, as well as recommended acoustic louvres to reduce noise generated from ASHP compressor and fan units. Planning regulations to limit noise to less than 42 dbA separating the unit and a neighbouring building. Noise generated from the DAC units is ~48 dB[21] at a distance of 10 meters, which means the sound pressure levels would need to reduce by ~ 6 dB. Locating the air coolers 20 meters from the neighbouring property should fall within regulation and limit the need for acoustic panelling.

[21] Sound pressure level at 10 m – Solid Energy V voolers

4.12 CAPEX

A full breakdown of the capital costs for the full network are outlined in Table 4-10, Table 4-11 and Table 4-12 for the PWF, MAWF and DM scenarios, respectively. Appendix A show the breakdown of the key CAPEX items for each scenario.

Table 4-10 Capital costs for full network (PWF Scenario)

	Unit	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Heat pump technology	£m	0.73	-	-	0.73	2.35
Top-up technology	£m	-	-	-	-	-
Plate heat exchangers	£m	0.24	0.02	0.02	0.08	0.04
Heat Interface Units	£m	-	-	-	0.04	-
Heat Meters	£m	0.02	-	0.01	0.03	-
Building Connection	£m	0.11	0.03	0.04	0.12	0.02
Ground infrastructure - Minewater	£m	6.30	-	-	-	-
Energy centre	£m	0.51	-	0.23	-	-
Electricals	£m	0.30	-	-	-	-
Network ancillaries	£m	0.14	0.03	0.01	0.09	0.02
District Heat Network	£m	9.95	0.29	0.46	2.66	0.28
Additional Costs	£m	6.86	0.14	0.29	1.41	1.02
Total (per phase)	**£m**	**25.16**	**0.52**	**1.05**	**5.16**	**3.72**
Total	**£m**	**35.60**				

Table 4-11 Capital costs for full network (MAWF Scenario)

	Unit	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Heat pump technology	£m	1.06	-	-	5.28	2.35
Top-up technology	£m	-	-	-	0.20	0.22
Plate heat exchangers	£m	0.25	0.03	0.03	0.53	0.04
Heat Interface Units	£m	0.00	-	-	0.04	-
Heat Meters	£m	0.02	-	0.01	0.17	-
Building Connection	£m	0.12	0.03	0.06	0.94	0.02
Ground infrastructure - Minewater	£m	25.97	-	-	-	-
Energy centre	£m	0.91	-	-	0.45	-
Electricals	£m	1.00	-	-	-	-
Network ancillaries	£m	0.16	0.03	0.02	0.58	0.02
District Heat Network	£m	13.42	0.17	0.83	21.87	0.15
Additional Costs	£m	16.09	0.10	0.36	11.27	1.05
Total (per phase)	**£m**	**58.98**	**0.35**	**1.31**	**41.34**	**3.86**
Total	**£m**	**105.84**				

Table 4-12 Capital costs for full network (DM Scenario)

	Unit	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Heat pump technology	£m	0.73	-	-	0.73	2.35
Top-up technology	£m	-	-	-	-	-
Plate heat exchangers	£m	0.24	0.02	0.02	0.08	0.04
Heat Interface Units	£m	-	-	-	0.04	-
Heat Meters	£m	0.02	-	0.01	0.03	-
Building Connection	£m	0.11	0.03	0.04	0.12	0.02
Ground infrastructure - Minewater	£m	0.00	-	-	-	-
Energy centre	£m	0.51	-	0.23	-	-
Electricals	£m	0.30	-	-	-	-
Network ancillaries	£m	0.10	0.01	0.01	0.03	-
District Heat Network	£m	9.95	0.29	0.46	2.66	0.28
Additional Costs	£m	4.48	0.14	0.29	1.39	1.01
Total (per phase)	**£m**	**16.44**	**0.50**	**1.05**	**5.08**	**3.70**
Total	**£m**	**26.76**				

The majority of capital costs are made up by the steel pipework for heat distribution. Steel material is typically required for distributing at high temperatures i.e. 80°C. PEX pipework could also be considered to reduce capital cost which would be suitable for a lower temperature Network (70°C or less). This could be explored at future stages if lower network temperatures are technically feasible. A cost comparison between steel and plastic pipework is provided in Figure 4—12.

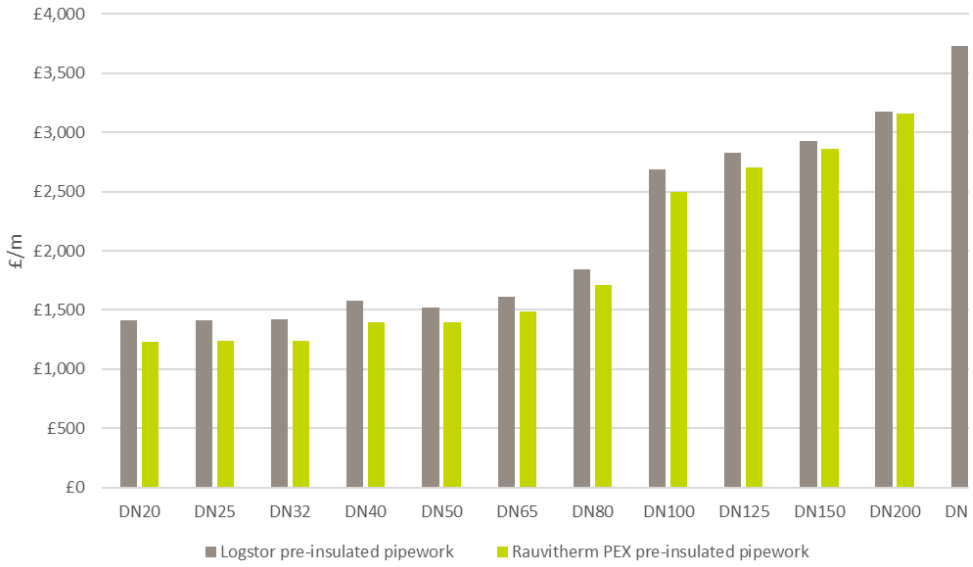

Figure 4—12 Plastic versus Steel pipework cost comparison

4.13 Techno-economic modelling

This section outlines the TEM analysis carried out for each network scenario, providing information on the capital and operational expenditure (CAPEX, OPEX) and the financial performance of the OLCHN.

The TEM is a pre-tax model used to give an initial indication of costs, revenues, and potential cash flows over time. This TEM is different from a financial model (prepared in the following sections of this report) and refines information such as heat sales tariffs. A TEM is not to be taken as financial advice – it is to be used as part of the OBC to identify project opportunities worth progressing to a deeper level of detail at the next project stage.

4.13.1 Methodology

The selected options mentioned in Section 4.7 (PWF, MAWF and DM) were taken forward for assessment within the TEM. The model uses various inputs such as the energy demand/consumption, the capital, operational and replacement expenditure, and income from the sale of heat to determine the following key economic and socio-economic performance indicators:

- Internal rate of return (IRR)
- Social internal rate of return (SIRR)
- Net present value (NPV) whereby a positive NPV achieved at 40 years would indicate a financially attractive scheme
- Discounted payback over a 40-year project life.

The revenues for the network and charges to the customer are separated into three sources on revenue/cost.

- Variable heat sales (p/kWh)
- Standing charges or fixed rate costs (£/unit of £/kW).
- Connection charges (£/connection)

It is worth noting that typically, the £/unit is typically used for non-bulk domestic connections, and £/kW is for commercial or bulk heat supply connections.

4.13.2 Modelling Boundaries

Figure 4—13 depicts the key costs and revenues associated with the OLCHN. The boundary diagram demonstrates the key elements considered within the TEM. The TEM considers the economics of the scheme from the perspective of a JV i.e. OMBC and private ESCO.

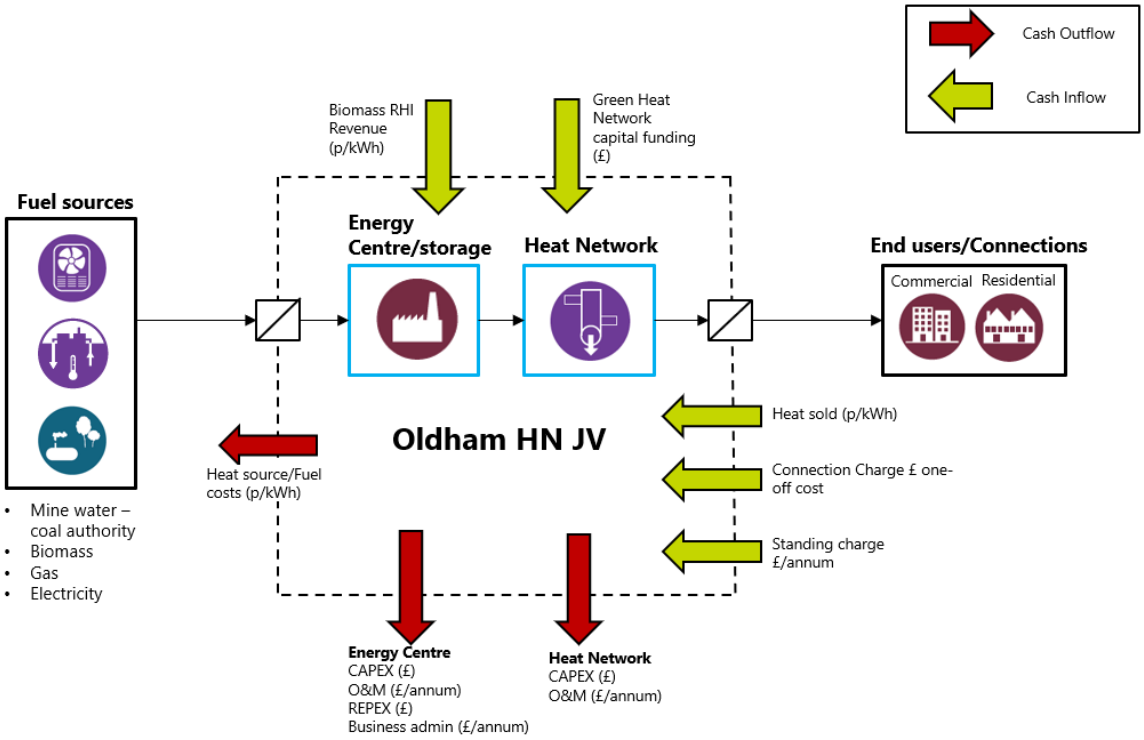

Figure 4—13 Boundary diagram for Oldham District Heat Network

4.13.3 Modelling Assumptions

4.13.3.1 Counterfactual

The counterfactual scenario is used as a basis for establishing the heat sales price, standing charges and connection charges. The counterfactual scenario represents the alternative heating solution for customers if the proposed heat network were not instated.

The counterfactual heat sales price, standing charges and connection charges for this TEM are determined based on the following assumptions:

- All **council buildings** and the **new housing developments** will utilise **communal air source heat pumps** without any top up technology.
- **Existing residential buildings,** including those connected to St Mary's Heat Network, all of which are social housing, will use **individual gas boilers**. This is in compliance with the GHNF requirement which mandates modelling social housing based on gas boilers.
- All **existing non-council commercial buildings** and **mandated buildings** will be equipped with **communal air source heat pumps** with **gas boiler top-up**.
- All **new non-council commercial buildings** will utilise **communal air source heat pumps** with **electric boiler top up.**

The counterfactual for each building is described in Appendix A.

4.13.3.2 RHI – commercial revenue

The Non-Domestic Renewable Heat Incentive (NDRHI) is a government programme designed to increase the uptake of renewable heat to work aid meeting the UK's renewable energy targets. The Department for Energy Security and Net Zero closed the NDRHI scheme in Great Britain to new applicants on 31 March 2021.

The NDRHI scheme supports businesses, public sector, and non-profit organisations to increase the uptake of renewable heat by providing financial incentives. Equipment must have been installed in England, Scotland and Wales on or after 15 July 2009. Equipment include solar thermal collectors, heat pumps, biogas combustion, and biomass to name a few.

Accredited installations receive quarterly payments over 20 years based on the amount of eligible heat generated. The scheme operates within England, Scotland, and Wales.

The biomass boiler was registered for RHI and is eligible for RHI payments and based on the system being accredited on or after the 1st April 2016 – 19th September 2017 the payment the council should receive will be £0.0259p per kWh. Biomass providers AMP clean energy offer a service to manage RHI costs to ensure payments are received based on biomass performance. The biomass boiler would be eligible for payments up to 2038.

4.13.3.3 Heat sales price

The network generates revenue through the sale of heat to the building connections. Figure 4—14 shows a breakdown of how these costs are calculated and Table 4-13 outlines the heat sales prices for the different building typologies across the network for the PWF, MAWF and DM scenarios. The heat sales prices are calculated as the weighted average heat price for each connection type, relative to building demand. The current prices paid for by the customers and counterfactual tariffs is highlighted in the "*Customer and Tariff note*".

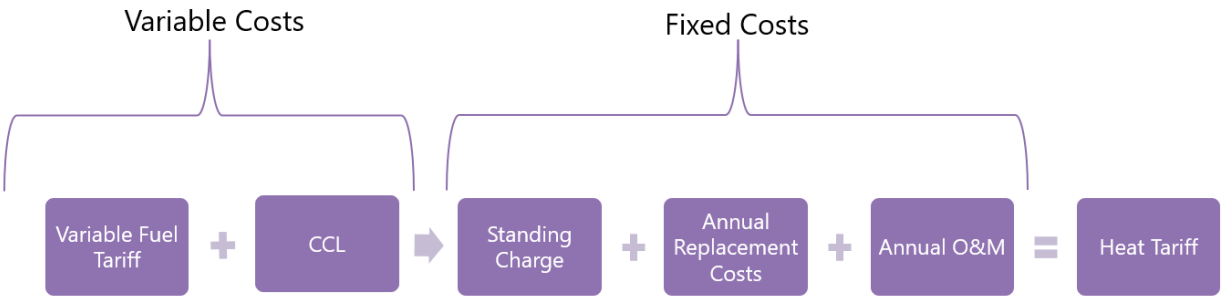

Figure 4—14 Breakdown of heat sales calculation

Table 4-13 Heat sales prices for each scenario

	PWF/Do Minimum		MAWF	
Commercial	**New Build**	**Existing**	**New Build**	**Existing**
Variable weighted average (p/kWh)	**10.59**	**10.58**	**10.59**	**10.81**
Fixed weighted average (£/kW)	**70.1**		**68.0**	
Residential	**New Build**	**Existing**	**New Build**	**Existing**
Variable weighted average (p/kWh)	**10.64**	**8.99**	**10.64**	**8.99**
Fixed weighted average (£/kW)	**75.1**	**12.2**	**75.1**	**12.2**
Mandated Buildings	**New Build**	**Existing**	**New Build**	**Existing**
Variable weighted average (p/kWh)	-	-	-	**10.55**
Fixed weighted average (£/kW)	-		**56.2**	

4.13.3.4 Connection charge

A connection charge was calculated for each building as the avoided cost to a building by joining the heat network. In this case, the capital cost of the low carbon technology and peaking plant top-up, outlined in Appendix A, that the building is expected to put in place if connection to the heat network was not available. A breakdown of a connection charge is outlined in Table 4-14. The breakdown for each building can be seen in the "*Customer and Tariff note*".

Table 4-14 Connection charge breakdown

Phase	Units	PWF	MAWF	Do Minimum
Phase 1	£m	2.39	2.49	2.39
Phase 2	£m	0.71	0.71	0.71
Phase 3	£m	0.73	0.92	0.73
Phase 4	£m	1.77	9.15	1.77
Phase 5	£m	1.37	1.37	1.37
Total	**£m**	**6.97**	**14.6**	**6.97**

4.13.3.5 Operating cost

Operating expenditure (OPEX), replacement expenditure (REPEX) and business costs are applied to the TEM, the rates are shown in Table 4-15.

Table 4-15 Breakdown of key operating costs

Cost	Rate	Unit	Source
Fuel Import Rates			
Natural gas	4.8	p/kWh	DESNZ Q4 2022 Quarterly price inc. CCL -Medium Bands[22]
Grid electricity	20.2	p/kWh	As above
Biomass (Wood chip)	5.2	p/kWh	AMP Energy Quote
Low grade heat cost (minewater)	1.0	p/kWh	Assumed as per previous stakeholder engagement
Operation Expenditure: Heat supply equipment			
Biomass Boiler	0.80	p/kWh	Operators quote
ASHP/WSHP	0.25	p/kWh	Manufacturer recommendation
ASHP/WSHP (Applied only when heat is generated)	0.45	% Of CAPEX	Manufacturer recommendation
Gas boilers top up/back up	5	% Of CAPEX	Industry experience
Operation Expenditure: Network and connection equipment			
Plate heat exchangers	2	% Of CAPEX	Industry experience
Bulk heat meters & HIU's	35	£/unit/year	Industry experience
District network	0.06	p/kWh	DECC report[23]
Metering and billing - Bulk	500	£/connection/year	Industry experience
Metering and billing – Non-bulk	85	£/dwelling/year	Industry experience
Business Rates			
Staff Costs	50,000 – 75,000	£/year	Industry experience
REPEX			
% REPEX cost incurred annually over the plant lifetime	80	% Of CAPEX	Industry experience

[22] Department for Energy Security and Net Zero, Gas and electricity prices in the non-domestic sector, https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector [Accessed 03/08/2023]
[23] DECC, 2015. Assessment of the costs, performance, and characteristics of UK heat networks. https://www.gov.uk/government/publications/assessment-of-the-costs-performance-and-characteristics-of-uk-heat-networks

4.13.3.6 Green Heat Network Fund

The Green heat Network Fund (GHNF) is deemed a critical funding source for this project. Therefore, careful consideration into the gated metrics were made throughout the development of the economic case. Table 4-16 summarises the gated metrics that were considered and how each option compared with each metric.

Table 4-16 Core gated metrics for GHNF

Metric	Minimum Score	Applicable to this project	GHNF metric met?		
			PWF	MAWF	DM
Carbon Gate	100gCO2e/kWh thermal energy delivered to consumers	✓	✓	✓	✓
Customer Detriment	Domestic and micro-businesses must not be offered a price of heat greater than a low carbon counterfactual for new buildings and a gas/oil counterfactual for existing buildings	✓	✓	✓	✓
Social IRR	Projects must demonstrate a Social IRR of 3.5% or greater over a 40-year period	✓	×	×	✓
Minimum Demand	For urban networks, a minimum end customer demand of 2GWh/year. For rural (off-gas-grid) networks, a minimum number of 100 dwellings connected.	✓	✓	✓	✓
Maximum CAPEX	Grant award requested up to but not including 50% of the combined total commercialisation + construction costs (with an upper limit of £1million for commercialisation)	✓	✓	✓	✓
Capped Award	The total 15-year kWh of heat/cooling forecast to be delivered will not exceed 4.5 pence of grant per kWh delivered **For the purpose of the TEM and Financial Model (FM) following feedback from GHNF we have used a maximum value of 3.5p/kWh available in order to make the application competitive**	✓	✓	✓	✓
Non-heat/cooling cost inclusion	For projects including wider energy infrastructure in their application, the value of income generated/costs saved/wider subsidy obtained should be greater than or equal to the costs included.	**n/a**	**n/a**	**n/a**	**n/a**

4.13.3.7 Socio-economic Impacts

The project if developed will help to drive the low and zero carbon economy in Oldham by providing a basis for contractors and suppliers to develop new skills. The scheme, once developed, is intended to deliver lower cost heat to developments compared to the alternative low carbon counterfactuals. This can be achieved through improved efficiencies in heat generation, as well as economies of scale (e.g., plant capital costs and energy purchasing).

4.13.3.8 Social IRR

The Social Internal Rate of Return (SIRR) looks at the overall return value of a project to society, both economically and socially. It considers the full range of costs and benefits, both private and social, associated with a project. The SIRR is calculated in much the same way as the financial IRR, except that instead it considers both the private and social costs and benefits over the lifetime of the project:

$$Social\ IRR = Economic\ IRR + Carbon\ Abatement\ Value + Air\ Quality\ Damage\ Cost$$

To calculate the SIRR the costs and benefits are measured against the counterfactual where the proposed project is not implemented. As with a financial IRR, the SIRR is expressed in monetary terms. Therefore, to calculate the SIRR, it is first necessary to put a monetary value on all the relevant costs and benefits. The social benefits included are:

- **Air quality damage costs** - The Green Book supplementary guidance[24] provides air quality damage costs from primary fuel use in pence per kilowatt hour. These are used to evaluate the impact of the change in air quality of a proposed heat network
- **Carbon abatement value** - The Green Book supplementary guidance provides guidance on the value to society in saving one tonne of carbon. Therefore, the net social impact on carbon emissions can then be given a monetary value using DESNZ carbon prices. This can be used to compare the carbon emissions associated with supplying heat through the counterfactual heating technology and the proposed heat network.

4.13.4 TEM results

This section of the report presents a 40-year techno-economic analysis for the three options modelled:

Table 4-17 Description of modelled option in the TEM

	Preferred way forward (PWF)	More ambitious preferred way forward (MAWF)	Do Minimum (DM)
Heat Network Description	Shared heat network at 80/50°C with compensated heating such that 60°C temperatures delivered in summer	Shared heat network at 80/50°C with compensated heating such that 60°C temperatures delivered in summer	Shared heat network at 80/50°C with compensated heating such that 60°C temperatures delivered in summer
Connections	Core council buildings + other core public buildings + new housing developments + St. Mary's heat network	Core council buildings + other core public buildings + new housing developments + extended council buildings + St. Mary's heat network + all FCHO housing stock in proximity of St Mary's heat network + mandated buildings	Core council buildings + other core public buildings + new housing developments + St. Mary's heat network
Primary lead technology	Biomass boiler (St Mary's). To be replaced in 2034 with ASHP.	Biomass boiler (St Mary's). To be replaced in 2034 with ASHP.	Biomass boiler (St Mary's). To be replaced in 2034 with ASHP.
Secondary heating technology	Minewater WSHP – Rhodes Bank – utilised as lead technology for summer (June – September) heating instead of biomass boiler	Minewater WSHP – Rhodes Bank. utilised as lead technology for summer (June – September) heating instead of biomass boiler.	ASHP – Rhodes Bank. utilised as lead technology for summer (June – September) heating instead of biomass boiler
Top up technology:	LTHW Gas Boilers (St Mary's).	LTHW gas boilers (St Mary's)	LTHW gas boilers (St Mary's)

[24] Department for Energy Security and Net Zero, Green Book supplementary guidance, https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal {Accessed 05/08/2023]

4.13.4.1 Methodology

The TEM analysis estimates the return on investment (including social values), Net Present Values (NPV), including social value (NPSV), and as per green book guidance the benefit cost ratio (BCR) over the lifetime of the project (40 years) using a number of inputs. This allows for the identification of the preferred shortlist options considering NPSV and BCR. The model calculates the energy consumption of the network, the capital expenditure (CAPEX), operational expenditure (OPEX), replacement expenditure (REPEX) and income from heat sales over the lifetime of the project. A sensitivity analysis was performed to test the scheme's sensitivity to a number of variables e.g. cost of heat, heat sales price and annual thermal load. The process is summarised in Figure 4—17.

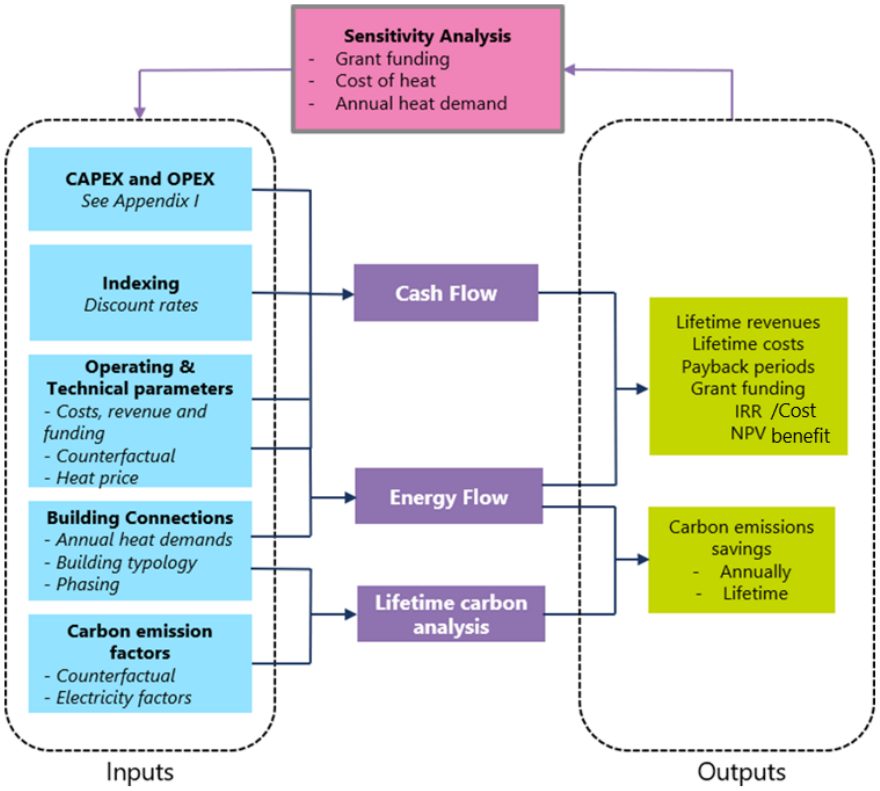

Figure 4—15 TEM methodology

The main financial outputs calculated are:

- **Net present value (NPV)** – the cumulative present value of net project cash flow over a period of time
- **Net present social value (NPSV)** – the cumulative present value of net project cash flow over a period of time *including social value costs from air quality damage and carbon abatement costs.*
- **Internal rate of return (IRR)** – the discount rate at which the project NPV is equal to zero at the end of the project lifetime
- **Social Internal rate of return (SIRR) -** the discount rate at which the project NPV is equal to zero at the end of the project lifetime *including social value costs from air quality damage and carbon abatement costs.*
- **Benefit cost ratio (BCR)** – The NPV of the projected benefits (discounted) divided by the capital cost (undiscounted). A BCR of >1 indicates that the project's estimated benefits outweigh its costs and will deliver a NPV >1, therefore a profitable scheme
- **Social Benefit cost ratio (SBCR)** – The NPSV of the projected benefits (discounted) divided by the capital cost (undiscounted). A SBCR of >1 indicates that the project's estimated benefits outweigh its costs and will deliver a NPSV >1, therefore a profitable scheme (*including social value costs from air quality damage and carbon abatement costs).*

4.13.4.2 TEM results

Figure 4—16 to Figure 4—18 show the cash flows for each scenario and Table 4-18 compares the key TEM results. All scenarios show that, without grant funding, the NPV at 40 years is below zero (benefit cost ratio < 1), which is mainly attributed to the high investment cost. The MAWF option also shows to not be profitable even with the maximum grant funding applied, due to high cost of connecting to all mandated buildings and minewater infrastructure.

The DM option is most economically viable, although it has a negative NPV without grant funding. With maximum grant funding from GHNF, an IRR of ~10% could be achieved. This is likely an attractive return for an external investor or ESCO. The improved performance of the DM option can be attributed to its lower capital cost for installing an ASHP. The efficiency difference is very small as per Figure 4—9. Please note the minewater COP is a worst case including extraction from deep seams, and the actual value will have an impact on relative performance.

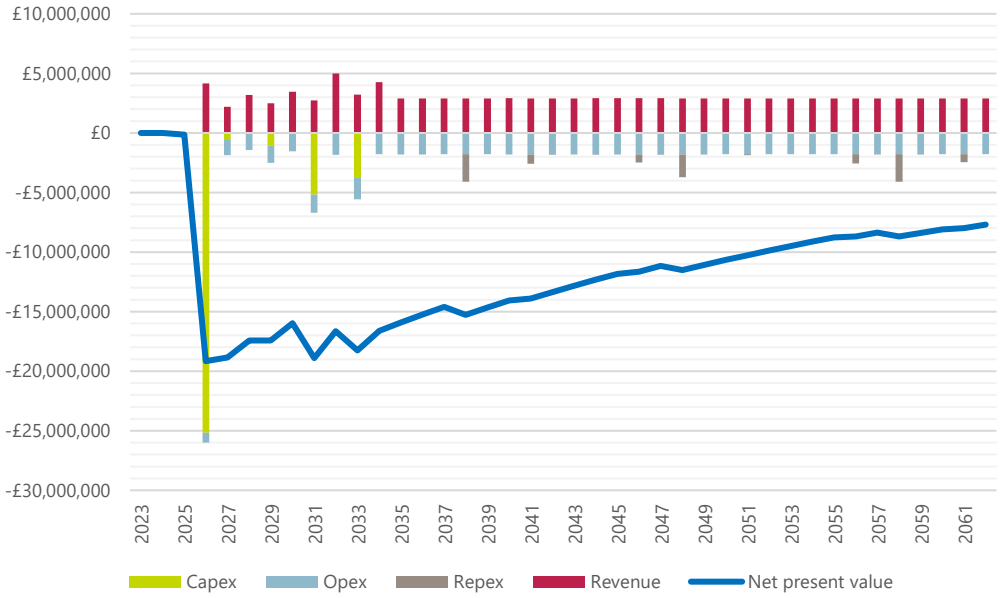

Figure 4—16 Discounted cash over 40-year project lifetime (without funding) - PWF

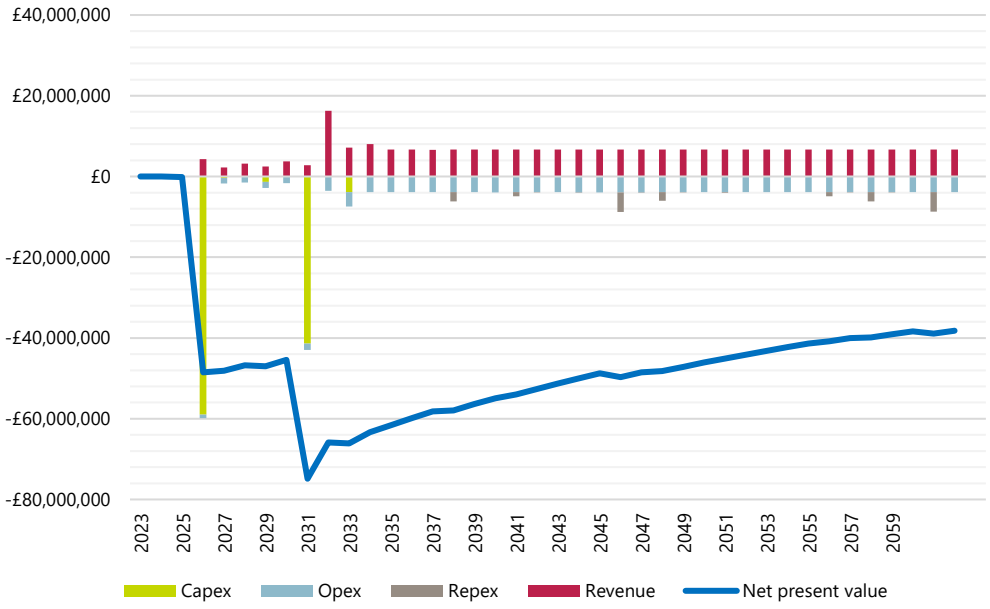

Figure 4—17 Discounted cash over 40-year project lifetime (without funding) - MAWF

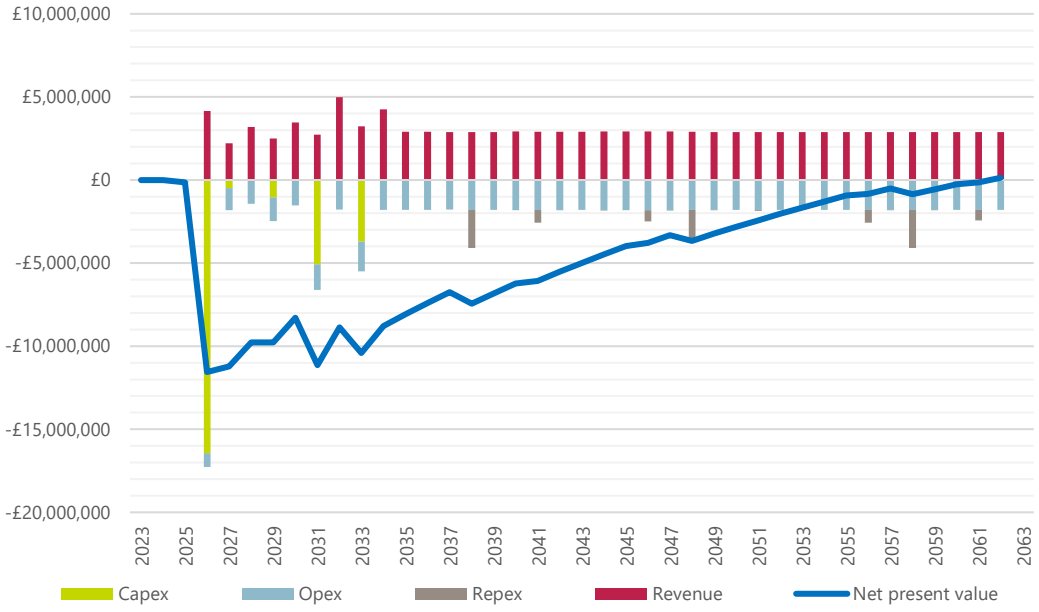

Figure 4—18 Discounted cash over 40-year project lifetime (without funding) - DM

The key results from the TEM are summarised below in Table 4-18. Values presented in brackets indicate a negative value. The DM option is preferred on an economic basis. This option best aligns with meeting CSFs for OMBC including low cost of heat, reliable deliverability of heat and meeting net zero policies. However, the main heat supply is not from minewater source heat pumps, which does not align with technology choice in OMBC's reliable heat to customer project objective.

Table 4-18 Key TEM results for the Optimised Network Scenarios

Metric		PWF	MAWF	DM
Capital Cost (discounted) (£M)		(33.9)	(98.3)	(22.8)
Lifetime Cost (discounted) (£M)	O&M	(6.15)	(9.11)	(6.18)
	REPEX	(5.08)	(9.29)	(5.08)
	Fuel cost	(21.86)	(44.46)	(21.85)
Connection charge revenue (discounted) (£M)		5.56	11.21	5.56
Lifetime revenue (discounted) (£M)	Heat sales	31.06	71.59	31.07
	Standing charges	20.34	33.44	20.34
RHI income (£M)**		2.17	2.31	2.17
NPV at 40 years (£M)		(7.97)	(39.52)	(1.10)
IRR at 40 years (%)		0.6%	No return	3.0%
Benefit cost ratio at 40 years		0.88	0.75	0.98
Social NPV at 40 years		(6.79)	(24.01)	0.09
Social IRR (%) at 40 years*		2.00	1.50	3.52
Social Benefit cost ratio at 40 years		0.93	0.86	1.04
Funding Available from GHNF (£M)*		**13.2**	**18.1**	**8.78**
NPV at 40 years with funding (£M)		**2.86**	**(21.44)**	**6.76**
IRR at 40 years with funding (%)		**6.0**	**0.10**	**9.99**

* Funding limited to 50% of Phase 1 CAPEX
** Higher RHI income due to more demand met by biomass boiler for connecting to more buildings

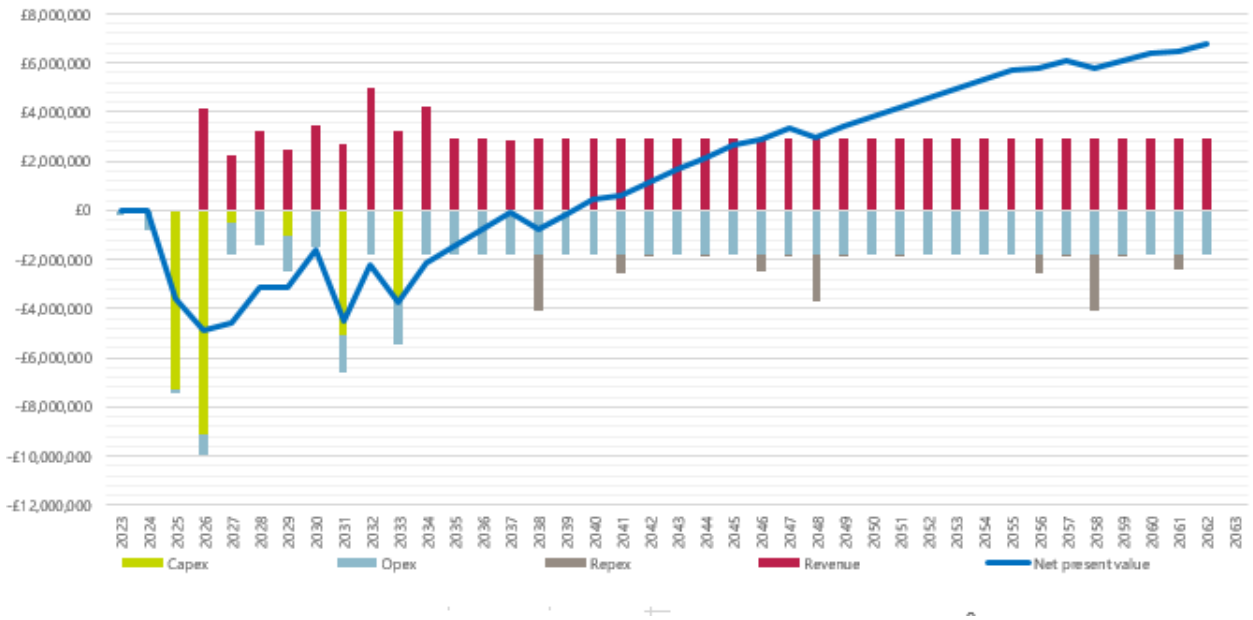

Figure 4—19 Discounted cash over 40-year project lifetime (with funding) - DM

4.13.5 Carbon Assessment

Figure 4—20 displays the anticipated carbon reduction potential over a 40-year project lifetime by comparing the low carbon networks with the BAU. The results show that all schemes are expected to achieve a considerable carbon reduction of ~80%. The MAWF showing the highest absolute carbon reduction due to more building connections. Both core network schemes (PWF and DM) show similar carbon reductions of more than 140,000 tCO2e over 40 years (~3,500 tCO2e/a).

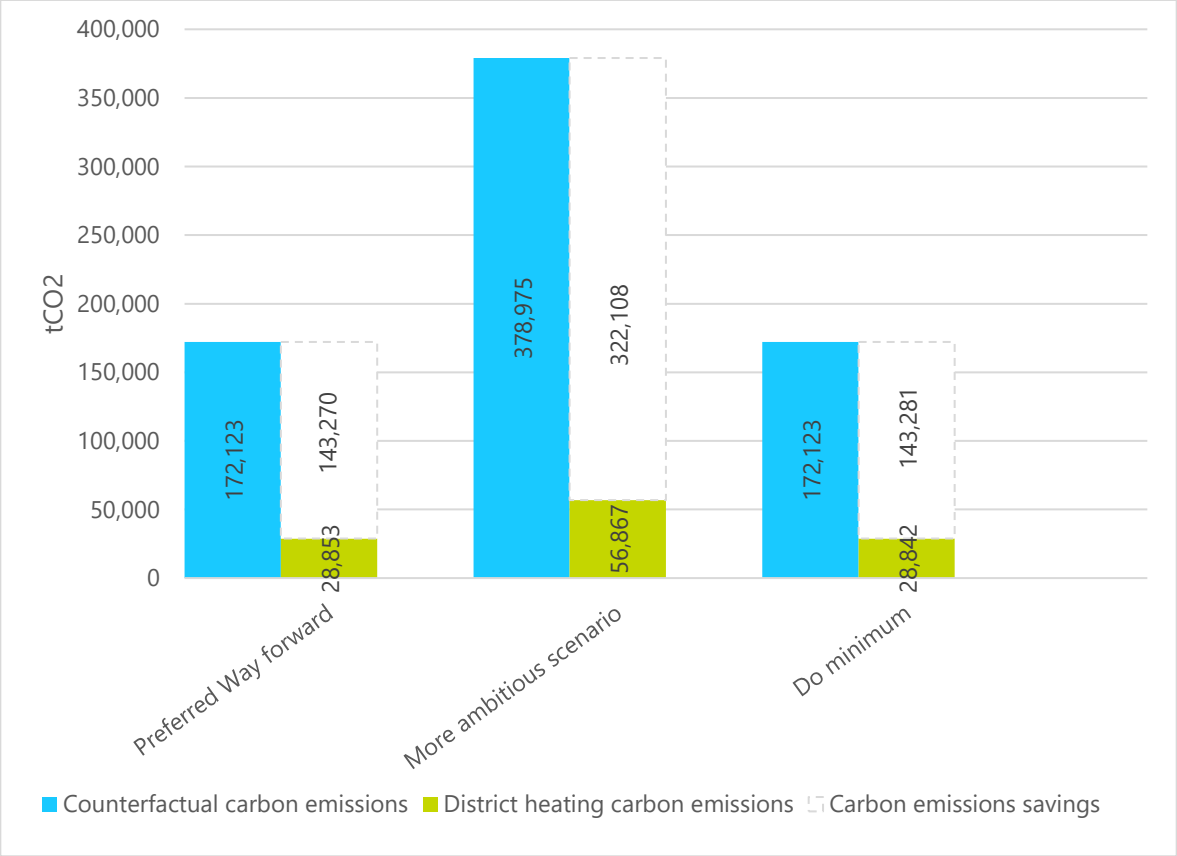

Figure 4—20 Comparison of carbon savings over 40 years for low carbon Heat Network versus BAU

One of the key gated metrics for the GHNF application involves ensuring the proposed scheme produced <100g$CO2_e$/kWh of heat delivered after the first 5 years of operation. Given capital funding is key for this scheme, the modelling tested both scenarios against the GHNF carbon metric across the 40-year period. The results are shown in Figure 4—21 with all scenarios meeting the GHNF carbon gate after the first 5 years of operation.

The initial surge in carbon emissions in the first year of operation is a result of utilising the gas boiler as a temporary substitute for the biomass boiler. This approach is employed until there is a sufficient network load to warrant activating the biomass boiler, after the first year, where the carbon emissions would decrease significantly.

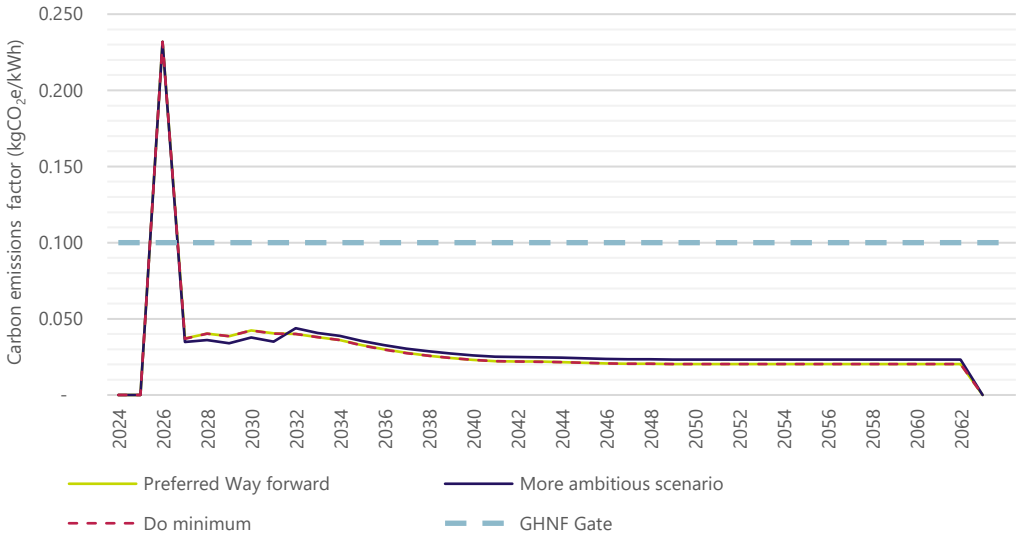

Figure 4—21 kgCO2$_e$/kWh heat delivered vs GHNF gate

4.13.6 Social IRR

Following methodology in Section 4.13.3.8, Table 4-19 outlines the social values attributed to the network scenarios. The social value has been determined using the GHNF as guidance for counterfactual comparison, carbon emissions factors, carbon pricing and air quality damage costs[25].

Table 4-19 Social values attributed to the Oldham project

		Monetary Value, £		
Social Value	**Unit**	**PWF**	**MAWF**	**DM**
Discounted project carbon abatement value over 40 years	£M	11.6	26.37	11.6
Discounted project air quality impact value over 40 years	£M	(8.3)	(-9.16)	(8.3)
Total discounted social value	£M	3.1	(-2.31)	11.1
Social IRR	%	2.0	1.5	3.52

It can be seen from Table 4-19 that the PWF/DM scenario have significant social value related to carbon abatement, despite the air quality damage cost attributed to biomass by DESNZ. The resulting discounted social value show to be positive for all options due to carbon abatement value outweighing air quality damage. The PWF and MAWF scenarios however, doesn't pass the GHNF due to poor performance of the economic cashflow. Nonetheless, the DM scenario is the only option that passes the GHNF metric of 3.5% social IRR.

Biomass air quality damage costs can be reduced through efficient long-run operation of the boilers and treatment of flue gases. It should be noted that the scheme is utilising a stranded asset and plans to replace the biomass boiler at the end of the technology lifetime with heat pump technology provides a much lower air quality damage cost.

[25] Department for Energy Security and net Zero, Green Heat Network Fund (GHNF), https://www.gov.uk/government/publications/green-heat-network-fund-ghnf [Accessed 05/08/23]

4.13.7 Sensitivity analysis

A sensitivity analysis was completed to assess the key parameters impacting economic performance of all scenarios. Figure 4—22 to Figure 4—24 shows the sensitivity on the 30-year NPV by varying key parameters by +/- 10%, and 30%.

Overall, the NPV is most sensitive to line items that have the most influence on the cashflow. Consequently, the following factors exert the most substantial influence across all scenarios:

- **Heat sales price:** This has the highest revenue potential, offering an avenue for enhancing operational profitability. However, the price is modelled to ensure equitable price of heat, especially in relation to concerns around fuel poverty. Nonetheless, the flexibility in setting heat sales prices for council-owned buildings may offer an opportunity to bolster the project's economic viability in all scenarios.
- **Fuel cost and heat pump efficiency**: As it significantly affects the operational expenses of the project, a reduction in fuel costs—achieved through measures like lowering the imported fuel price or optimising the efficiency of heat pumps to minimise fuel consumption—presents an opportunity for enhancing project viability. This holds particular relevance in the PWF, and to a lesser extent, the MAWF scenarios, where there exists some uncertainty surrounding the CoP of the minewater technology solution.
- **Capital expenditure:** Given the substantial infrastructure demands of this project, particularly in terms of pipework expenses, it's noteworthy that capital expenditure exerts the most significant influence on the project's cashflows. This effect is particularly pronounced in the context of the PWF/MAWF scenarios, where there is an additional minewater costs. The optimisation of these expenditures presents a valuable opportunity to support the project.

On the other hand, the annual heat demand and standing charges exerts a minimal influence on the overall NPV in all scenarios. As a result, augmenting the network load or expediting certain phases (e.g., connecting mandated buildings earlier) has negligible ramifications on the project's economic feasibility, particularly when matched with a proportional capital expenditure to connect such buildings, as seen in the MAWF scenario.

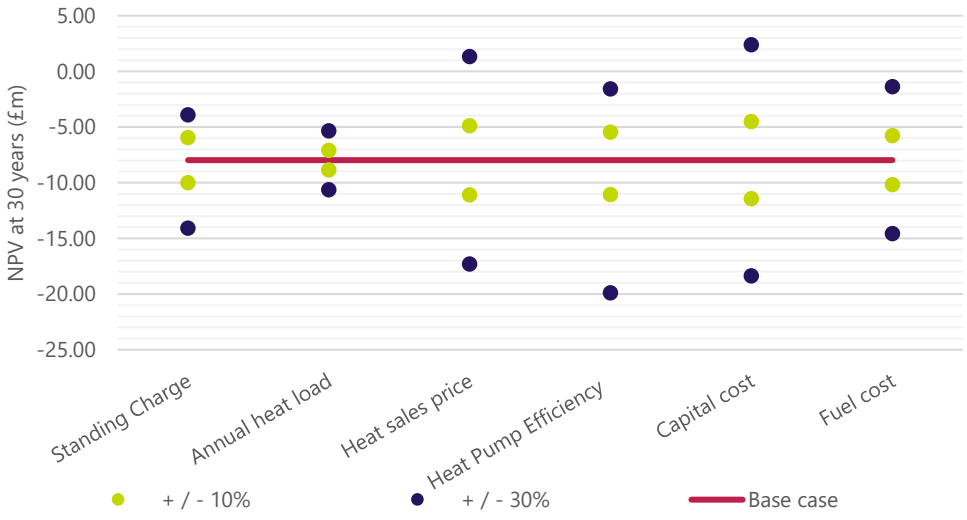

Figure 4—22 NPV sensitivity for the PWF scenario

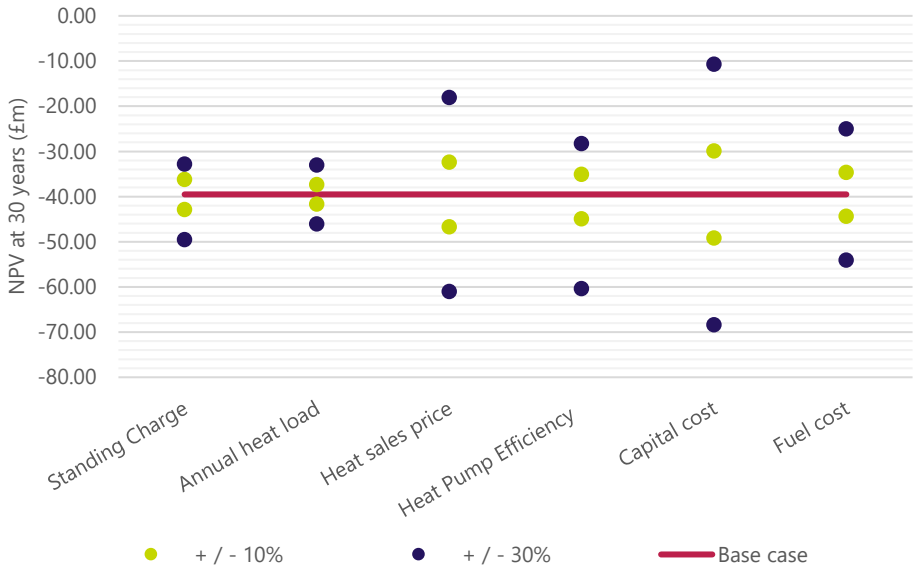

Figure 4—23 NPV sensitivity for MAWF scenario

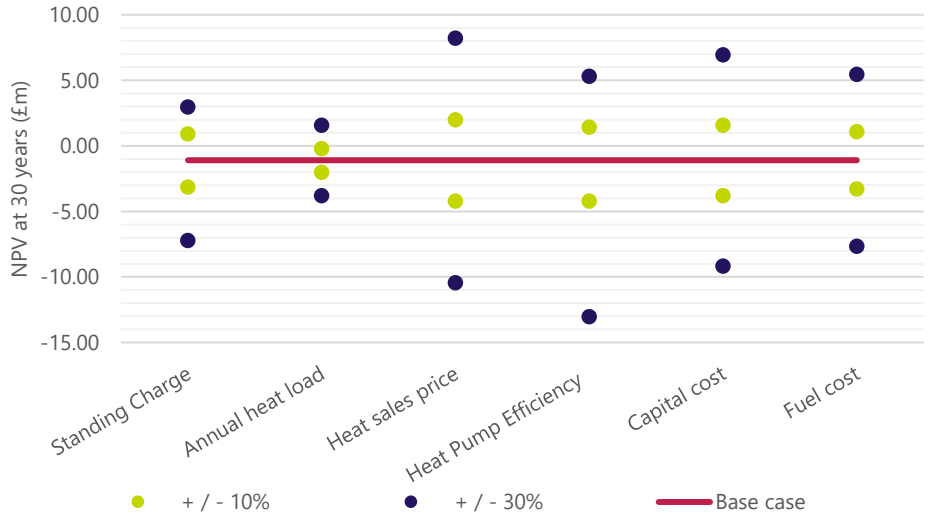

Figure 4—24 NPV sensitivity analysis for the DM scenario

5 Commercial Case

5.1 Purpose

This section examines the commercial case for the OLCHN. Specifically this case aims to:

- Develop a commercial strategy including
    - Legal structure
    - Governance
    - Stakeholder roles and responsibilities
- Define risk allocation between stakeholders
- Define contractual and insurance arrangements
- To develop a PCR compliant procurement strategy.

The Commercial Strategy was developed by Buro Happold (BH) in accordance with the OMBC's vision and strategy for the OLCHN as well as the Council's wider Oldham Green New Deal (OGND) strategy. The proposed delivery structure and procurement approach was agreed in principle through workshops with support from BH, OMBC, DESNZ, management consultants (ARUP) and QMPF LLP.

OMBC wish to procure a delivery partner to support in the delivery of their Oldham Green New Deal (OGND) strategy, forming a Joint Venture (JV) company. The delivery partner would support with the delivery various decarbonisation projects across the borough including the heat network project. The OLCHN is intended to be the "anchor project" of the OGND partnership.

The commercial case aims to ensure that the procurement process to appoint a strategic partner to assist OMBC in the delivery of their Oldham Green New Deal (OGND) strategy is well structured, adheres to the Public Procurement Regulations[26], and seeks a best solution for OMBC.

5.2 Commercial Strategy

5.2.1 Preferred Delivery Model

There are four key delivery models associated with delivery of a heat network as shown in Table 5-1.

[26] The Public Procurement (Amendments, Repels and Revocations) Regulations 2016, https://www.legislation.gov.uk/uksi/2016/275/contents/made [Accessed 28/09/2023]

Table 5-1 Delivery models for heat network delivery

Delivery Model	Description
Private Sector Led	'turn key' solution. Private sector entity responsible for all design, build, operate and maintain aspects of the network. Private sector company provides capital and owns assets.
Public-Private Shared Leadership	OMBC partners with private sector entity(s) and shares risk and returns. Roles are defined via governance structures and contribution to funding.
Public Sector led	OMBC responsible for the design, build, operate and maintain aspects of the network, including funding. OMBC owns assets.
Community Company (COCO)	A community body is involved in the project and supplies heat to the network offtakers. Roles are defined via governance structures.

The key drivers for the OMBC are:

- to ensure its residents on the network are provided reliable and affordable low carbon heat
- ensuring that the delivery aligns with the borough's wider OGND strategy
- finding a scheme that is commercially attractive for private sector investor to partner with OMBC to deliver the network.

OMBC wants to ensure their drivers are met but understands that it does not have the technical expertise or capital to deliver the OLCHN without the support from the private sector. Therefore, the Public-Private Shared Leadership delivery model is the preferred approach to deliver the network.

OMBC is in a unique position where the OLCHN can form the first and anchor project for a wider OGND Delivery Partnership. The long-term objective of the OGND is to appoint a strategic partner that could deliver the infrastructure components associated with the deal, which include but is not limited to the following:

- Delivery of the OLCHN
- EV Charging Infrastructure
- Commercial and domestic energy efficient retrofit solutions
- Renewable energy generation and storage

As the anchor project, the heat network delivery will set a precedent for the future infrastructure projects by showcasing the OMBC's wider energy transition vision. OMBC has a long-term interest in the OLCHN project but appreciates the technical and commercial complexities that are associated with its delivery. The Public-Private Shared Leadership model enables OMBC to share and minimise the risks associated with heat network delivery with a private sector partner. The partner will mitigate the risk by providing external expertise and market knowledge.

Therefore, recognising the OMBC's wider ambitions, this commercial case outlines an approach to appoint a delivery partner for the OGND, who in turn will support the delivery of the OLCHN, as well as the other future infrastructure projects.

The governance structure of the partnership would be decided during the negotiation stages of the procurement event for the appointment of the private sector partner. This stage is critical to the OMBC as it is where the partnership roles, responsibilities, and levels of control over the network are defined, and also defines the ownership structure of the company that is to be established to deliver the network (the appointed partner who forms the OGND Company with the OMBC is also expected to be able to deliver other infrastructure works as part of the wider OGND strategy as per above). This approach should be in best interest of the OMBC and would determine their controlling influence to deliver the network to the following project objectives:

1. **Net zero carbon –** *Meet OMBC's net zero policy requirements by 2025 for council buildings and 2030 for the metropolitan borough by implementing low-carbon technologies and onsite interventions. In areas where decarbonisation is challenging, consider the use of fossil fuel technology while exploring alternative solutions. Additionally, prioritising community decarbonisation efforts to ensure a comprehensive and sustainable reduction in carbon emissions across the borough.*

2. **Cost of heat to customers -** *Maintain a slight flexibility to increase the cost of heat to council/public buildings if needed, not exceeding a pre-defined amount agreed within the business case assessment. This flexibility will be assessed during financial modelling, where any necessary cost adjustments will be implemented to ensure that the network is financially viable, whilst ensuring that social housing costs remain at or below current pricing levels to limit any increase in fuel poverty.*

3. **Reliable heat to customers -** *Main heat supply >85% will be from low-carbon sources. If minewater is selected as the main source of heat additional low-carbon resilience e.g. air source heat pumps are required for resilience. Additional top-up electric/gas boilers can be included to ensure uninterrupted heat supply throughout the project lifetime (40 years).*

4. **Social value -** *Achieve a social IRR of at least 3.5% over the project's lifetime of 40 years and actively targeting specific council-defined social values (see above), while ensuring that associated risks to project viability are maintained at an acceptable level.*

5. **Future proofing -** *Prioritise low-carbon heating solutions for the heat network coupled with combination of retrofitting/energy efficiency measures over the schemes lifetime to reduce heating demand.*

6. **Economic / Financial –** *Procurement of an Oldham Green New Deal joint venture delivery partner prior to heat network construction (2025/2026) that would enable the delivery of the heat network, bringing skills and expertise, whilst allowing the council some elements of involvement and control. Aim of the heat network scheme is to not provide a revenue opportunity for the council. There is greater importance in maintaining a cost of heat for customers equivalent or lower versus a defined counterfactual and investigating ways to minimise consumer cost.*

The Public-Private Shared Leadership delivery model approach is commonly seen in the market, especially where LA'S need capital contribution from the private sector. The private sector entity will ensure that the DHN is managed efficiently to prevent the risk of failure. Through the Public-Private model the financial risk associated with the network will be passed on to the private sector partner, but the partner will benefit from the financial returns of the project.

5.2.2 Identification of Preferred Delivery Vehicle

The Public-Private Shared Leadership approach involves the OMBC and the private sector partner driving the project through a JV partnership. The partnership would involve the creation of a corporate vehicle, such a Special Purpose Vehicle (SPV) to serve as a Company that would be defined through the Shareholders Agreement, capturing the roles and responsibilities of each party, including the provision of capital contribution and voting rights.

5.2.3 Requirement for a Corporate Vehicle

OMBC wish to procure a delivery partner to support in the delivery of their OGND strategy. OMBC would partner with a private sector entity through a shareholder's agreements in a Public-Private Shared Leadership arrangement to form a Company.

This partnership would form a OGND JV Company, which would contract with OLCHN Delivery Partner to deliver the OLCHN. The JV Company could contract with the OLCHN Delivery Partner through one of the following contractual arrangements:

- Appointment of a Design, Build, Operate, Maintain (**DBOM**) contractor, including Metering and Billing
- Establishing a Special Purpose Vehicle (**SPV)** to deliver the network – the SPV could be another JV company or a single entity
- An ESCO **Concession**
- A **Third Party ESCO**

The current proposal for the OLCHN delivery structure is expected to be in the form of a JV SPV between OMBC and a OLCHN Delivery Partner.

The OLCHN Delivery Partner can be the same or a different entity to the OGND Delivery Partner. The arrangement between the OGND JV Company and the DHN Delivery Partner will be finalised during the procurement of the OGND Delivery Partner.

Under a JV SPV delivery structure for the DHN project, the OLCHN Delivery Partner would be expected to deliver the following activities:

- Provision of capital to finance the network
    - OMBC will provide capital to the network via the GHNF.
    - The OLCHN Delivery Partner will provide capital through their internal sources (e.g., debt, equity, etc.,)
- Purchase of power from energy suppliers
- Design, Build, Operate and Maintain heat network infrastructure
- Generation of low carbon heat for network customers
- Sale of heat to customers
- Provision of services, including metering and billing

- Future expansion and decarbonisation of the network

The above activities can be delivered by OMBC or the private sector entity in isolation, however the partnership arrangement ensures that the activities associated with the OLCHN delivery are acceptable and agreed by all party members.

Therefore, creating a corporate vehicle in the form of a JV Company is necessary to ensure a successful delivery of the network whereby the project objectives are met, and the OLCHN reflects the OMBC's wider vision for energy transition.

There are several advantages to establishing a corporate delivery vehicle which should be considered, for example:

- Ring Fencing Risk: Creation of a corporate vehicle enables OMBC to remove itself directly from the project but be involved indirectly through the vehicle (as a partner in the Company). This would protect the OMBC's balance sheet if a claim were to be made against the Company as the claim would be held to the vehicle, which become insolvent with no recourse to OMBC. However, dependant on the finalised shareholders agreement, any financial or operational risk would sit with the private sector company.

- Transactions and Exit Strategy: The separate vehicle enables equity to be invested or divested directly into or out of the OLCHN via the partnership from either member of the partnership. It also enables the exit strategy for OMBC, as shares in the vehicle can be sold to a third party, or vice versa should OMBC want to own the assets.

- Network Expansion: As a partner in the Company, OMBC will retain a level of control over future expansions plans of the network. This will enable OMBC to deliver the network in line with their long-term decarbonisation objectives and OGND. It will also enable OMBC, as a potential zoning co-ordinator, to ensure that the network expands into areas identified by the AZP.

Given that OMBC wants continued involvement in the project but requires external capital contribution, delivery, and operational knowledge, establishing a sperate corporate vehicle is necessary for the network's delivery.

5.2.4 Choice of Delivery Vehicle

It was confirmed that OMBC has the power to establish a corporate vehicle for OLCHN delivery upon review of the Localism Act 2011, which states that under a Local Authority's (LA's) general power of competence[27], a LA has the ability to act in a way that individuals generally may do. This legislation allows OMBC to form a corporate vehicle to own and operate the network. It is important to note that, under the Localism Act, a LA must form a company for purposes where it is acting for commercial reasons.

Although the appointed partner would serve as the commercial entity within the partnership, establishing a company would enable OMBC to act commercially should they wish to do so in the future. Formation of a Company also allows for an exit strategy as previously discussed.

It is important to note that establishing a Company would require it to be registered on Companies House and is a legal undertaking for which would be completed during the commercialisation phase.

There are various types of legal forms that OMBC and the OGND Partner could adopt to deliver the heat network, as shown in Table 5-2.

[27] Localism Act 2011
https://www.legislation.gov.uk/ukpga/2011/20/section/1/enacted, [07/09/2023]

Table 5-2 Legal forms for heat network delivery

Legal Form	Description
Limited Liability Partnership	In this scenario, the company is a partnership in which the members have a limited liability. Therefore, the members are only liable for debts incurred by the entity with respect to their original investment in the partnership.
Company Limited by Guarantee	In this scenario the members act as guarantors. The company does not usually have share capital or shareholders. This is a common approach adopted by the public sector as the company limited by guarantee suits an entity that is not designed to generate wealth for the members but enables the company to manage specific activity. Therefore, profits generated from entity are not easily extracted and usually reinvested into the entities objectives.
Company Limited by Shares	In this scenario, the company members are shareholders and have limited liability according to their shareholding. The company can trade as a legally entity and allows the members to raise capital and invest/ divest in the Company. This approach allows for a simple entry or exit strategy by the purchase or sale of shares in the company. A Company Limited by Shares is the most common approach for heat network delivery.
Community Interest Company	In this scenario the company is formed primarily for social reasons. Profits generated from the company is typically reinvested into the social purposes as opposed to generating profit for the company members.

5.2.5 Recommendation for Delivery Vehicle

It is recommended that a Company Limited by Shares legal form is adopted as it allows for flexibility and for the Company members to divest/ invest in the OLCHN if required. This legal form is the most appropriate.

5.2.6 Stakeholder Roles and Responsibilities

This section of the Commercial Case examines the Public-Private Shared Leadership deliver model and identifies the roles and responsibilities of the OMBC, the OGND Partner and the OLCHN Delivery Partner, including the following:

- OGND Partner: The appointed private sector partner who would form the OGND JV Company with OMBC.
- OGND JV Company: The Company that establishes a JV SPV to deliver the network.
- DHN Delivery Partner: The appointed private sector partner who would form the OLCHN JV Company with OMBC.
- OLCHN JV Company: The Joint Venture Company formed by OMBC and appointed OLCHN Delivery Partner.

The relationship between FCHO and the Company is proposed to be in the form of an asset transfer agreement, which best represents the nature of relationship with the asset transfer and discount on heat sales price. This would be agreed during commercialisation.

The flow of monies and roles and responsibilities for each of the stakeholders is shown in the in the operational structure in Figure 5—1 and further described in Table 5-3.

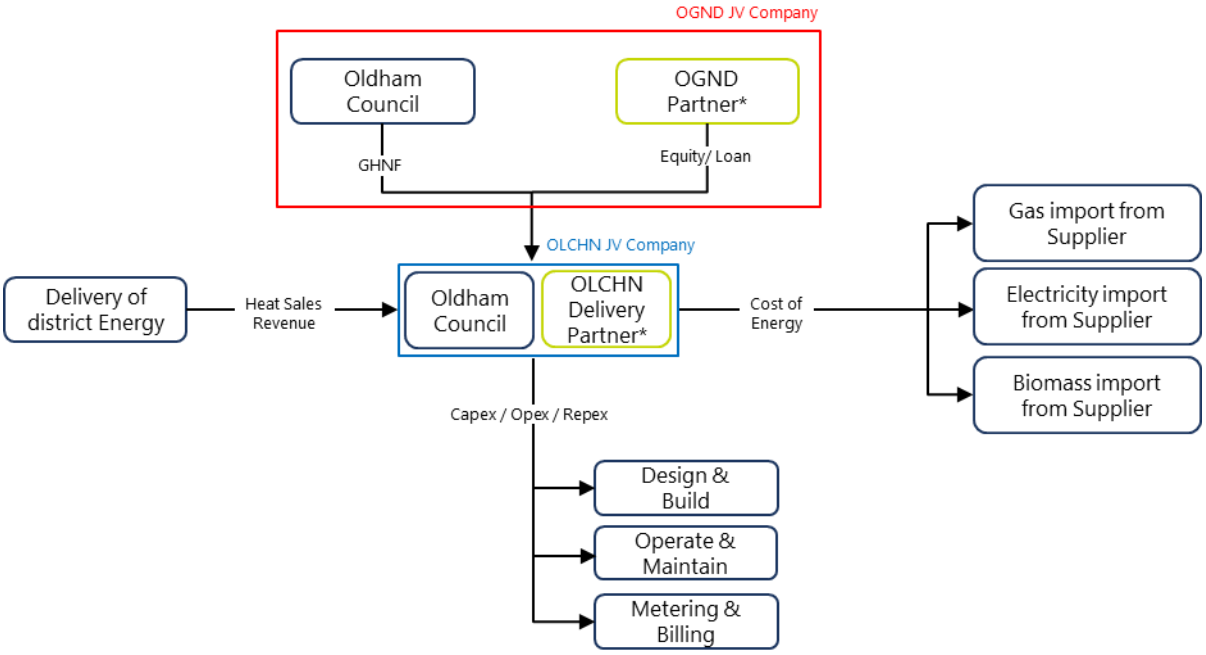

Figure 5—1 Proposed delivery and operational structure including stakeholder responsibilities[28]

[28] *The OGND Partner and the OLCHN Delivery Partner can be a single entity.

Table 5-3 Stakeholder roles and responsibility descriptions

Role	Responsibility	Description
Promotion	OMBC	As OMBC is the leading entity of this OBC, it is likely that OMBC would assume the promotion role and deliver the following: • Management of the procurement process to appoint a OGND Partner. • Stakeholder coordination, including engaging with key customers, for example FCHO. • Coordinating with other public sector parties, for example DESNZ and the GMCA.. • Engagement with potential customers to join the network.
Customers	OLCHN Customers	As detailed in the Economic Case, during the OBC several options were considered with regards to the networks build out, with varying types of customer connections. In the 'DM' option, the heat network would include the following customers: • Core Council buildings • Other core public buildings • New town centre developments • St Mary's heat network The aforementioned customers form the base case for the heat network, where each customer is expected to have a heat supply agreement to secure revenue for the Company. The network can be expanded; however, the base case customers form the minimal viable case.
Governance	OGND Partner OLCHN Delivery Partner OMBC	The Initial governance structure of the Company will be driven by OMBC but would ultimately have to be agreed with the OGND Partner through negotiation. The Company will be governed by a board of directors as determined in the Shareholders Agreement, along with the ownership split between partners. Each of the partners would have a specific delegation dependant on their input into the Company, including: • OMBC will be able to exercise control through its appointed directors in the Company. • The OLCHN Delivery Partner (as appointed by the OGND JV Company) would undertake all aspects of the heat networks operation, including the adopting of the FCHO network and the design, build, operation and maintenance of the new network through the JV SPV. • Once a OLCHN Delivery Partner has been selected and terms agreed, the legal documents required to implement these governance arrangements produced.

Regulation	OLCHN Delivery Partner DHN Customers	At the time of writing, the regulation of heat is due to be implemented by the upcoming Energy Bill which is currently going through parliament. This would place district heat networks under Ofgem regulation and place similar obligations for the supply of heat as currently in place for other utilities providers. Regulation would cover all aspects of heat networks, including pricing (for domestic and commercial) and give heat network operators similar powers as enjoyed by other utilities providers. Ofgem has step in rights from 2025 where it believes prices are 'disproportionate' and/or poor service/reliability. Redress will be via fines and/or compensation. As part of the GHNF application the heat network is also required to register with the Heat Trust.
Funding	OGND / OLCHN Delivery Partner OMBC	OMBC was awarded grant funding via the HNDU to support the feasibility study for this OBC. It is currently understood funding for the heat network will be provided by OMBC via the GHNF ((subject to successful application). The remaining funds would be provided by the OGND or OLCHD Delivery Partner's own internal source of finance (debt or equity)). Grant funding for the heat network delivery, including commercialisation, construction and minewater borehole testing is being applied for by the OMBC via the GHNF.
Asset Ownership	OMBC DHN Delivery Partner	There are a number of possibilities for asset ownership, which needs to be agreed between OMBC and the OLCHN Delivery Partner. However, the following has been assumed to be in the best interest of the OMBC: • Ownership of the existing St Mary's network to be assumed by the OLCHN JV Company. • Ownership of subsequent heat network assets to be assumed by the Company. It is currently assumed that the heat network will be delivered through a JV SPV. Therefore, asset ownership would sit at the OLCHN JV Company level.
Development of Property	OMBC Third parties	This initiative is part of OMBCs wider decarbonisation strategy, the OGND. New developments or refurbishment of existing properties would be expected to connect to the heat network or mandated under HNZ.
Land Ownership	OMBC Private landowners	Expanding the heat network beyond the FCHO assets is likely to require additional land rights for energy centre(s). For the below ground assets (pipes), wayleaves/ easements, or other forms of agreements will be required when crossing third party lands. Generally, it is better to lay the below ground assets in the public highway rather than crossing third party lands. Access to the public highway would be via Section 50 applications under NRSWA though if the Energy Bill has been implemented this will be simpler and easier.
Installation	OLCHN Delivery Partner	The OGND JV Company would appoint a specialist, assumed to be the OLCHN Delivery Partner to would deliver all aspects of the instillation works.

Heat network Design, construction and ongoing operation	OLCHN Delivery Partner Energy supplier	The adoption of the FCHO network is to be adopted by the OLCHN JV Company. The OLCHN Delivery Partner will operate and maintain the heat network and also undertake all metering and billing activities, including the purchase of energy. For the expansion of the networks, the OLCHN Delivery Partner would design, build, operate and maintain the new heat network and also undertake all metering and billing services, including the purchase of energy in the form of a supply contract with an energy supplier.
Supplier of Last Resort		Under current regulation, which may change in the future, there is no Supplier of Last Resort as with other utilities. Therefore, if the OLCHN Delivery Partner ceases to trade, it would fall to the OGND JV Company to make arrangements for alternative solution to enable the customers to be supplied. The exact details should be incorporated into the contract between OMBC and the OGND Partner at the commercialisation stage.

5.3 Managing Contracts

The OLCHN JV Company formed by OMBC and the OLCHN Delivery Partner is responsible for delivering the networks design, build, operate, maintain, metering and billing contract (this can be in the form of a single or multiple contracts)Table 5-3. It is assumed that the OLCHN Delivery Partner will manage the contract.

The OLCHN is to be delivered and expanded over multiple phases over several years. The OLCHN Delivery Partner would manage the design and build of each phase and undertake the necessary checks to ensure successful delivery, such as site inspections and testing of equipment.

The construction element of the contract builds upon the work produced by the technical team appointed by the OMBC during the OBC stages of the project. The contract includes a set of Employers Requirements and would specify the performance and standards that need to be met by the network, as well as outlining the measures that will be put in place to ensure these are met. An information pack will be shared with the potential partners during the procurement event which would include the network layout and survey work that is required to be undertaken for the pipe installation and connection to the customer buildings. The connection to the buildings would require building services engineering with standard specifications for which there are existing standard forms of contracts.

Any ground surveys, topographic survey, ground penetrating radar surveys and customer liaison is the responsibility of the OLCHN Delivery Partner to carry out. This also includes design work that is required by the energy centre to enable any outline planning permissions to be applied for.

The procurement event to appoint a OLCHN Delivery Partner involved a Soft Market Testing (SMT), including a Questionnaire (see attached *SMT Summary Note*) that aimed to produce a long list of ESCOs / partners that can be engaged during the full procurement event. The questionnaire also detailed the OMBC's wider vision, where the bidding ESCO may also be required to become the strategic OGND partner (this structure would be further assessed during commercialisation).

The SMT exercise was critical to produce a list of interested ESCOs and the questions helped understand various company's skills and capability to deliver the network. A competitive dialogue process would be undertaken which would allow for the ESCOs to submit their initial tender and allow the OMBC and client team to provide feedback through the dialogue phase. During the dialogue phase OMBC may change their requirements and/ or terms and conditions of the contract presented by the ESCOs, which would lead to a revised short list of tenders. This shortlist of ESCOs will be invited to submit a final submission which will then be assessed by the evaluation panel (to consist of OMBC and appointed advisors), and the submissions would be scored against a pre-agreed set of criteria. The ESCO that scores the highest in the evaluation assessment will be awarded the contract and become the OLCHN Delivery Partner (and therefore OGND Partner) in the OLCHN JV Company (and therefore OGND Company). An Indicative timeline of the procurement event is detailed in Section 5.6 and Table 5-9.

The appointed OLCHN Delivery Partner, who will be responsible for the roles of Principal Designer and Principal Contractor under the Construction Design and Management Regulations (CDM).

5.3.1 Customer Services

In addition to the construction and design elements, the OLCHN Delivery Partner will be responsible for collating data such as customer demand and network generation, ensuring the network is operating to the correct efficiency and produces the agreed levels of carbon savings. The OLCHN Delivery Partner is also responsible for providing customer services, including the metering and billing of customer heat sales and responding to customer queries.

Successful metering and billing is paramount to ensure a successful revenue generation of the OLCHN, but also critical to ensure customer relationships are well maintained. The utilities industry has a poor reputation with regards to the metering and billing services, therefore it is important that the Company sets Key Performance Indicators (KPIs) that would be regularly monitored for effective metering and billing, but also to ensure that any customer queries are responded to in a timely manner. These KPIs should be in line with the current Guaranteed Standards of Performance (GSOP) as applied by Ofgem to the energy market as its Ofgem's intention to implement these with the assumption of heat regulation. The KPIs will need to cover meter reading frequency, meter reading accuracy, dispute handling and timing of appoints amongst others.

The OLCHN Delivery Partner would also be responsible for the customer connection and supply contracts (with input from the council as member in the OLCHN JV Company) and any lease agreements that may be included in the connection agreement. A regular (e.g. annual) price adjustment would need to be undertaken to the networks customers supply agreements to allow the network to adjust to any price fluctuations as a result of changes in the energy market. Regular consultations should be held with the customers to allow for an opportunity for the Company to react to any concerns or queries. The customers may also wish to novate their contracts to another party or terminate the agreement.

The operational contractual relationships between the various network stakeholders is illustrated in Figure 5—2 and further described in Table 5-4.

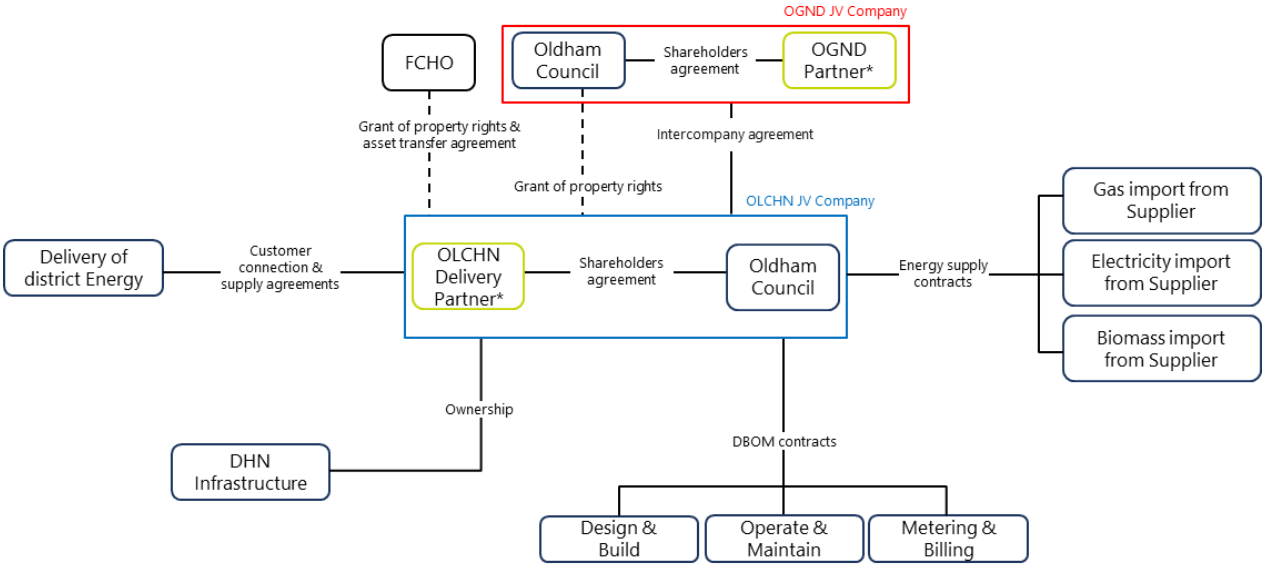

Figure 5—2 Proposed delivery and operational structure including contractual relationships between stakeholders[29]

A SMT exercise was undertaken by BH with support from the OMBC. A market engagement piece was shared on the OMBC procurement portal, 'The Chest', outlining the OLCHN project, including the preferred JV delivery structure.

Several responses were received, and most confirmed the JV structure was as suitable approach to deliver the network. However, some returns stated that other forms of delivery structure may be more suitable, but this is likely to reflect their own business practices or specialisms as opposed to with regards to the network itself. The other form suggested were:

- Third Party ESCO

[29] *The OGND Partner and the OLCHN Delivery Partner can be a single entity.

- ESCO Concession
- DBOM

Further market engagement would be held during the commercialisation stage to ensure that the correct delivery structure is selected.

Table 5-4 Contractual agreements summary

Contract	Contracted Parties	Summary
Shareholders Agreement	1. OMBC 2. OGND Partner 3. OLCHN Delivery Partner	The Agreement among the JV shareholders outlining how the company should be operated as well as rights and obligations for each member. The Shareholder's Agreement is to ensure that the shareholders rights are protected, and they are treated fairly in the partnership. Voting rights and stake in the partnership are agreed in the Agreement as well as each shareholder stake in the partnership. The Voting and shares are usually dependant on the asset of equity provided by the respective parties, however It is possible for a 'golden share' to be agreed in the Agreement. The Agreement also defines the Board, including the split between the Directors and Non-executive Directors and their powers.
Articles of Association	1. OMBC	The Articles of Association are a set of documents that define the purpose of the OGND Company and the constitutional rules when governing the business. Which is expected to: • Define how share and dividends will be issued and what voting rights each of the shareholders will have. • Outline the process for director appointment or removal. • Outline the structure of the Company and responsibilities of the business.
JV SPV	1. OMBC 2. OGND Partner 3. OLCHN Delivery Partner **1.**	The heat network infrastructure is to be delivered by the OLCHN Delivery Partner. In this case, it is expected that the OLCHN Delivery Partner would deliver the works associated with the heat network through a JV SPV. This JV SPV would be responsible for establishing the following: • Employers requirements and technical specifications produced by the Company confirmed the standards that the networks design and build should adhere to. • A delivery programme including a completion date. • Service Level Agreements that align with good industry practices. • Key Performance Indicators ensure the OLCHN Delivery Partner responds to customer failures, faults and customer complaints. • Metering and billing services

		• Inclusion of price certainty in the customer heat supply agreements.
Financing	1. OMBC 2. OGND Partner **2.**	It is currently understood that a portion of the heat networks capital cost will be supported from the OMBC via the GHNF. The remaining cost are to be provided by the appointed OGND Partner.
Energy Centre Lease	1. OMBC 2. OLCHN Delivery Partner	OMBC would be required to provide a long-term lease agreement to the OLCHN Delivery Partner for the site that the energy centre is be based. The lease would provide the OLCHN Delivery Partner with unlimited access so that the OLCHN Delivery Partner to not hinder the running of the energy centre. The lease fee between OMBC and the OLCHN Delivery Partner would depend on the arrangement between the two parties in the Shareholders Agreement. The existing energy centre asset transfer agreement will seek to transfer ownership of the St Marys site.
Pipe Lease, easements wayleaves	1. OMBC 2. FCHO 3. Third parties 4. OLCHN Delivery Partner	The OLCHN Delivery Partner would require the legal right to build the network pipes as well as to maintain them over the network lifetime. The network is predominantly based on FCHO land with the expansion phases to take part OMBC owned land. Therefore, the OLCHN Delivery Partner would require pipe lease, easement and/ or wayleaves where possible from the OMBC, FCHO, or third parties. OMBC will need to grant permission to the OLCHN Delivery Partner for when the network is developed within the public highway.

5.4 Risk allocation

5.4.1 Overview of Risk Allocation

This section of the OBC expands on the risks that were highlighted in the Strategic Case and Economic Case. The key risks were developed from discussions with OMBC and existing market knowledge of heat network delivery.

Table 5-5 details the key risks and parties responsible. Table 5-7 shows how the key risks can be mitigated through contract management.

Table 5-5 Key risk description

Key Risk	Key Risk Allocation	Description
Energy price risk	OLCHN Delivery Partner	Although the energy markets have seen unprecedented volatility in recent times, the UK power market has started to stabilise but are still subject to the wider geopolitical events such as the Russia-Ukraine war. For this reason, the import and sale price of energy for the network could impact the commercial success of the network. There is an energy price risk if the customer supply agreements do not back off against the movements in the energy market. This risk should be under the responsibility of the OLCHN Delivery Partner, however, given OMBCs priority objective (to ensure a cost of heat to the customers) it is crucial to ensure the network customers are protected from energy price spikes. The risk of energy price fluctuation can be mitigated through long term supply contracts for the import/ sale of energy and that the sale price in the customer supply agreements is indexed to the import price.
Heat sales volume risk	OLCHN Delivery Partner	Demands that do not meet what was originally forecasted pose a volume risk to the OLCHN Delivery Partner as it is directly impacts the revenue generation of the network. However, the risk to OMBC could be mitigated by ensuring that the OLCHN Delivery Partner is responsible for volume risk. OMBC must also ensure that the OLCHN Delivery Partner is unable to recover the decreased revenue by increasing the energy tariffs.
Technology risk	OLCHN Delivery Partner	The technology risk is held by the OLCHN Delivery Partner and associated with the low carbon technology within the energy centre. It is therefore the responsibility of the OLCHN Delivery Partner to ensure the energy centre technologies evolve with the wider low carbon strategy of the network and OMBC.
Planning risk	OLCHN Delivery Partner	The key planning risk for heat network delivery is the risk associated with obtaining planning permissions for the energy centre. However, this is low risk because the OLCHN builds upon the existing St Mary's network. As the network builder, planning risk sits with the OLCHN Delivery Partner. In the case where planning permission is required, the Company should ensure that early engagement with the planning authority is commenced to avoid delays.
Regulation risk	OMBC/ OLCHN Delivery Partner	As the network is to be designed and constructed by the OLCHN Delivery Partner, the regulatory risk is held by the OLCHN Delivery Partner. It is therefore the responsibility of the

		OLCHN Delivery Partner to ensure that the network complies with local national regulatory policies.
Operational risk for existing St Mary's network	OLCHN Delivery Partner	The existing St Mary's Heat Network is to be adopted by the OLCHN Delivery Partner. Therefore, the operational risk should be passed to the OLCHN Delivery Partner.
Design, Build, Operate, Maintain	OLCHN Delivery Partner	The design, build, operate and maintain risks associated with the network would be held by the OLCHN Delivery Partner. OMBC can ensure any risk associated with the design and build are mitigated by ensuring that the D undergoes quality and assurance controls during the design and construction phases of the network's development. Further risks associated with the operating and maintaining the network can be mitigated through Key Performance Indicators within the OLCHN Delivery Partner contract.
Environmental risk	OLCHN Delivery Partner	The environmental risk is shared between the Companies partners. However, the OLCHN Delivery Partner is responsible for assessing the environmental impacts of the network's construction and during its operations.
Health and safety risk	OLCHN Delivery Partner	As the OLCHN Delivery Partner is undertaking all design, build, operate and maintain aspects of the network, it is responsible for the risk associated with the network's health and safety during construction and operation.
Reputational risk	OMBC/ OGND Partner/ OLCHN Delivery Partner	Reputational is ultimately held by the OLCHN Delivery Partner and Council as members of the Company. As OMBC is driving the projects delivery and promoting the network as part of the OGND, its reputation could be damaged by poor performance or unfair energy pricing methodologies. Therefore, OMBC should ensure that risks associated with reputation are monitored and managed through the project's lifetime.

5.4.2 Managing Operational Risk

Operational risk can be managed through the inclusion of KPIs within the design, build, operate, maintain, metering and billing contract. This would require the OLCHN Delivery Partner to deliver the operations of the network to the OMBC's standards and ensure that the OLCHN Delivery Partner reaches its obligations and back off customer liability. The below bullets and Table 5-6 outline the KPIs that could be included in the customer Connection and Supply Agreements. However, the exact measures are negotiated with both the customers and the OLCHN Delivery Partner before the agreements are signed.

- Frequency and duration of interruptions
- To heat supply setting a limit in terms of the number of durations per annum and the max period for an interruption
- In addition the KPIs would state alternative means of heat supply in the event the interruption period is exceeded and compensation paid as a monetary value
- Call out response times in the event of a fault/interruption to supply
- Complaints handling would also detail how complaints are responded to and in what timescale and again compensation if missed

- Appointments would also be defined as a period within which appointments would be offered and again compensation if the appointment is missed.
- Operational KPI covering water quality – penalty points if not achieved
- Operational KPI covering energy efficiency of the network – penalty points if not achieved

It is recommended that the following the KPI schedule includes the following but is not limited those detailed in

Table 5-6 Key performance indicators

Key Performance Indicator	Rationale	Penalty to network delivery partner
Heat availability for customers, including losses and planned interruptions	Provision of reliable heat	Financial penalty for loss of heat supply as agreed in design, build, operate, maintain, metering and billing contract.
Response to call outs	Provisions of customer services in a timely manner and investigation/ resolution of problems	KPI failure points for when heat network contractor fails to respond accordingly.
Customer satisfaction	Appreciation of customers views on the heat network service	Heat network contractor to undertaken customer surveys to manage satisfaction.
Water treatment and water quality	Control over water treatment and water quality to protect the networks operations and lifetime.	KPI failure points if water quality is not maintained to agreed standard.
Metering and billing	Energy bills invoiced correctly and in a timely manner to ensure customer satisfaction is well maintained.	Financial penalty if energy bills are not invoiced as agreed to standards in the design, build, operate, maintain, metering and billing contract.
Health and safety	Ensure that the heat network is operating safely.	KPI failure points if agreed health and safety failure points are not met.

5.4.3 Analysis of risk mitigation through contract management

Table 5-7 Risk mitigation

Risk	Allocation	Mitigation through contract management
Adoption risk	OLCHN Delivery Partner	This risk associated with adoption of the St Mary's Heat Network will be managed through the procurement process. Surveys of the St Mary's Heat Network will be undertaken to ensure that any risks are raised so that the OLCHN Delivery Partner is aware and can make provision with their submissions during the procurement exercise.
Design and Build risk	OLCHN Delivery Partner	The cost to design and build the network could increase to what was quoted for in the original tender. Inflation rates have increased dramatically over the past 12 month causing the cost of services and materials to also increase. The price of the original tender could also change due to OMBC altering their requirements for the heat network. During the tender stage the contract with the OLCHN Delivery Partner would be a fixed priced contract to deliver the networks infrastructure to the technical specifications as agreed with the OGND JV Company. As the design and build contractor, all risk associated with the design and build of the contract should be transferred to the OLCHN Delivery Partner There is a risk of additional costs to be incurred by the OGND JV Company due to any variations to the contract, such as in the event where the OLCHN Delivery Partner encounters unexpected ground conditions during the excavation and reinstatement of the network's pipes. This risk should be managed be managed by undertaking ground surveys.
Operating risk	OLCHN Delivery Partner	There are several risks associated with operating the network: <u>Failure to supply heat:</u> This risk will be passed on to the OLCHN Delivery Partner who is operating the network. The Company should manage the operational risk by ensuring the contract contains robust standards and KPI's that the OLCHN Delivery Partner should be responsible to pay guaranteed service payments. OMBC and OGND Partner should also ensure that the OLCHN Delivery Partner has a security package in place in the event of failure by the OLCHN Delivery Partner . In addition, in the event where there is failure of supply, the OLCHN Delivery Partner should provide temporary generators to supply heat during the outage. This also needs to be reflected in the customer agreement. <u>Leaks from the heat network:</u>

		Leaks from the network could lead to the failure of supply of heat and cause the increased cost for water and water treatment, as well as potentially causing long term damage to the assets if not fixed. This risk is passed to the OLCHN Delivery Partner that operates and maintains the network; however, measures should be in place to protect the network: • Surveillance systems to be used by the OLCHN Delivery Partner to monitor the network for leaks and then be responsible for repairing and incurring any costs incurred. • The OLCHN Delivery Partner to undertake surveillance tests as part of the networks design phases and instillation. This will include a leak and commissioning tests of the surveillance system. <u>Energy centre efficiencies</u> Through the ASHP (and back up boilers) the energy centre will convert the imported power to heat. In the event where the technology is not meeting the expected performance, an increased cost would be incurred owing to the increased demand in imported power. As the heat sale price is agreed in the customer agreements, the increased cost due to increased volume should be incurred by the OLCHN Delivery Partner. The DHN Delivery Partner is responsible for networks design and build, it should ensure that the acceptance tests are undertaken during the design and build phases to ensure that the energy centre is meeting the correct outputs and efficiencies as agreed in the design, build, operate, maintain, metering and billing contract. <u>Cost of fuel:</u> The cost of electricity and gas to operate the network is dependent on the conditions of the UK energy markets. Any increased fuel cost will have a direct impact on the project's financial returns. This risk can be mitigated by ensuring that the customer heat supply agreements are indexed to the price of the fuel that is imported to operate the network. Fluctuations in the import price of fuel will be reflected in the customers agreements so that there is no differential. <u>Operating costs:</u> In addition to fuel cost, there are other costs associated with operating a network such as the cost for undertaking planned and unplanned maintenance for the energy centre equipment. This cost can differ from what is originally expected, but as O&M contractor this is the responsibility of OLCHN Delivery Partner.

Customer volume risk	OLCHN Delivery Partner	The networks returns are related to the revenue generated from the heat sales of the network. The heat sales are directly related to the volume of heat sold to the customers. Therefore, the financial viability of the network is dependent on the OLCHN Delivery Partner securing customers to connect to the network. The appointed OLCHN Delivery Partner can manage this risk by early engagement with the networks offtakers. This should be a fairly simple process as most of the buildings are owned by OMBC or FCHO, who OMBC has a working relationship with. Early engagement with the owners should be commenced to ensure connection to the network at the agreed date. This will also be required for the College, where an incentive may be required to provide them with a commercially attractive offer in addition to the carbon savings. Engagement with the College to date suggests and affinity towards the network. The volume risk can also be mitigated through long term customer supply agreements. However, in the first instance the HoTs should be agreed to ensure that the customers agree in principle to join the network for a given duration. Although not legally binding, the HoTs show that the customer is committed to the network which will give a level of guarantee to the OLCHN JV Company. The HoTs form the basis of the connection and supply agreements, which are legally binding and include the connection date and contract duration, thereby giving the Company a guaranteed revenue stream.
Tram line crossings	OLCHN Delivery Partner	The network is planned to cross the tram line in two locations. Therefore, early engagement was commended with Transport for Greater Manchester and Keolis Amey Metro Link during the OBC to mitigate any delays in agreeing a method for the tram line crossings.
Property rights	OLCHN Delivery Partner	The OLCHN Delivery Partner is required to obtain property rights to allow it to install and operate the network. However, given the energy centre is located on Council land, OMBC should ensure that access is granted to the OLCHN Delivery Partner. The OLCHN Delivery Partner will be required to obtain wayleaves and/or easements for areas where the network is to be constructed and operated in lands that are not owned by OMBC. In the event where the land is owned by the customers, any relevant property rights should be reflected in the customer connection agreements. It is important to note that provision of land rights by the third parties to the OLCHN Delivery Partner could include negotiations, which can lead to a payment fee. It is the responsibility of the OLCHN Delivery Partner to incur this cost.

5.4.4 Risk Covered by Insurances

There are risks associated with a heat networks delivery that cannot be reduced by transferring to contracts but can be included in the networks insurances. The risk covered by insurance typically include the following and expected to be undertaken by the OLCHN Delivery Partner:

- Contractors All Risk insurance (CAR)
- Professional Indemnity Insurance
- Delay start-up Insurance
- Employers' liability insurance
- Construction Third Party and Public Liability Insurance
- Latent Defect Insurance
- Property damage Insurance
- Business Interruption Insurance
- Engineering Breakdown Insurance and Engineering Breakdown Interruption Insurance (in the case of catastrophic failure of equipment)

5.5 Head of Terms

A set of Heads of Terms (HoTs) were developed by legal advisors, Womble Bond Dickinson, with support from BH. The HoTs (see attached *Oldham Low Carbon Heat Network Customer Supply HoTs* and *Oldham Low Carbon Heat Network Customer Connection HoTs*) have been sent to potential DHN connectors. The Letters of Intent (LOI) have been signed.

- Letter of Intent (LOI)
- Customer Supply Agreements
- Customer Connection Agreements

5.6 Procurement strategy

OMBC recognises that it does not have the capital (apart from what is provided by the GHNF), capability, expertise or resource to deliver the heat network in house. Therefore, an external partner is required to bring in expertise to design, construction, operate (including the procurement of energy) and maintain the network and provide metering and billing services, but also that of the energy centre, consisting of the specialised energy generation technologies. The external expertise and capital would be provided in the form of the OGND Partner to form a Company with OMBC. The Company would then establish a JV SPV with a OLCHN Delivery Partner to deliver the heat network. The OGND Partner and OLCHN Delivery Partner can be a single entity. This approach ensures that the network delivery and operations are not directly associated with OMBC, and also enables OMBC to deliver its wider decarbonisation strategy as part of the OGND.

There are however some other aspects of the heat network delivery that may require involvement from OMBC including:

- Provision of easements, wayleaves and road access.
- Contract management.
- Legal services.
- Promotion, marketing and communication, including stakeholder management.

This section of the Commercial Case details elements that must be considered during the procurement strategy to appoint a OGND Partner.

5.6.1 Procurement Regulations

OMBC is a LA and therefore is subject to procurement regulations that govern contracting authorities, including the Public Contracts Regulations.

On May 2023, changes to the Public Procurement Regulations came into force updating the Public Contracts Regulations 2015 (PCR 2015) and the Utilities Contracts Regulations 2016 (UCR 2016). The key changes are as follows:

1. 6(15A): when a contracting authority is unable to provide a value for a contract, PCR 2015 regards the contract value as exceeded the value to trigger application of PCR 2015.

2. 18(4): contracts cannot be terminated if the contracting authority is doing so in a way that "circumvents" the rules under PCR.

3. 48: Prior Information Notices are no longer allowed to be used for a call for competition; including those that are procured under the "lighter touch regime".

5.6.2 Choice of Procedure

There are several methods that are available to OMBC when procuring a OGND Partner for the heat network delivery, PCR as shown in Table 5-8.

Table 5-8 Considerations for choice of procedure under PCR

Choice of Procedure	Description
Open Procedure	• The contracting authority invites the interested parties to submit tenders by a specific date. • The process does not include a separate selection stage. • All tenders are evaluation and the contract which is the Most Economically Advantageous (MEAT) is awarded. • There are no negotiations with tenderers.
Restricted Procedure	• The contracting authority considers applications from interested parties and invites a minimum of 5 applicants to submit tenders, determined based on objective and non-discriminatory rules and criteria. • The contract is award based on MEAT. • There are no negotiations with tenders.
Competitive Procedure with Negotiation	• The contracting authority considers applications from interested parties and invites a minimum of 3 tenders to negotiate. • Negotiations may involve successive bidding rounds to reduce the number of tenderers to be negotiated. • The final tenders cannot be negotiated.

Competitive Dialogue	• The contracting authority considers applications from interested parties and invites a minimum of three qualified applicants to enter into discussions with a view to identifying the solutions(s) capable of meeting their needs. • A competitive dialogue may take place in successive stages. • There can be no substantive discussions following the submission of final tenders. • Limited non-substantive negotiations may also take place after the bidder with the most economically advantageous offer has been identified

The **Open Procedure and Restricted Procedures** are simpler to administer and therefore quicker to deliver with a lower cost to OMBC because they do not allow for negotiations with the tenderers. The restricted engagement with the bidders could lead to key aspects of the project to be missed, and given the complexity of a DHN delivery, thorough engagement with the tenders is crucial to ensure successful delivery. The bidders are also likely to want to negotiate the terms and conditions of the contract as well as specific details regarding the Shareholders Agreement, including:

- The stake split in the Company.
- Service level agreements.
- Indemnities to be provided due to delay or fault by the contractor.
- Appropriate caps on liability.

Given the complexity of delivery, a dialogue process will be crucial for OMBC to ensure that the bidding OGND Partners fully understand the scope of works involved and provides an opportunity for the network route and customer requirements to be addressed.

The **Competitive Dialogue and Negotiated Procedures** are more flexible in nature and enable detailed discussions with the bidders on the networks technical and commercial solutions. The dialogue and negotiations are generally at a greater cost compared to the open and restricted procedures. This is due to the greater length of time and resource that is required by the process because of further engagement with the bidders. The dialogue and negotiation phases would require a higher level of involvement from OMBC and client team (including any third party support that is required to support the OMBC) in evaluating the tenders, responding to bidder questions, preparation for and engagement in the dialogue/negotiation sessions themselves.

The Competitive Dialogue and Negotiated Procedures are similar and offer flexibility, but both would require a greater involvement from OMBC. Therefore, the success of the procurement process is dependent on the OMBC's ability to successfully deliver and control the exercise.

5.7 Recommended Procurement Approach - Competitive Dialogue

The procurement event is to appoint a strategic partner for the OGND who in turn can also support with the delivery of the OLCHN.

The delivery of DHNs includes complex technical, commercial, and legal aspects. OMBC would benefit from dialogue with the tenderers during the procurement process to ensure that tendering OGND Partners understand what is required of the project, but also to provide an opportunity for the bidders to present their offer to OMBC. It is also seen as advantageous that Competitive Dialogue (unlike the Competitive Procedure with Negotiation) will enable if necessary; limited negotiations to take place after the bidder with the most economically advantageous offer has been identified. OMBC's Commercial Procurement Unit is in agreement with this approach, which is also indicated as the market's preferred procedure in initial market engagement which it has conducted. It is therefore

recommended that a Competitive Dialogue procedure is most suitable for OMBC. The market engagement will outline any key issues prior to the full procurement event.

The key stages during the Competitive Dialogue process are as follows and detailed further in Table 5-9.

1. Selection Questionnaire (SQ) & Descriptive Document
2. Issue Invitation To Participate in Competitive Dialogue (IPCD)
3. Issue Invitation To *Submit* Outline Solutions (ISOS)
4. Detailed dialogue sessions with two bidders
5. Issue Invitation To *Submit* Final Tenders (ISFT) to two bidders.

Analysis of the SMT results showed an overwhelming support of the Competative Dialouge procuremnet process, which confired it is a suitable procedure to progress. This approach was also supported by legal advisors, WBD.

Table 5-9 Competitive Dialogue Procurement Activities

Key Stage	Milestone	Target Dates
	Market engagement - SMT	Market engagement has previously been conducted and will not be repeated (tbc). **It is recommended that the ESCO's who previously participated in the market engagement are informed of the approximate tender release date.**
	Drafting of SQ and CD stages documents/packs and adverts. - CF & FaTS - SQ with evaluation detail - *Draft* IPCD, ISOS, ISFT etc., - Preparation of data	Monday 15th April - Friday 10th May 2024 (4 weeks) **(an indicative timeline has been developed by BH with support from OMBC as shown in Figure 7—1)**
1	**Selection Questionnaire (SQ) & Descriptive Document** Publication of SQ&DD and adverts (publicly open) Deadline for responses to SQ	Publish SQ and adverts – Monday 13th May 2024 Deadline – Friday 14th June 2024 **(allowing for bank holidays and to meet the minimum 30 day legal requirement)**
	Selection Questionnaire: Evaluation, Clarifications Moderation Shortlist decisions (minimum #3, recommend #4) Outcome letters Finalise drafting of Invitation to Participate in Competitive Dialogue (IPCD) pack.	Monday 17th June 2024 – Friday 12th July 2024 (4 weeks). **Unknown number of submissions to evaluate resulting from open advertisement.**
2	**Issue Invitation To Participate in Competitive Dialogue (IPCD)** to shortlisted 4 bidders. **Initial dialogue sessions with potentially four bidders** (sessions and dialogue areas (commercials, contract etc., TBC) Finalise drafting of Invitation to Submit Outline Solutions (ISOS) information.	8 weeks total time estimated: Issue invitation – Monday 15th July 2024 Dialogue sessions held between Mon 22nd July – Friday 30th August 2024 (6 weeks). Summer holidays/availability considerations. Closure of dialogue – by Friday 30th August 2024

		Bidder response is not required at this stage. ISOS documents finalized by Friday 6th September 2024 (1 week).
3	**Issue Invitation To *Submit* Outline Solutions (ISOS)** to the 4 bidders. Deadline for responses to ISOS	Issue ISOS - Monday 9th September 2024 ISOS deadline – Friday 27th September 2024 **(3 weeks).**
	Outline Solutions: Evaluation, Clarifications Moderation Shortlist decisions (#2 minimum) Outcome letters Finalise drafting of invitation to continue with detailed dialogue.	Monday 30th September 2024 – Friday 18th October 2024 (3 weeks). **Four submissions estimated.**
4	Invitation to continue with detailed/ongoing dialogue. **Detailed dialogue sessions with two bidders** (#sessions and dialogue areas (commercials, contract etc., TBC) Closure of all dialogue. Finalise Invitation To Submit Final Tender (ISFT) documents	8 weeks total time estimated: Invitations issued Monday 21st October 2024 Detailed dialogue sessions held between Mon 28th October – Friday 6th December 2024 (6 weeks) Closure of dialogue – by Friday 6th December 2024. **ISFT documents finalized by Friday 13th December 2024 (1 week).**
5	**Issue Invitation To *Submit* Final Tenders (ISFT) to two bidders.** Deadline for receipt of Final Tenders	Issue pack to two bidders – Monday 16th December 2024 Deadline - Friday 10th January 2025 ***4 weeks allowed (rather than 3) for accommodating Christmas shut down***

	Final Tenders: Evaluation, Clarifications Moderation Identification of preferred bidder Delegated report drafted.	Monday 13th – Friday 31st January 2025. (3 weeks). Two submissions estimated. **3rd – 4th February 2025**
	Delegated report circulated for comments (Legal, Risk, Finance etc., and sign off).	**Wednesday 5th February 2025**
	Authorisation to Award achieved by: *(Note the Scheme of Delegation / Governance Process)* ***In November 2023 if successful in our grant funding application; the Council will need to go to Cabinet to accept the grant funding so will secure advanced delegated authority at the same time. Otherwise an award of >£400k would be a cabinet decision and approximately three month's time allowance would be needed for this end-to-end.***	Friday 21st February 2025 **Assuming *advanced* delegated authority is secured, 2.5 weeks is allocated to report comments and sign off. (Duration to be agreed with Council)**
	Successful bidder – letter issued by:	Outcome letter – Monday 24th February 2025 **Final award letter (post-standstill) – Friday 7th March 2025**
	Issue mandatory CF & FaTS award notices	**March 2025**
	Clarification of final details prior to contract signature	**March 2025 (3 weeks)**
	Contract signature and start date; ***From here; OMBC can progress with forming the SPV with the appointed partner to deliver the heat network.***	**End March 2025 (This is the target date from which this timeline is worked back from).**
	Completion/contract end date	**TBC**

6 Financial Case

6.1 Introduction and overview

This section of the business case outlines the key financial requirements for the OLCHN, as well as the base heat, revenue and operating cost assumptions. It also details the income and expenditure expectations, budget planning, financial risks and key sensitivities.

This financial case considers the financial viability of the scheme, focusing on a project ESCO structure assumed to be a JV between OMBC and a third-party development partner.

This financial case and model was completed by QMPF based on the technical assumptions provided by BH. A full list of the assumptions used in the financial model can be found in Appendix C and the full financial model has been provided as part of this submission.

6.2 Context

The council is seeking to procure a wider strategic partnership with a private sector partner to deliver a range of low carbon projects within the council area as part of the OGND, including the OLCHN, which will act as an anchor project for OGND. The strategic partner will enter a JV with the Council, provide all equity funding required in excess of any grant which the council obtains, and deliver the OLCHN (as outlined in Commercial Case above).

The offtakers of the scheme are split between 5 project phases including:

- Phase 1 - Oldham Metropolitan Borough Council Buildings, Existing St Mary's Heat Network and First Choice Homes
- Phase 2 – New Housing Development (Former Magistrates Court and Tommyfield Market)
- Phase 3 – New Development (Additional housing and Green Shoot Business Centre 1)
- Phase 4 – Oldham College, additional housing development and Green Shoots Business Centre 2
- Phase 5 – The Spindles Shopping Centre

The scheme will be constructed in 5 phases, with construction on phase 1 assumed to start on the 1st April 2025. Phase 1 operations is assumed to start on 1st April 2026, and all 5 phases are due to be operational in 2033/34. The funding drawdown and construction costs are assumed to profiled across two tranches in FY 2025/26 with the first tranche drawn down within the first month after construction starts on phase 1. It is assumed that all offtakers within the same phase are connected to the OLCHN at the same time, and the finance case considers the scheme over a 40-year operational life.

This finance case assumes the OLCHN is developed using bulk heat from the existing 3.5MW Biomass boiler located within the existing St Mary's Heat Network until the end of its useful life in FY 2032/33 before switching to ASHP for the remainder of the OLCHN's useful life. In the first four phases of the scheme it is assumed that ASHPs will be used as top-up to the biomass boiler and as the main heating technology during the summer when the biomass boiler is not operational to maximise the efficiency of the network. Top-up heat will be satisfied using gas back-up boilers, which will be fuelled by importing gas from the grid.

The St Mary's Heat Network and associated biomass boiler is currently owned by FCHO. It is assumed the assets and ongoing responsibility for maintenance and delivery of heat on the network will be transferred to the JV at nil cost.

The OLCHN has been assessed within the TEM against alternative designs, layouts and heat source options. The preferred solution, which incorporates the biomass boiler and ASHPs, as outlined above, was selected by the Council as being most economical for the offtakers. The finance case assesses the financial viability and funding risks associated with the preferred option.

The OLCHN will be funded using a combination of:

- GHNF grant funding: Grant funding is assumed to cover 100% of commercialisation cost up to £1m and up to 50% of all incurred construction costs, provided the total grant award is below 4.5p/kWh of heat delivered during the first 15 years, while meeting the wider GHNF funding hurdles (specifically the social and project IRR hurdles).
- Strategic partner/developer financing: Assumed that the developer of the OLCHN will provide the remaining funding for the construction of the OLCHN in the form of equity and a shareholder loan.

6.3 Financial requirements and resources

6.3.1 Project Capital Costs

The proposed network has a total construction cost of £28.7m on a nominal basis, inclusive of £1m of commercialisation costs. Commercialisation is assumed to occur during FY 2023/2024 and 2024/2025 with corresponding spend and drawn down of commercialisation grant funding. Construction is anticipated to occur across five phases with the first phase starting on 1st April 2025 and the final phase concluding 31st March 2033. The funding for construction is assumed to be drawn from GHNF funding and development partner capital which, is modelled as a mix of shareholder loan and equity. This is detailed in Section 6.3.2below. A breakdown of the funding requirements during project construction can be found in Table 6-1Table 6-1 on a nominal basis.

Table 6-1: Project Construction Funding Requirements on a nominal basis.

Uses of Finance	Total (£,000)	%
Heat network (pipe and trench costs)	14,166	49%
Engineering, design and associated delivery costs	7,703	27%
Air source heat pump	3,810	13%
Commercialisation	1,000	3%
Energy centre building	756	3%
Construction of building heat substations	545	2%
Building connection costs	222	1%
Construction of high voltage substation and DNO electricity connection	295	1%
Energy centre ancillaries (Electricals, mechanical)	160	1%
HIU	48	0%
Total	**28,705**	**100%**

The useful life of the initial equipment is determined on an individual asset basis, with asset lives ranging from 15 to 40 years (see Table 4-9). Component replacement costs have been included in the project cash flows where they are expensed as incurred across the operational life of the OLCHN. The component replacement costs total £15.32m on a nominal basis over the life of the project. Additional funding is required to cover large component replacement costs where operational cashflow in each year cannot meet the funding requirement.

6.3.2 Sources of Funds: Construction

Funding for the OLCHN in the base case is assumed to be provided by a mix of GHNF funding and development partner equity. The grant funding amount was estimated initially on maximum allowable GHNF grant parameters set out in the application guidance document:

- Commercialisation grant funding is available on up to commercialisation costs to a maximum reward of £1m. It is assumed that the maximum £1m commercialisation grant is awarded.
- Construction grant funding is available on up to 50% of total construction (CAPEX) costs. The Project assumes an award of £7.78m in construction grant, equating to 31.5% of the total capex.
- The total grant funding award should not be more than 4.5p of grant per 1kWh of heat delivered to customers over the first 15 years of operation. **The grant funding sought for the Network is equivalent to 2.41p per 1kWh.**
- The project must achieve a social IRR in excess of 3.5%. The Network social IRR is 3.50%.
- The project must not exceed a real pre-tax post-grant project IRR deemed to be excessive by GHNF, for the purpose of this business case it is assumed a 10% IRR is appropriate and not excessive. An IRR significantly below this level may not attract sufficient investment from the market to support investment in the OLCHN. The OLCHN real pre-tax project IRR in the financial model is 9.81%.

The total grant funding amount was solved to achieve these parameters. It is assumed that the development partner provides the remaining capital in the form of 70% shareholder loan and 30% equity, with distributions reflective of the financing structure. The model assumes that shareholder loan and equity are provided by the developer, the first in FY 2025/26 and the last in FY 2058/59. The blended IRR of the shareholder loan returns, and the equity dividend distributions is equivalent to an unlevered equity IRR. The shareholder loan is included to enable distributions during early years of the project when surplus cash is generated but the OLCHN does not generate an accounting profit, which could restrict dividend distributions and result in trapped cash.

A breakdown of the sources of funding during project construction can be seen in Table 6-2.

Table 6-2: Sources of Project Funding

Source of finance	Total (£,000)	%
Grant funding (GHNF) - Commercialisation	1,000	3%
Grant funding (GHNF) - Construction	7,780	27%
Equity and shareholder loan	13,743	48%
Project cashflows	6,182	22%
Total	**28,705**	**100%**

As noted above, for prudence is has been assumed that all grant funding (for the construction phase) is drawn in FY 2025/26 and 2026/27 and spent within the year it is drawn, development partner capital is drawn as required thereafter to build-out the remainder of the Project phases and subsequent replacement costs.

6.4 Heat assumptions

The base case model uses assumptions described in Section 4.

The base case model assumes that the 3.5MW biomass boiler that is currently located in the existing St Mary's Heat Network is used as the bulk low-carbon heat source from the start of operations until the end of its useful life in FY 2032/33, with a gas boiler providing top-up heat during this time. During this period, it is assumed that an ASHP will be used during the summer months when the ASHP is more efficient than the biomass boiler and heat demands are lower. The ASHP will also be used during the winter for top-up heat in the first instance during this period, with the gas boiler providing the remaining top-up heat where required. In FY 2033/34, all low-carbon heat will be delivered by ASHPs until the end of the Project.

The total customer heat demand is 27,429 MWh p.a. and the total heat requirement is 10% greater than this to account for system heat losses as per CP1 guidance. It is expected that the low-carbon heat source will provide c. 92% of the annual heat demand over the life of the project, and back-up boilers providing the remaining supply. Parasitic electricity demand has also been modelled to supply the energy centre and Network.

As the OLCHN is built out, offtakers will be required to pay a one-off connection charge to the developer to gain access to it. It is assumed that a connection charge will be incurred by all offtakers (including the OMBC) that are not currently connected to the existing St Mary's heat network.

The offtakers are assumed to be a combination of existing council buildings and housing developments, new housing developments, private developments, and Oldham College buildings with the following heat demands.

All offtakers are assumed to be connected to the network on 1st April 2034 in the base case.

Table 6-3 Summary of offtaker connections and heat demand

	Total Heat Demand (MWh/a)	%
Phase 1	17,714	65%
Phase 2	2,374	9%
Phase 3	2,155	8%
Phase 4	4,479	16%
Phase 5	707	3%
Total	**27,429**	**100%**

Table 6-4 Detailed breakdown of offtaker heat demand

	Phase	Heat Demand (MWh/a)	%
Henshaw House	Phase 1	260	1%
Lyceum - Music Centre	Phase 1	398	1%
The Link Centre	Phase 1	365	1%
Oldham Leisure Centre	Phase 1	1,692	6%
Old Library	Phase 1	111	0%
New Performance Space	Phase 1	214	1%
St. Marys DHN	Phase 1	13,300	48%
Gallery Oldham	Phase 1	526	2%
Oldham Library	Phase 1	614	2%
FCH Cluster: Central ext. (Houses)	Phase 1	233	1%
New Housing Development: Former Magistrates Court and Manchester Chambers	Phase 2	1,089	4%
New Housing Development: Tommy field Market	Phase 2	1,286	5%
New Housing Development: Former Leisure Centre	Phase 3	851	3%
New Housing Development: Mumps and Wallshaw Street	Phase 3	359	1%
New Housing Development: Southgate Street and Waterloo Street	Phase 3	890	3%
New Development: Green Shoots Business Centre 1	Phase 3	54	0%
New Housing Development: Civic Centre and Queen Elizabeth Hall	Phase 4	1,979	7%
New Housing Development: Bradshaw Street	Phase 4	494	2%
Oldham College - Campus Central	Phase 4	181	1%
Oldham College - Digital & Creative Centre	Phase 4	205	1%
Oldham College - Hair, Beauty & Travel Centre	Phase 4	169	1%
Oldham College - Health & Life Sciences Building	Phase 4	728	3%
Oldham College - Bellis Centre	Phase 4	407	1%
Oldham College - OC Business Centre	Phase 4	111	0%
Oldham College - Student Hub	Phase 4	91	0%
New Development: Green Shoots Business Centre 2	Phase 4	115	0%
The Spindles Shopping Centre	Phase 5	707	3%
Total		**27,429**	**100%**

6.5 Revenue assumptions

In line with GHNF guidance, tariff pricing was formed on the basis of achieving an equivalent, or cheaper tariff when compared with counterfactual tariffs. Existing social housing offtakers connected the St Mary's Heat Network had pricing obligations which had to be maintained when setting the tariffs for the new heat network, new tariffs for the St Mary's Heat Network to be agreed with FCHO during commercialisation (*see the Economic Case and supporting evidence 01.05 Customer Tariff Note for further details on tariff setting*).

The estimated annual revenues from the first year of operations (from 1st April 2026) until the end of the project are shown in the graph below. Revenues for the OLCHN are generated by offtakers paying heat tariffs to the ESCO, with offtakers paying a combination of fixed tariff (standing charges) and variable tariff (£ per kWh heat demand) prices. Offtakers will also pay a one-off connection charge when connecting to the heat network, with the exception of existing St Mary's Heat Network offtakers.

It is understood that the biomass boiler is eligible for a RHI subsidy, discussed in detail below.

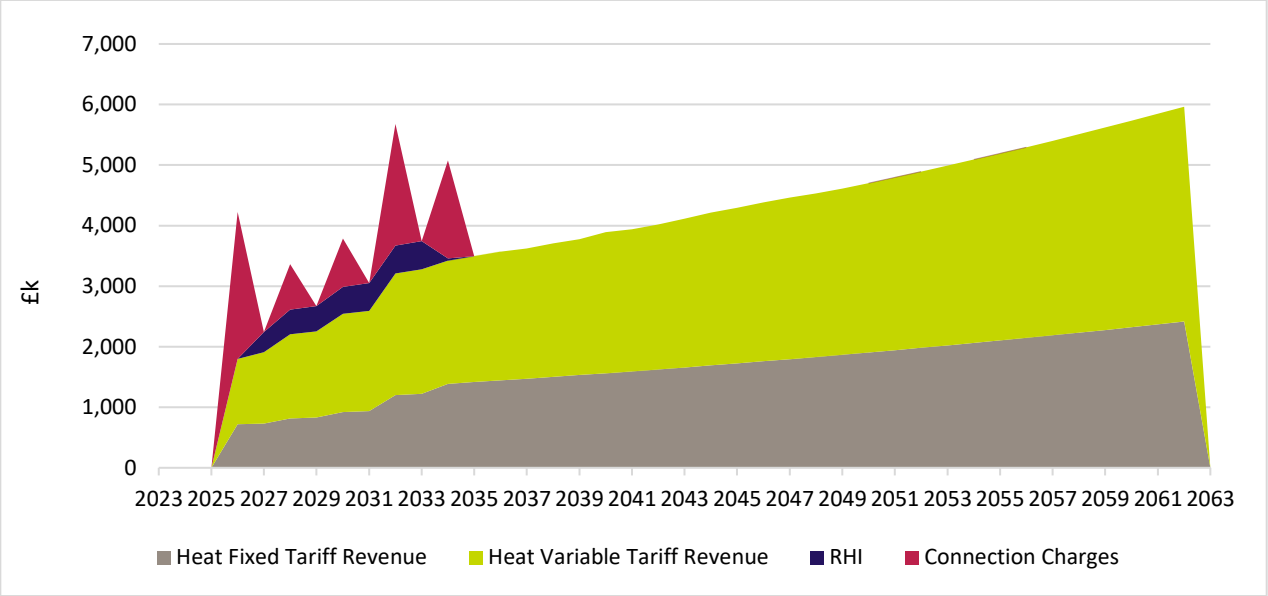

Figure 6—1 Project Revenue Breakdown

6.5.1 Fixed Revenues (Standing Charges)

The fixed heat tariffs are described in Section 4. The standing charge price is based on a £/kW basis for each offtaker classification which has been converted to an annual cost by multiplying the standing charge by the peak heating demand of the offtaker. Heating standing charge revenues are assumed to index annually at the Office for Budget Responsibility ("OBR") CPI forecast until 2027, then at 2% (CPI) thereafter. The OLCHN generates £61.18 m in standing charge revenue on a nominal basis over the 40-year operational period.

Table 6-5 Project fixed tariffs (standing charges) for classified offtakers

Typology	£/kW
Commercial	70.10
Residential - Bulk	75.10
Residential - Non Bulk[30]	12.20

[30] Residential non-bulk rates are based on undiversified peaks loads for each building whereas bulk residential rates are based on a diversified peak load

6.5.2 Variable Revenues

The variable heat tariff are based on a £/MWh basis (see Section 4.13.3.3), and is categorised by four different offtaker tariffs based in 2023 prices which are as follows described in Table 6-6.

Table 6-6 Variable heat tariff classifications

Typology	£/MWh
Residential - Existing	8.99
Commercial - Existing	10.58
Commercial - New	10.59
Residential - New	10.64

The real price indexation and inflation assumptions have been based on the underlying variable cost of heat:

- BEIS Green Book (Table 4-8 Retail Prices) low scenario electricity and gas price forecast
- Biomass woodchip price forecast based on Argus Issue 23-1 Industrial wood chip forward prices until 2026 then remaining constant until the Biomass Boiler is taken offline in 2034.

BEIS electricity and gas price forecasts are assumed to apply until the end of the project, resulting in c.£91.68 m in revenue from variable heat tariff charges over the 40-year operational life on a nominal basis.

6.5.3 Connection Charges

As offtakers connect to the OLCHN they will pay a connection charge, assumed to occur on the first day of operation of the connection. It is assumed that existing offtakers connected to the St Mary's Heat Network will not pay a connection charge when the project is operational, given that they would have already paid a connection charge when connecting to the St Mary's Heat Network. The connection charge assumptions are described in Section 6.5.3, and a summary of the connection charges is outlined in Table 6-7 below, on a nominal basis.

Table 6-7 Summary of OLCHN connection charges

Phase	Connection Charge (£,000)
Phase 1	2,428
Phase 2	750
Phase 3	795
Phase 4	2,014
Phase 5	1,617
Total	**7,604**

6.5.4 RHI Revenues

The biomass boiler situated within the existing St Mary's district heat network has an existing RHI subsidy which is due to expire in 2038, although the award will stop when the biomass boiler is retired in FY 2032/33. The revenue received from the RHI subsidy is based on the annual heat generated from the biomass boiler multiplied by an RHI rate of 2.79p/kWh, which is indexed annually by CPI. The revenue of the subsidy ranges from c. £331k to £459k per financial year across the operational period of the biomass boiler.

6.6 Operating Cost Assumptions

The estimated annual operational costs from the first full year of operations (from 1st April 2026) until the end of the project is shown in the graph and table below. OLCHN utilises woodchip for the biomass boiler during operation, gas for the back-up boilers and electricity for the ASHP's, energy centre plant and network. The real price increases for these utility costs are based on the relevant BEIS low scenario forecasts, with general inflation added on top. BEIS gas price and electricity forecasts are available until the end of the project. All operating costs are incurred from 1st April 2026.

The model makes a prudent assumption that 30 days of working capital is reserved to cover operating expenses, with capital costs paid as incurred as is typical in the market.

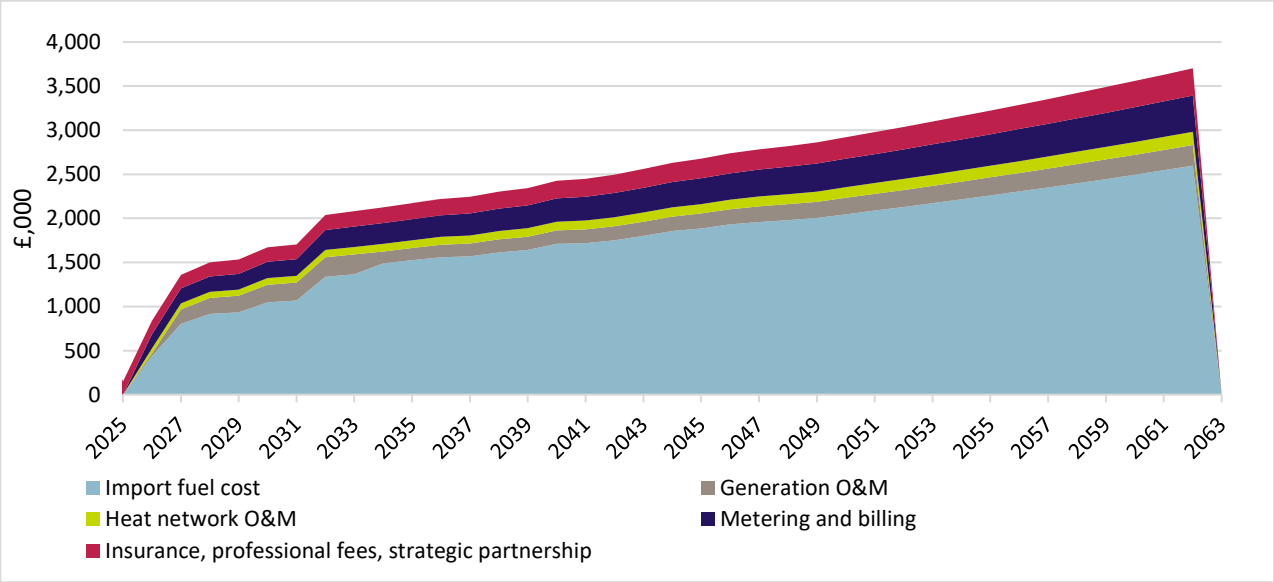

Figure 6—2 Project nominal operating costs.

Table 6-8 Project operating cost breakdown in nominal terms

Operating Cost Item	Operating Cost Category	Charging Basis	2027	2034	Indexation
Biomass boiler maintenance	O&M	£'000/ p.a.	123	0	OBR to 2027, CPI at 2% after
Winter ASHP	O&M	£'000/ p.a.	10	20	
Summer ASHP	O&M	£'000/ p.a.	4	82	
Gas boiler	O&M	£'000/ p.a.	29	33	
Heat building substations	O&M	£'000/ p.a.	7	12	
Offtaker heat meters and heat integrated units	O&M	£'000/ p.a.	48	55	
Pipework system monitoring and maintenance	O&M	£'000/ p.a.	11	19	
Replacement costs (REPEX)	Replacement costs	£'000/ p.a.	0	0	
Bulk metering and billing	Metering and billing	£'000/ p.a.	4	15	
Non-bulk metering and billing	Metering and billing	£'000/ p.a.	115	132	
Staff costs	Staff Costs	£'000/ p.a.	52	89	
Insurance	Insurance	£'000/ p.a.	31	36	
SPV management costs	SPV Management	£'000/ p.a.	41	47	
Professional (legal, audit & tax)	Professional	£'000/ p.a.	31	36	
Strategic partnership costs	Strategic Partnership	£'000/ p.a.	52	59	
Total Fixed Costs		**£'000/ p.a.**	**556**	**635**	
Woodchip for biomass boiler	Import Fuel Costs	£'000/ p.a.	573	0	Argus Issue 23-1 Industrial wood chip forward prices
Import electricity costs for energy centre and network pumps	Import Fuel Costs	£'000/ p.a.	220	1,414	BEIS forecast plus indexation at 2%
Natural gas import price (peak and backup boilers)	Import Fuel Costs	£'000/ p.a.	11	65	BEIS forecast plus indexation at 2%
Total Variable Costs		**£'000/ p.a.**	**803**	**1,479**	
Total Operating Costs		**£'000/ p.a.**	**1359**	**2115**	

6.7 Tax and accounting assumptions

The tax assumptions for the ESCO are set out in Table 6-9. These are based on QMPF's wider project experience and have been agreed with the OMBC. The assumptions do not constitute tax advice and engagement with formal tax advisers should be taken at the next stage to determine the appropriateness of the assumptions.

A check has been included in the model to ensure that Corporate Interest Restriction rules, which allow for shareholder loan interest to be deducted from corporation tax payments, does not surpass the 'De minimis' test and if it does, does not surpass the 'Fixed Ratio' test, both outlined below:

- De minimis: £2m net interest
- Fixed Ratio: 30% of 'tax-EBITDA'

Given the project does not exceed the £2m net interest requirement per annum, it is our understanding that all the interest can therefore be deducted from profit in the calculation of corporation tax. However, as referenced above, this is not a substitute for formal tax advice and should be confirmed at the next stage of development.

Table 6-9 Project tax assumptions

Tax Item	Assumption	Comment
Corporation Tax	25.00%	In line with government announced rates applying from 2023.
VAT	20% on construction costs, VAT is assumed to be fully recoverable and charged and reclaimed within the same period during construction. VAT during operations is assumed to be settled within each semi-annual period and therefore do no not include this in the model.	
Component replacement expenditure	Individual REPEX capitalised for each piece of equipment.	
Writing Down Allowances	Main pool – 18% Special rate pool – 6%	

6.7.1 Accounting assumptions

There are several accounting assumptions made within the model which impact the accounting recognition of profit and loss items, working capital allowance and depreciation. Details of accounting assumptions are outlined in Table 6-10 below.

Table 6-10 Model accounting assumptions

Accounting Item	Assumption	Comment
Fixed asset depreciation	Straight line over asset useful life.	Assets are depreciated over their individual lifespan i.e. assets with a shorter useful life will be depreciated over a shorter time rather than all assets being depreciated over the project life.
Connection charge recognition	Connection charges are deferred across the life of the project to reduce impact on tax.	

6.8 Forecast income and expenditure

The forecast cash inflows and outflows for the OLCHN are shown in Figure 6—3 and Table 6-11. The figures are nominal. Full financial statements on an annual basis are presented in the 'OpCo1_FS' tab in the financial model.

Prior to start of construction, the commercialisation grant is drawn down in two tranches in FY2023/23 and FY2024/25 to cover commercialisation costs incurred in across this period. Construction grant funding and developer capital is drawn by the ESCO to fund the construction costs at the start of the project. The model assumes that the developer will receive annual interest payments from shareholder loans (totalling £5.5m), the final interest payment occurs in 2062 as the loan principal is fully repaid. Dividends are paid out from the OLCHN ESCO's after accounting for shareholder loan repayments in any periods where there is a positive net cash flow and sufficient retained earnings after operating costs, totalling £26.37m across the life of the Project.

The graph below shows how the cashflows generated by the Project are sufficient to cover annual operating costs in most periods from the start of operations, with the exception of 2038, 2047 and 2057, which include large replacement costs for customer gas boilers and heat interface units. During these periods, there will be a requirement for additional capital to be drawn either from the council or the development partner to cover the REPEX. Alternatively, the OLCHN could hold a REPEX reserve account which would retain a portion of revenues to cover forecast REPEX spend, removing the need to add additional capital to the project. This has been included as a key sensitivity in Section 6.10.1 and may be the way in which a development partner will prefer to structure the OLCHN.

The upticks in income at the start of the project (up to 2034) are due to connection charge income being received by the project.

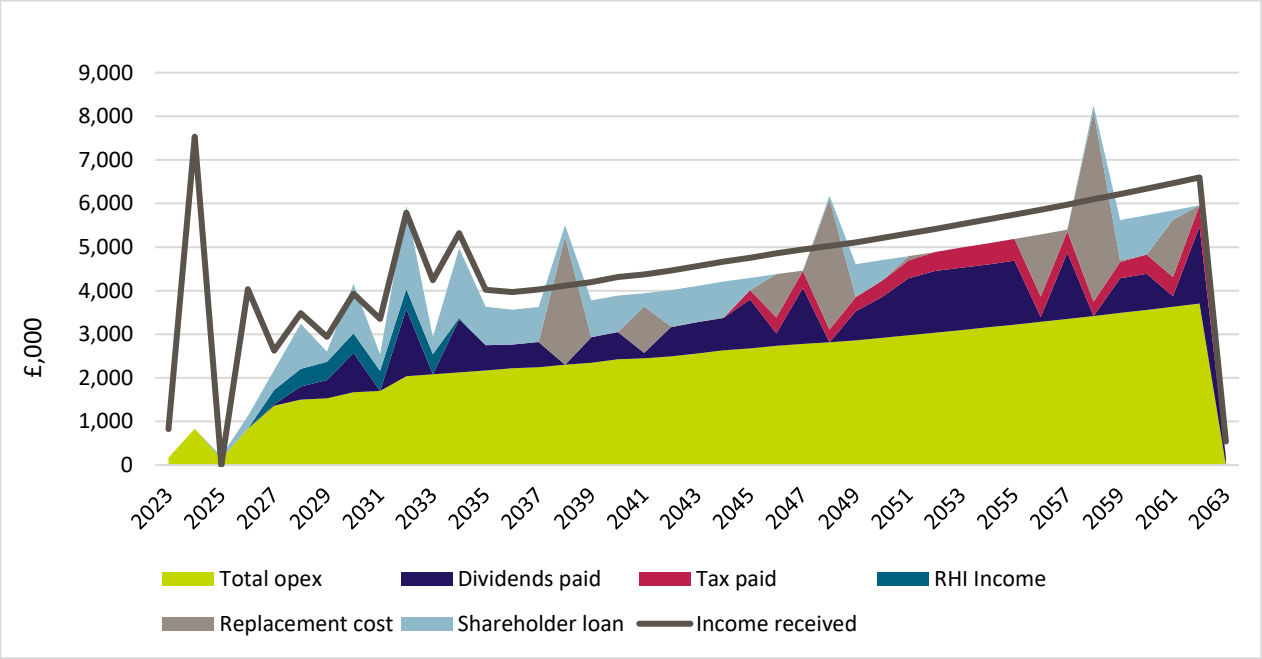

Figure 6—3 Project income, opex and distributions during operations.

The upticks in income at the start of the project (up to 2034) are due to connection charge income being received by the Project.

Table 6-11 Forecast Income and Expenditure (NPV calculation uses a 6.09% nominal discount rate as per UK Government Green Book (2022) guidance)

Nominal Project Cashflows	Total (£,000)	NPV (£,000)
Income		
Heat Variable Tariff Revenue	91,688	27,108
Heat Fixed Tariff Revenue	61,184	17,709
Connection Charges	7,604	5,143
RHI Income	3,020	1,983
Total Revenue	**163,496**	**51,943**
Expenditure		
Input Fuel Cost - Woodchip, Electricity and Gas	(65,954)	(19,017)
Replacement Costs	(15,317)	(3,451)
O&M	(10,633)	(3,380)
Insurance, professional fees, ESCO management and strategic partnership fees	(9,350)	(3,618)
Metering and Billing	(10,641)	(3,189)
Corporation Tax Paid	(7,282)	(1,208)
Total Expenditure	**(119,177)**	**(33,863)**
Net VAT	**-**	**5**
Net Income (excl. CAPEX)	**44,320**	**18,085**
Capex		
Construction Cost	(28,242)	(21,415)
Net Income after Capex	16,078	(3,330)
Funding Drawdown and Repayment		
Grant Funding	8,780	7,644
Developer provided equity	19,926	11,376
Cashflows after Sources of Funding	44,784	15,557
Interest and fees		
N/A	0	0
Surplus Cash Available to Shareholders (Dividend)	**44,784**	**15,557**

6.9 Budget arrangements and business planning

OMBC's finance team has been involved in the base case development process and has approved the key assumptions and financial model. As previously stated, the base case scenario assumes the OLCHN will be structured as a JV between the OMBC and a development partner. Procurement of a development partner will be completed in later project phases, and BH via the council has undertaken soft market testing prior to commercialisation to gauge developer interest. The project ESCO is assumed to be funded through GHNF grant and developer partner equity, including:

- £7.78m construction grant;
- £1m commercialisation grant;
- £19.93m developer partner equity.

The business case assumes that the full amount of GHNF grant requested by the OMBC, totalling £8.780m, will be available to the OLCHN. The current assumption is that the council will not be required to provide funding for the Project, with the development partner contributing the remainder of funds over and above grant amounts.

The council should be aware that the base case financial model requires further injections of capital across the lifecycle of the OLCHN. There could be a risk to the council that it may be liable for these costs, should the development partner fail to meet them. However, this risk could be mitigated through contractual obligations set out in the development partner procurement process. Alternatively, there is a risk that the REPEX is not carried out, thereby reducing the efficiency, safety and operability of the network.

OMBC may have ongoing costs in relation to managing its strategic partner relationship. Through discussion with the council it has been agreed that the OLCHN will contribute £50,000 per year towards these costs which have been included as a project operating cost incurred in 2025/2026 until the end of the project. Should the Council costs exceed these then it would need to source additional funds from its wider budget or via further agreement with the JV partner.

6.9.1 Grant funding requirement

OMBC's capital plan does not include funds to contribute to the capital costs of the OLCHN. Therefore, the council is pursuing a development partner to finance the project and is seeking GHNF grant funding to deliver a project with a return which is likely to enable private sector investment in the OLCHN.

To evaluate the project on a standalone basis exclusive of grant funding, we have run a model scenario that assumes a developer/investor provides 100% of the required project funding. Investor returns are compared with the base case model. Results are summarised in Table 6-12.

Table 6-12 No GHNF grant scenario vs base case

	Equity IRR %	Pre-tax post-grant Project IRR %	Social IRR %
No GHNF grant / Developer wholly funded	4.63%	3.40%	3.50%
Base case including GHNF grant	10.95%	9.81%	3.50%
Base case excluding working capital (GHNF application scenario)	11.80%	9.99%	3.52%

Based on feedback from soft market testing with potential development partners performed by BH on behalf of the OMBC, for a project to be compelling to a developer/investor to pursue, they would expect to receive a return that at least covers their cost of capital which given current market rates will likely exceed 4.63%. With no grant funding, the project returns would not be in-line with investors' expectations and therefore would struggle to attract a development partner.

With the addition of the GHNF grant, returns are in-line with investor expectations from the soft market testing exercise and the OLCHN would likely attract interest from potential development partners. Furthermore, the project meets the hurdle rate of 3.5% social IRR and is within the 10% pre-tax post-grant project IRR limit stated in the GHNF guidelines.

6.10 Financial risk

In line with DESNZ guidance for GHNF grant applications, the base case financial model assumes that the project distributes profits, via dividends and shareholder loan, in each period. The OLCHN does not retain cash within a reserve account to cover future REPEX. The base case assumes that in periods where income is insufficient to cover expenditure, there will be capital available (either through the development partner or the Council) to cover outstanding costs.

In order to assess the financial risks associated with the Project we have undertaken a number of sensitivities in respect of the operational cost, demand and income risk which can be found in Table 6-11.

For each sensitivity, the funding required is fixed unless the sensitivity results in changes in construction cost which reduce the eligible GHNF grant amount, given that the grant up to 50% of eligible CAPEX until 2026/27. This occurs in construction costs +/-20% sensitivity. This sensitivity assumes that the funding shortfall is funded by an increase in grant funding and development partner funding.

6.10.1 REPEX Sinking Fund

The base case TEM and financial modelling currently distributes all cash from the OLCHN after covering operating costs in the form of dividends. Given that the OLCHN has a 'lumpy' replacement cost profile, the OLCHN's economics have to withstand large replacement expenditure as equipment reaches the end of its useful life within the 40-year project lifecycle, leading to periods where additional cash injections are required.

A development partner will want to understand if the OLCHN is able to meet that future spend by utilising income, without the need to inject additional funding in the future beyond the build-out phase. Therefore, a scenario has been included in the financial model that includes a REPEX sinking fund provision which retains up to 50% of dividends eligible for distributions (remaining 50% cash-sweep) within the OLCHN to cover forecasted REPEX spend in the following 5-years. For prudence, it is assumed that no interest is earned on REPEX reserve account balances.

6.10.2 Base Case - Phase 1 only

This sensitivity was run with the purpose of analysing the impact on the OLCHN if only the first phase is completed, and no further phases are constructed. Phase 1 offtakers consist largely of council buildings, the existing St Mary's heat network and FCHO which are likely to be the anchor offtakers for the network. There is a risk that future offtakers do not connect to the network, either due to delays in construction of the developments or due to selecting an alternative heating source. Therefore, considering only phase 1 provides a realistic 'worst case scenario' for an incoming development partner and the Council.

Table 6-13 Financial case sensitivity analysis results

Project Risk Category	Scenario	Grant funding £'000	Development Partner Funding Requirement £'000	Equity IRR%	Pre-tax post-grant Project IRR %	Social IRR %
Base Case	Base Case – Council ESCO	8,780	20,573	10.95%	9.81%	3.50%
	Base Case - Excl. OMBC Strategic Partner Cost*	8,780	19,925	11.84%	10.73%	3.76%
	Base Case GHNF Application Excl. W/C	8,780	19,807	11.80%	9.99%	3.52%
	Base Case - Phase 1 Only**	8,780	12,541	n/a	n/a	0.52%
Replacement Cost	Replacement costs - Reserve facility	8,780	19,925	10.14%	9.81%	3.50%
No Grant	No GHNF Funding	0	28,705	4.63%	3.40%	3.50%
Heat Demand	Heat Demand +20%	8,780	18,957	12.70%	11.64%	4.16%
	Heat Demand -20%	8,780	20,447	9.18%	7.97%	2.71%
Construction Cost	Construction Cost +20%	8,780	23,262	6.03%	4.57%	2.27%
	Construction Cost -20%	7,224	13,531	17.43%	16.70%	5.04%
Revenue	Standing Charge +20%	8,780	19,925	13.92%	12.96%	4.52%
	Standing Charge -20%	8,780	19,925	7.67%	6.36%	2.43%
	Heat Price +20%	8,780	19,925	15.57%	14.73%	5.05%
	Heat Price -20%	8,780	19,925	5.72%	4.26%	1.84%
	Connection Charges +20%	8,780	19,925	12.57%	11.53%	3.79%
	Connection Charges -20%	8,780	19,925	9.60%	8.36%	3.22%
Operating Costs	Utility Purchase Cost +20%	8,780	19,925	7.43%	6.09%	2.34%
	Utility Purchase Cost -20%	8,780	19,925	14.07%	13.13%	4.59%
	OPEX (exc. Repex + Utility costs) +20%	8,780	19,925	9.18%	7.96%	2.95%
	OPEX (exc. Repex + Utility costs) -20%	8,780	19,925	12.71%	11.65%	4.03%
	Repex +20%	8,780	19,925	10.71%	9.57%	3.36%
	Repex -20%	8,780	19,925	11.18%	10.03%	3.63%
Inflation	Interest Rate +1%	8,780	19,925	11.61%	9.81%	3.50%
	Interest Rate -1%	8,780	19,925	10.32%	9.81%	3.50%

6.11 Conclusion

The results of the sensitivities lead to the following conclusions:

- The OLCHN base case which includes grant funding from GHNF is investable from the perspective of a development partner, while satisfying all hurdle rates set out by the GHNF.
- Where grant funding is not available, the OLCHN would not be investable for a development partner to meet return expectations.
- OLCHN remains robust in all sensitivity cases and reasonably well hedged against inflation, however and incoming development partner would look to monitor CAPEX spend as increasing CAPEX has a large impact on project returns.
- If only the first phase was completed with no subsequent phases, the project may not generate sufficient revenue to cover operational expenditure and subsequently generate an investor return.

7 Management Case

7.1 Introduction

The roles undertaken from the stakeholders involved in the project are crucial for its delivery and mitigation of associated risks. The roles suggested for the implementation of the OLCHN have been presented in Commercial Case (see Section 5). It should be mentioned that following the commercial workshops and communication with the stakeholders it is assumed that OMBC will have the leading project governance role.

7.2 Delivery timeline

The proposed delivery timeline for the project has been assumed to commence construction by the end of Q1 2025 to allow for a potential heat on date in 2026. Prior to Q1 2025 a funding application to the GHNF and a commercialisation phase needs to be completed. Key commercialisation milestones include:

- Development of heat network ITT specification
- Procuring consultants
- Minewater pre-design investigation borehole drilling and testing
- Pipework routing access approvals
- Ownership/lease secured for energy centre location
- Core customer supply agreements agreed
- Any bulk heat sale agreements to heat network
- Planning approval achieved
- Infrastructure delivery contracts agreed
- Commitment of non-GHNF funding.

An indicative timeline for the delivery of the heat network project is shown in Figure 7—1.

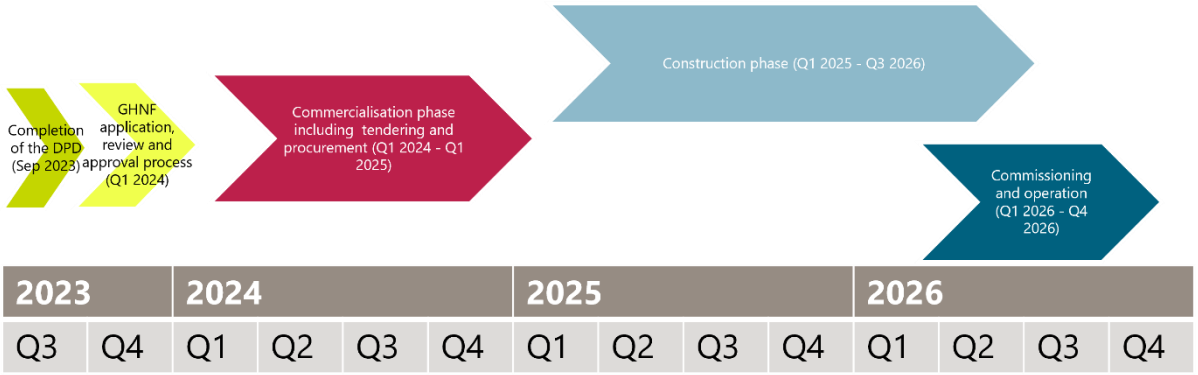

Figure 7—1 Indicative high-level timeline for the Oldham Low Carbon Heat Network project

7.3 Project management governance arrangements

The OBC process engaged with multiple key stakeholders within the council and FCHO. Figure 7—1 summarises the key stakeholder list from the Council and FCHO that have been involved with the process and will part of the OLCHN project going forward from OMBC and FCHO.

Table 7-1 List of key internal stakeholder engaged during OBC

Key stakeholder	Role	Contact details
Nigel Fraser	Team Leader Capital Projects (Town Centre regeneration)	nigel.fraser@oldham.gov.uk
Sarah Orrell	Commercial and Procurement Solicitor	sarah.orrell@oldham.gov.uk
Dan Cheetham	Interim Procurement Lead (construction projects)	Dan.Cheetham@oldham.gov.uk
Emma Tweedie	Senior Category Manager (low carbon infrastructure / concession contracts / delivery partnerships)	Emma.Tweedie@oldham.gov.uk
Rosalyn Smith	Estates Team Leader	rosalyn.smith@oldham.gov.uk
Helen Khan	Lead Energy Manager	Helen.Khan@oldham.gov.uk
John Winterbottom	Divisional Manager – Technical Delivery (Estates)	john.winterbottom@Oldham.gov.uk
Gordon Anderson	Head of Highways & Engineering	gordon.anderson@oldham.gov.uk
Katy Webster	Assistant Director – Property & Projects	Katy.Webster@oldham.gov.uk
Paul Clifford	Director of Economy	Paul.Clifford@oldham.gov.uk
Emma Barton	Executive Director for Place & Economic Growth	emma.barton@oldham.gov.uk
Andrew Hunt	Green Energy and Sustainability Manager	andrew.hunt@oldham.gov.uk
Christopher Lewis	Strategic Lead – Creating a Better Place	Christopher.Lewis@oldham.gov.uk
James Postle	Senior Finance Manager	James.Postle@oldham.gov.uk
Simon Davies	Energy Efficiency and Sustainability Manager	Simon.Davies@fcho.co.uk

7.4 Change and contract management arrangements

It is suggested that OMBC develop, with the support of their OGND Delivery Partner, a programme management plan, in which risks are monitored and risk mitigation actions are recorded, as well as key milestones throughout the project. In order to ensure a variety of stakeholder needs are properly met, it is necessary that appropriate governance over the project is in place and the group continues to work as a team on the project.

Change and contract management should be informed and communicated to the relevant stakeholders, along with how this affects costs and timeline. Therefore, it is also recommended for the people monitoring and managing change and contracts to be experienced project managers with APM and/or PRINCE2 qualifications.

7.5 Benefits realisation arrangements

Benefits realisation should also be included in the project management plan. Ensuring the project delivers its project objectives and low carbon/sustainability goals is of vital importance to all stakeholders. The project objectives presented in Section 3.3.2 are:

1. **Net zero carbon –** *Meet OMBC's net zero policy requirements by 2025 for council buildings and 2030 for the metropolitan borough by implementing low-carbon technologies and onsite interventions. In areas where decarbonisation is challenging, consider the use of fossil fuel technology while exploring alternative solutions. Additionally, prioritising community decarbonisation efforts to ensure a comprehensive and sustainable reduction in carbon emissions across the borough.*

2. **Cost of heat to customers -** *Maintain a slight flexibility to increase the cost of heat to council/public buildings if needed, not exceeding a pre-defined amount agreed within the business case assessment. This flexibility will be assessed during financial modelling, where any necessary cost adjustments will be implemented to ensure that the network is financially viable, whilst ensuring that social housing costs remain at or below current pricing levels to limit any increase in fuel poverty.*

3. **Reliable heat to customers -** *Main heat supply >85% will be from low-carbon sources. If minewater is selected as the main source of heat additional low-carbon resilience e.g. air source heat pumps are required for resilience[31]. Additional top-up electric/gas boilers can be included to ensure uninterrupted heat supply throughout the project lifetime (40 years).*

4. **Social value -** *Achieve a social IRR of at least 3.5% over the project's lifetime of 40 years and actively targeting specific council-defined social values (see above), while ensuring that associated risks to project viability are maintained at an acceptable level.*

5. **Future proofing -** *Prioritise low-carbon heating solutions for the heat network coupled with combination of retrofitting/energy efficiency measures over the schemes lifetime to reduce heating demand.*

6. **Economic / Financial –** *Procurement of an Oldham Green New Deal joint venture delivery partner prior to heat network construction (2025/2026) that would enable the delivery of the heat network, bringing skills and expertise, whilst allowing the council some elements of involvement and control. Aim of the heat network scheme is to not provide a revenue opportunity for the council. There is greater importance in maintaining a cost of heat for customers equivalent or lower versus a defined counterfactual and investigating ways to minimise consumer cost.*

[31] The viability of minewater has been assessed as part of a supplementary scope of works. Please refer to section 4 for a summary of the assessment.

The following arrangement/actions are suggested to be planned to mitigate risks that might affect meeting the desired goals:

- The OLCHN JV Company to monitor and report carbon reduction resulting from the heat network and include targets within the operation of the network. These emissions should remain below the 100gCO2e/kWh threshold in accordance with GHNF guidance. However, there is potential to surpass this target based on the economic case's results, encouraging a more ambitious approach of <50GCO2e/kWh (see Section 4.13.5).
- O&M contracts should include monitoring of the technologies' performance and review against key metrics such as heat pump efficiency and carbon factor (kgCO2e/kWh) as described in the economics case (see Section 4.9.2 and 4.13).
- The OLCHN JV Company and O&M contracts should review future technology advancements to optimise the operation of the heat network and replacing old and/or less efficient equipment at the end of its lifetime
- The OLCHN JV Company should actively manage utility costs and renewable credentials for primary electricity supplied to the energy centre. The Company should investigate options for long-term power purchase agreements with local renewable electricity suppliers and on-site generation opportunities, comparing their performance against alternative tariff arrangements.
- THE OLCHN JV Company should complete a formal review of the economic performance every 6 months (minimum) to consider improvements required to meet required financial targets
- The OLCHN JV Company should develop an information pack to help engage future heat off-takers.

7.6 Risk Management Arrangements

Risks and suggested mitigation measures have been included within the risk register included in as an appendix (*see* attached *Oldham Low Carbon Heat Network Risk Register*) The risk register includes the probability and impact weighting before and after mitigation action.

The risk register should be handed to the D&B contractors who will then act as Principal Designer and Principal Contractor under CDM regulations 2015. There will be a shared responsibility between OMBC and the DHN Delivery partner (the client) and the D&B Contractor to keep the risk register updated during implementation and operation, communicating potential issues to the stakeholders.

The overall responsibility for the project still remains with OMBC and the DHN Delivery Partner. Therefore, clauses should be included in the contract for the client to be able to intervene in case risks are not mitigated or communicated timely and properly. The key risks associated with committing to the heat network development have been identified with proposed mitigation in Table 7-2.

Table 7-2 Summary of key risks and mitigation (Impact/Probability scores range from 1 to 5, with 5 indicating a greater impact/probability).

Risk	Impact	Probability	Mitigation	Action Owner
Technical				
Failure of the biomass boiler to re-start upon re-commissioning	4	2	• Engagement with biomass suppliers and operators during the project to understand re-commissioning requirements of biomass boiler. • Start-up tests and recommissioning to be carried out well before heat network delivery comes online	• BH • DHN Delivery Partner
Unable to deliver biomass fuel requirement suitable for existing biomass	5	2	• Engagement with fuel chip suppliers to assess the availability and compatibility of delivery of sustainable woodchip.	• BH
Heating generation equipment does not perform as well as anticipated	4	2	• Heat network modelled for high temperature with compensated heating. Heat pump efficiencies modelled for high temperature heating (80/50 F/R). Engagement with manufactures to provide confidence on efficiencies. In reality lower temperatures could be possible which would improve the network efficiency and benefit network economics. For the biomass boiler manufactures specification was utilised for efficiencies and expected performance.	• BH
Heat network distribution losses greater than expected	3	3	• Performance report for existing network has been reviewed and shows good current network performance • Transfer risk to DBOM contractor - specify high performance as per CP1 guidance and ensure detailed approval, inspection, testing and acceptance process including penalties for under performance. Minimise route lengths where possible in route proving process	• BH • DHN Delivery Partner • Commercialisation Partner
Planning / Construction				
DHN planning approval not granted for network	4	3	• Instigate pre-application as early in the design process as is possible. Maintain regular dialogue with planning department and highways in relation to the scheme design.	• OMBC • Commercialisation Partner • DHN Delivery Partner
New build connections are not developed or energy strategy development for new developments does not consider a heat network	4	3	• Regular engagement and continuous dialogue with planning department and developers to ensure all parties are aware of the DHN, the design considers the DHN and is suitable to connect to a DHN	• BH • OMBC • Commercialisation Partner

Risk	Impact	Probability	Mitigation	Action Owner
			• Planning policy developed that means DHN connection has to be considered for the area	
Financial / Economic				
Scheme not awarded grant funding	5	2	• Scheme developed in accordance with GHNF metrics • Frequent contact with funders (GHNF) to verify scheme eligibility and incorporate feedback into project design • Frequent contact with alternative funding opportunities • Investigation completed to optimise network further with energy centre location change and reduction in CAPEX	• BH
Procurement costs higher than expected	4	3	• Conservative approach to budget • Manage uncertainty in the design and build costs through carrying out surveys in the commercialisation stage • Cost consultant engaged to review costs • DNO cost received for connection requirements	• BH • OMBC • Commercialisation Partner
Rising energy prices lead to high operational costs and an uneconomically viable scheme	4	4	• Heads of terms and heat supply agreements detail future pricing indexation for heat sales is tracked to import prices- enabling prices to be adjusted as necessary to maintain revenue • BEIS projected energy prices included in TEM and financial model • Seek low cost of heat with Coal Authority	• BH • QMPF • Commercialisation Partner
Construction period takes longer than expected leading to loss of funding commitment from GHNF	5	3	• Scheme selected that is deliverable within the time frames • Potential to expand as part of future phases	• OMBC • DHN delivery partner • BH
Strategic / Commercial				
Limited capacity within OMBC to own and operate DHN	4	2	• Complete commercial case to identify acceptable delivery model that would include a DHN Delivery Partner with experience in the industry	• BH
Commercialisation fails to produce a project financially acceptable to OMBC and the DHN Delivery partner	4	2	• Regular engagement with OMBC financial officers during financial and commercial case • Market testing for technical and financial private sector partner completed • Completion of commercial and financial case with relevant OMBC parties	• Commercialisation Partner • BH • OMBC

Risk	Impact	Probability	Mitigation	Action Owner
Buildings decide not to connect or do not want to connect at an economically viable price for the heat network	5	3	• Regular engagement with connections and ongoing communication regarding progress and timelines • Letters of Support and Heads of Terms issued as part of the GHNF application and commercial case	• OMBC • Commercialisation Partner • BH • DHN Delivery Partner • FCHO

7.7 Contingency arrangements and plans

The key risks involved in the project are:

1. Commercialisation fails to produce a project financially acceptable to OMBC, FCHO and the DHN Delivery Partner
2. New build connections are not developed or energy strategy development for new developments does not consider a heat network

Both of these project risks have been mitigated at this stage. The project IRR is 10% and this has been shared with potential DHN Delivery Partners via a soft market testing exercise. Additionally the new developments are being developed by one master developer, who is fully aware and onboard with the heat network proposals.

It is important for OMBC to have step-in rights for the event that the appointed contractors contract becomes untenable. In that case, clauses in the contract should be included that allow OMBC and the JV partner to take over the project in order to be delivered.

Appendix A Economic Case Appendices

Summary of heat demand

Building Name/ID	New Development, Existing or New Build? (New build <10 yrs.)	Typology	Annual Heat Demand (MWh)	Peak Load (kW)	PWF /DM	MAWF
New Housing Development: Civic Centre and Queen Elizabeth Hall	New Development	Residential - apartment	1979	730		
New Housing Development: Former Magistrates Court and Manchester Chambers	New Development	Residential - apartment	1089	401		
New Housing Development: Former Leisure Centre	New Development	Residential - apartment	851	314		
New Housing Development: Bradshaw Street	New Development	Residential - apartment	494	211		
New Housing Development: Metropolitan Place	New Development	Residential - apartment	257	136		
New Housing Development: Mumps and Wallshaw Street	New Development	Residential - apartment	359	170		
New Housing Development: Southgate Street and Waterloo Street	New Development	Residential - apartment	890	328		
New Housing Development: Tommyfield Market	New Development	Residential - apartment	1286	474		
Henshaw House	Existing	General office	260	211		
Lyceum - Music Centre	Existing	Cultural activities	398	181		
The Link Centre	Existing	General office	365	216		

Oldham Leisure Centre	New-Build	Swimming pool centre	1692	644		
Old Library	New Development	General office	111	163		
New Performance Space	New Development	Cultural activities	214	215		
County Court	New Development	Residential - apartment	141	99		
Blue Coat School 2	New Development	Schools and seasonal public buildings	774	625		
St Mary's DHN	New-Build	Residential - apartment	13300	6795		
Oldham College - Campus Central	Existing	University campus	181	241		
Oldham College - Digital & Creative Centre	Existing	University campus	205	259		
Oldham College - Hair, Beauty & Travel Centre	Existing	University campus	169	191		
Oldham College - Health & Life Sciences Building	Existing	University campus	728	423		
Oldham College - Bellis Centre	Existing	University campus	407	444		
Oldham College - OC Business Centre	Existing	University campus	111	81		
Oldham College - Student Hub	Existing	University campus	91	224		
University Campus Oldham - Studio	Existing	University campus	180	173		
Gallery Oldham	Existing	Cultural activities	526	699		

Oldham Library	Existing	Cultural activities	614	541		
Coldhurst Community Centre	Existing	Cultural activities	107	55		
Rock Street Centre	New Development	General office	183	59		
FCHO Cluster: Belmont Street ext. (Flats)	New-Build	Residential - apartment	532	216		
FCHO Cluster: Central ext. (Houses)	New-Build	Residential - house	233	145		
FCHO Cluster: Crompton Street (Houses)	New-Build	Residential - house	760	340		
FCHO Cluster: Crompton Street (Flats)	New-Build	Residential - apartment	223	122		
FCHO Cluster: Egerton Road ext. (Houses)	New-Build	Residential - house	208	130		
FCHO Cluster: Henshaw Street (Flats)	New-Build	Residential - apartment	107	81		
New Development: Green Shoots Business Centre 1	New Development	General office	54	79		
New Development: Green Shoots Business Centre 2	New Development	General office	115	168		
The Spindles Shopping Centre	New Development	General retail	707	1676		
R STEELE	Existing	Storage facility	262	151		
GREAT PLACES HOUSING GROUP	Existing	Storage facility	137	89		
SPEEDY HIRE CENTRES LTD & Others	Existing	Storage facility	205	123		

HIGHFIELD WORKS	Existing	Storage facility	122	82		
Liquid Envy & Others	Existing	Bar, pub or licensed club	295	168		
105 Union Street	Existing	General office	301	171		
OLDHAM SCIENCE 6TH FORM COLLEGE	Existing	Schools and seasonal public buildings	371	206		
MEDTIA SQUARE	Existing	General office	299	170		
Blue Coat School - Building 1	Existing	Schools and seasonal public buildings	654	346		
COLDHURST INDUSTRIAL ESTATE & Others	Existing	Storage facility	150	96		
CHEFS KEBAB HOUSE	Existing	Storage facility	137	95		
MECCA BINGO CLUB	Existing	Entertainment halls	1240	637		
HALFORDS LTD	Existing	General retail	346	193		
Marios Hair Design	Existing	General retail	155	98		
ARQIVA LTD ROOF OF & Others	Existing	General office	491	265		
NatWest and Others	Existing	High street agency	129	86		
MARSHALL PUMP SYSTEMS,	Existing	Storage facility	269	155		
Abryll House	Existing	General office	200	121		

Post Office	Existing	General retail	140	91		
Blue Coat School - Building 2	Existing	Schools and seasonal public buildings	170	106		
Coldhurst Industrial Estate	Existing	Storage facility	1550	791		
KEOGHS NICHOLLS LINDSELL AND HARRIS SOLICITORS	Existing	General office	104	73		
CENTRAL DANCING ACADEMY	Existing	Dry sports and leisure facility	116	79		
ASTIRVANT LTD & Others	Existing	Storage facility	152	97		
Street Record & Others	Existing	General office	108	75		
Oldham Council & Others	Existing	General office	143	92		
Primark & Others	Existing	Large non-food shop	784	410		
Oldham Central Bus Station	Existing	Public waiting or circulation	227	134		
The Squire Knott	Existing	Bar, pub or licensed club	147	94		
HUTCHINSON 3G UK LTD ROOF OF & Others	Existing	General office	427	233		
CO-OPERATIVE FUNERAL SERVICE & Others	Existing	General retail	232	137		
GMWDA, MEDTIA CHAMBERS & Others	Existing	General office	190	116		
ST MARY'S MEDICAL CENTRE	Existing	Clinic	105	73		

Oldham Bus Station	Existing	Public waiting or circulation	147	94		
GREAVES ARMS HOTEL	Existing	Bar, pub or licensed club	108	75		
Blue Coat School - Building 3	Existing	Schools and seasonal public buildings	221	131		
Blue Coat School - Building 4	Existing	Schools and seasonal public buildings	535	287		
J N WRAY LTD & Others	Existing	Cultural activities	136	89		
BANK CHAMBERS,	Existing	General office	207	124		
TOKYO PROJECT	Existing	Entertainment halls	114	78		
BARCLAYS BANK PLC	Existing	High street agency	141	91		
TERRITORIAL ARMY CENTRE & Others	Existing	Storage facility	557	298		
The Upsteps	Existing	Bar, pub or licensed club	128	85		
MAX SPIELMANN & Others	Existing	General retail	131	86		
HERON FOODS & Others	Existing	Large food store	123	83		
ICELAND FOODS PLC & Others	Existing	Large food store	541	290		
POSITIVE STEPS	Existing	General office	283	162		
MEZZANINE FLOOR & Others	Existing	High street agency	204	123		

DIMENSION DANCE STUDIOS & Others	Existing	Dry sports and leisure facility	134	88		
VANTAGE HYUNDAI	Existing	General retail	214	127		
Yorkshire Bank plc & Others	Existing	High street agency	136	89		
Oldham, Sixth Form College - SPORTS HALL	Existing	Dry sports and leisure facility	400	220		
NATIONWIDE AUTOCENTRE	Existing	General office	439	239		
AL MULINO RESTAURANT & Others	Existing	Restaurant	537	288		
JOHN STREET MEDICAL PRACTICE	Existing	Clinic	149	95		
THE JALAL PRACTICE & Others	Existing	Clinic	1074	554		
C E X LTD	Existing	Large non-food shop	101	71		
LIVINGSTONES & Others	Existing	General retail	953	433		
WESTWAY NISSAN	Existing	General retail	161	101		
Blue Coat School - Building 5	Existing	Schools and seasonal public buildings	276	158		
PEARSON SOLICITORS & FINACIAL ADVISERS LLP	Existing	General office	113	77		
CONSERVATIVE CLUB & Others	Existing	General office	128	85		
ST PATRICKS PRESBYTERY	Existing	Cultural activities	239	140		

CIT TECH MOTORS & Others	Existing	General retail	284	162		
HOLY CROSS C E V A PRIMARY SCHOOL	Existing	Schools and seasonal public buildings	474	328		
OLDHAM SIXTH FORM COLLEGE	Existing	Schools and seasonal public buildings	1640	835		
Northmoor Academy & Others	Existing	Schools and seasonal public buildings	427	233		
SAINSBURYS SUPERMARKET LIMITED & Others	Existing	Large food store	1784	907		
THE OLD TOWN HALL	Existing	Restaurant	984	509		
JEWSON LTD & Others	Existing	Storage facility	785	411		
Blue Coat School - Building 6	Existing	Schools and seasonal public buildings	362	201		
Total			**56,657**	**32,560**		

Counterfactual assumptions for heat sales price, fixed cost price and connection charge calculation

Building Name/ID	Counterfactual main technology	Counterfactual top-up technology	New/Existing
New Housing Development: Civic Centre and Queen Elizabeth Hall	ASHP-Communal		New Development
New Housing Development: Former Magistrates Court and Manchester Chambers	ASHP-Communal		New Development
New Housing Development: Former Leisure Centre	ASHP-Communal		New Development
New Housing Development: Bradshaw Street	ASHP-Communal		New Development
New Housing Development: Metropolitan Place	ASHP-Communal		New Development
New Housing Development: Mumps and Wallshaw Street	ASHP-Communal		New Development
New Housing Development: Southgate Street and Waterloo Street	ASHP-Communal		New Development
New Housing Development: Tommyfield Market	ASHP-Communal		New Development
Henshaw House	ASHP-Individual		Existing
Lyceum - Music Centre	ASHP-Individual		Existing
The Link Centre	ASHP-Individual		Existing
Oldham Leisure Centre	ASHP-Individual		New-Build
Old Library	ASHP-Individual		New Development
New Performance Space	ASHP-Individual		New Development
County Court	ASHP-Communal		New Development
Blue Coat School 2	ASHP-Individual	Electric boiler	New Development
St Mary's DHN	Gas boiler - Residential		New-Build
Oldham College - Campus Central	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham College - Digital & Creative Centre	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham College - Hair, Beauty & Travel Centre	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham College - Health & Life Sciences Building	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham College - Bellis Centre	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham College - OC Business Centre	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham College - Student Hub	ASHP-Individual	Gas boiler - Commercial	Existing
University Campus Oldham - Studio	ASHP-Individual	Gas boiler - Commercial	Existing
Gallery Oldham	ASHP-Individual		Existing
Oldham Library	ASHP-Individual		Existing
Coldhurst Community Centre	ASHP-Individual		Existing
Rock Street Centre	ASHP-Individual		New Development
FCH Cluster: Belmont Street ext. (Flats)	Gas boiler - Residential		New-Build
FCH Cluster: Central ext. (Houses)	Gas boiler - Residential		New-Build
FCH Cluster: Crompton Street (Houses)	Gas boiler - Residential		New-Build
FCH Cluster: Crompton Street (Flats)	Gas boiler - Residential		New-Build
FCH Cluster: Egerton Road ext. (Houses)	Gas boiler - Residential		New-Build
FCH Cluster: Henshaw Street (Flats)	Gas boiler - Residential		New-Build
New Development: Green Shoots Business Centre 1	ASHP-Individual		New Development

New Development: Green Shoots Business Centre 2	ASHP-Individual		New Development
The Spindles Shopping Centre	ASHP-Communal		New Development
R STEELE	ASHP-Individual	Gas boiler - Commercial	Existing
GREAT PLACES HOUSING GROUP	ASHP-Individual	Gas boiler - Commercial	Existing
SPEEDY HIRE CENTRES LTD & Others	ASHP-Individual	Gas boiler - Commercial	Existing
HIGHFIELD WORKS	ASHP-Individual	Gas boiler - Commercial	Existing
Liquid Envy & Others	ASHP-Individual	Gas boiler - Commercial	Existing
105 Union Street	ASHP-Individual	Gas boiler - Commercial	Existing
OLDHAM SCIENCE 6TH FORM COLLEGE	ASHP-Individual	Gas boiler - Commercial	Existing
MEDTIA SQUARE	ASHP-Individual	Gas boiler - Commercial	Existing
Blue Coat School - Building 1	ASHP-Individual	Gas boiler - Commercial	Existing
COLDHURST INDUSTRIAL ESTATE & Others	ASHP-Individual	Gas boiler - Commercial	Existing
CHEFS KEBAB HOUSE	ASHP-Individual	Gas boiler - Commercial	Existing
MECCA BINGO CLUB	ASHP-Individual	Gas boiler - Commercial	Existing
HALFORDS LTD	ASHP-Individual	Gas boiler - Commercial	Existing
Mario's Hair Design	ASHP-Individual	Gas boiler - Commercial	Existing
ARQIVA LTD ROOF OF & Others	ASHP-Individual	Gas boiler - Commercial	Existing
NatWest and Others	ASHP-Individual	Gas boiler - Commercial	Existing
MARSHALL PUMP SYSTEMS,	ASHP-Individual	Gas boiler - Commercial	Existing
Abryll House	ASHP-Individual	Gas boiler - Commercial	Existing
Post Office	ASHP-Individual	Gas boiler - Commercial	Existing
Blue Coat School - Building 2	ASHP-Individual	Gas boiler - Commercial	Existing
Coldhurst Industrial Estate	ASHP-Individual	Gas boiler - Commercial	Existing
KEOGHS NICHOLLS LINDSELL AND HARRIS SOLICITORS	ASHP-Individual	Gas boiler - Commercial	Existing
CENTRAL DANCING ACADEMY	ASHP-Individual	Gas boiler - Commercial	Existing
ASTIRVANT LTD & Others	ASHP-Individual	Gas boiler - Commercial	Existing
Street Record & Others	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham Council & Others	ASHP-Individual	Gas boiler - Commercial	Existing
Primark & Others	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham Central Bus Station	ASHP-Individual	Gas boiler - Commercial	Existing
The Squire Knott	ASHP-Individual	Gas boiler - Commercial	Existing
HUTCHINSON 3G UK LTD ROOF OF & Others	ASHP-Individual	Gas boiler - Commercial	Existing
CO-OPERATIVE FUNERAL SERVICE & Others	ASHP-Individual	Gas boiler - Commercial	Existing
GMWDA, MEDTIA CHAMBERS & Others	ASHP-Individual	Gas boiler - Commercial	Existing
ST MARY'S MEDICAL CENTRE	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham Bus Station	ASHP-Individual	Gas boiler - Commercial	Existing
GREAVES ARMS HOTEL	ASHP-Individual	Gas boiler - Commercial	Existing
Blue Coat School - Building 3	ASHP-Individual	Gas boiler - Commercial	Existing
Blue Coat School - Building 4	ASHP-Individual	Gas boiler - Commercial	Existing

J N WRAY LTD & Others	ASHP-Individual	Gas boiler - Commercial	Existing
BANK CHAMBERS,	ASHP-Individual	Gas boiler - Commercial	Existing
TOKYO PROJECT	ASHP-Individual	Gas boiler - Commercial	Existing
BARCLAYS BANK PLC	ASHP-Individual	Gas boiler - Commercial	Existing
TERRITORIAL ARMY CENTRE & Others	ASHP-Individual	Gas boiler - Commercial	Existing
The Upsteps	ASHP-Individual	Gas boiler - Commercial	Existing
MAX SPIELMANN & Others	ASHP-Individual	Gas boiler - Commercial	Existing
HERON FOODS & Others	ASHP-Individual	Gas boiler - Commercial	Existing
ICELAND FOODS PLC & Others	ASHP-Individual	Gas boiler - Commercial	Existing
POSITIVE STEPS	ASHP-Individual	Gas boiler - Commercial	Existing
MEZZANINE FLOOR & Others	ASHP-Individual	Gas boiler - Commercial	Existing
DIMENSION DANCE STUDIOS & Others	ASHP-Individual	Gas boiler - Commercial	Existing
VANTAGE HYUNDAI	ASHP-Individual	Gas boiler - Commercial	Existing
Yorkshire Bank plc & Others	ASHP-Individual	Gas boiler - Commercial	Existing
Oldham, Sixth Form College - SPORTS HALL	ASHP-Individual	Gas boiler - Commercial	Existing
NATIONWIDE AUTOCENTRE	ASHP-Individual	Gas boiler - Commercial	Existing
AL MULINO RESTAURANT & Others	ASHP-Individual	Gas boiler - Commercial	Existing
JOHN STREET MEDICAL PRACTICE	ASHP-Individual	Gas boiler - Commercial	Existing
THE JALAL PRACTICE & Others	ASHP-Individual	Gas boiler - Commercial	Existing
C E X LTD	ASHP-Individual	Gas boiler - Commercial	Existing
LIVINGSTONES & Others	ASHP-Individual	Gas boiler - Commercial	Existing
WESTWAY NISSAN	ASHP-Individual	Gas boiler - Commercial	Existing
Blue Coat School - Building 5	ASHP-Individual	Gas boiler - Commercial	Existing
PEARSON SOLICITORS & FINACIAL ADVISERS LLP	ASHP-Individual	Gas boiler - Commercial	Existing
CONSERVATIVE CLUB & Others	ASHP-Individual	Gas boiler - Commercial	Existing
ST PATRICKS PRESBYTERY	ASHP-Individual	Gas boiler - Commercial	Existing
CIT TECH MOTORS & Others	ASHP-Individual	Gas boiler - Commercial	Existing
HOLY CROSS C E V A PRIMARY SCHOOL	ASHP-Individual	Gas boiler - Commercial	Existing
OLDHAM SIXTH FORM COLLEGE	ASHP-Individual	Gas boiler - Commercial	Existing
Northmoor Academy & Others	ASHP-Individual	Gas boiler - Commercial	Existing
SAINSBURYS SUPERMARKET LIMITED & Others	ASHP-Individual	Gas boiler - Commercial	Existing
THE OLD TOWN HALL	ASHP-Individual	Gas boiler - Commercial	Existing
JEWSON LTD & Others	ASHP-Individual	Gas boiler - Commercial	Existing
Blue Coat School - Building 6	ASHP-Individual	Gas boiler - Commercial	Existing

Breakdown of additional CAPEX cost

Additional		
Prelims	*15%*	*Of total*
Design fees	*10%*	*Of total*
Installation	*Included in costs*	*Of total*
Testing and commissioning	*Included in costs*	*Of total*
Contingency	*10%*	*Of total (including additional costs)*

Full CAPEX breakdown of the PWF Scenario

Phase	Units	1	2	3	4	5
Heating Equipment						
Heat pump[32]	£	190,000	-	-	190,000	2,352,000
Gas Boiler	£	-	-	-	-	-
Energy Centre/Plant Room						
Energy Centre Building	£	360,000	-	-	-	-
Thermal Store	£	150,000	-	225,000	-	-
Network Ancillaries						
Minewater Infrastructure	£	6,300,000	-	-	-	-
Water loop PHEX	£	7,200	2,400	-	9,600	2,400
Water loop filtration	£	17,000	5,700	-	22,700	5,700
Water loop pumping	£	19,300	6,400	-	25,700	6,400
DHN Pumps	£	65,800	9,100	8,200	27,200	900
Expansion vessel & Pressurisation	£	6,000	-	-	-	-
Water treatment	£	2,700	-	-	-	-
Controls	£	11,700	-	-	-	-
Other energy centre M&E	£	19,500	3,500	1,200	12,800	2,300
Pipe Cost						
Pipe and Trench	£	9,946,000	294,000	462,000	2,663,000	275,000
Connection Cost						
Heat Meters	£	18,200	4,000	8,100	30,300	2,020
Substation PHX	£	235,300	21,000	21,400	93,000	40,200
Building substation costs	£	112,400	29,000	38,400	116,000	19,100
HIU	£	-	-	-	43,200	-
Network Cost						
ENWL Connection (incl. contestable works)	£	100,000	-	-	-	-
Earthing	£	30,000	-	-	-	-
LV Switch Board	£	165,000	-	-	-	-
Total[33]	£	25,155,000	516,000	1,050,000	5,158,000	3,720,200

[32] Based on a versatile heat pump capable of functioning as both an air-source and water-source unit.

[33] Considers additional costs outlined in "Breakdown of additional CAPEX cost"

Full CAPEX breakdown of the MAWF Scenario

Phase	Units	1	2	3	4	5
Heating Equipment						
Heat pump[34]	£	1,056,000	-	-	5,279,000	2,352,000
Gas Boiler	£	-	-	-	202,000	222,000
Energy Centre/Plant Room						
Energy Centre Building	£	680,000	-	-	-	-
Thermal Store	£	225,000	-	-	450,000	-
Network Ancillaries						
Minewater Infrastructure	£	25,967,000	-	-	-	-
Water loop PHEX	£	8,400	3,600	1,200	76,600	2,400
Water loop filtration	£	19,800	8,500	2,800	181,000	5,700
Water loop pumping	£	22,500	9,600	3,200	205,600	6,400
DHN Pumps	£	66,200	9,100	10,100	110,300	1,500
Expansion vessel & Pressurisation	£	6,000	-	-	-	-
Water treatment	£	2,700	-	-	-	-
Controls	£	22,100	-	-	-	-
Other energy centre M&E	£	22,200	4,600	2,600	86,000	2,400
Pipe Cost						
Pipe and Trench	£	13,419,000	167,700	831,100	21,871,000	153,000
Connection Cost						
Heat Meters	£	22,220	4,040	12,120	167,660	2,020
Substation PHX	£	238,062	21,006	28,806	452,987	40,200
Building substation costs	£	123,390	29,222	58,762	938,747	19,087
HIU	£	-	-	-	43,200	-
Network Cost						
ENWL Connection (incl. contestable works)	£	800,000	-	-	-	-
Earthing	£	30,000	-	-	-	-
LV Switch Board	£	165,000	-	-	-	-
Total[35]	£	58,981,000	354,000	1,307,000	41,339,000	3,859,000

[34] Based on a versatile heat pump capable of functioning as both an air-source and water-source unit.

[35] Considers additional costs outlined in

Full CAPEX breakdown of the 'Do Minimum' Scenario

Phase	Units	1	2	3	4	5
Heating Equipment						
Heat pump[36]	£	190,000	-	-	190,000	2,352,000
Gas Boiler	£	-	-	-	-	-
Energy Centre/Plant Room						
Energy Centre Building	£	360,000	-	-	-	-
Thermal Store	£	150,000	-	225,000	-	-
Network Ancillaries						
Minewater Infrastructure	£	6,300,000	-	-	-	-
PHEX Loop	£	7,200	2,400	-	9,600	2,400
DHN Pumps	£	65,800	9,100	8,200	27,200	900
Expansion vessel & Pressurisation	£	6,000	-	-	-	-
Water treatment	£	2,700	-	-	-	-
Controls	£	11,700	-	-	-	-
Other energy centre M&E	£	14,000	1,700	1,200	5,500	500
Pipe Cost						
Pipe and Trench	£	9,946,000	294,000	462,000	2,663,000	275,000
Connection Cost						
Heat Meters	£	18,200	4,000	8,100	30,300	2,020
Substation PHX	£	235,300	21,000	21,400	93,000	40,200
Building substation costs	£	112,400	29,000	38,400	116,000	19,100
HIU	£	-	-	-	43,200	-
Network Cost						
ENWL Connection (incl. contestable works)	£	100,000	-	-	-	-
Earthing	£	30,000	-	-	-	-
LV Switch Board	£	165,000	-	-	-	-
Total[37]	£	16,435,000	497,000	1,050,000	5,081,000	3,701,000

[36] Based on a versatile heat pump capable of functioning as both an air-source and water-source unit.

[37] Considers additional costs outlined in

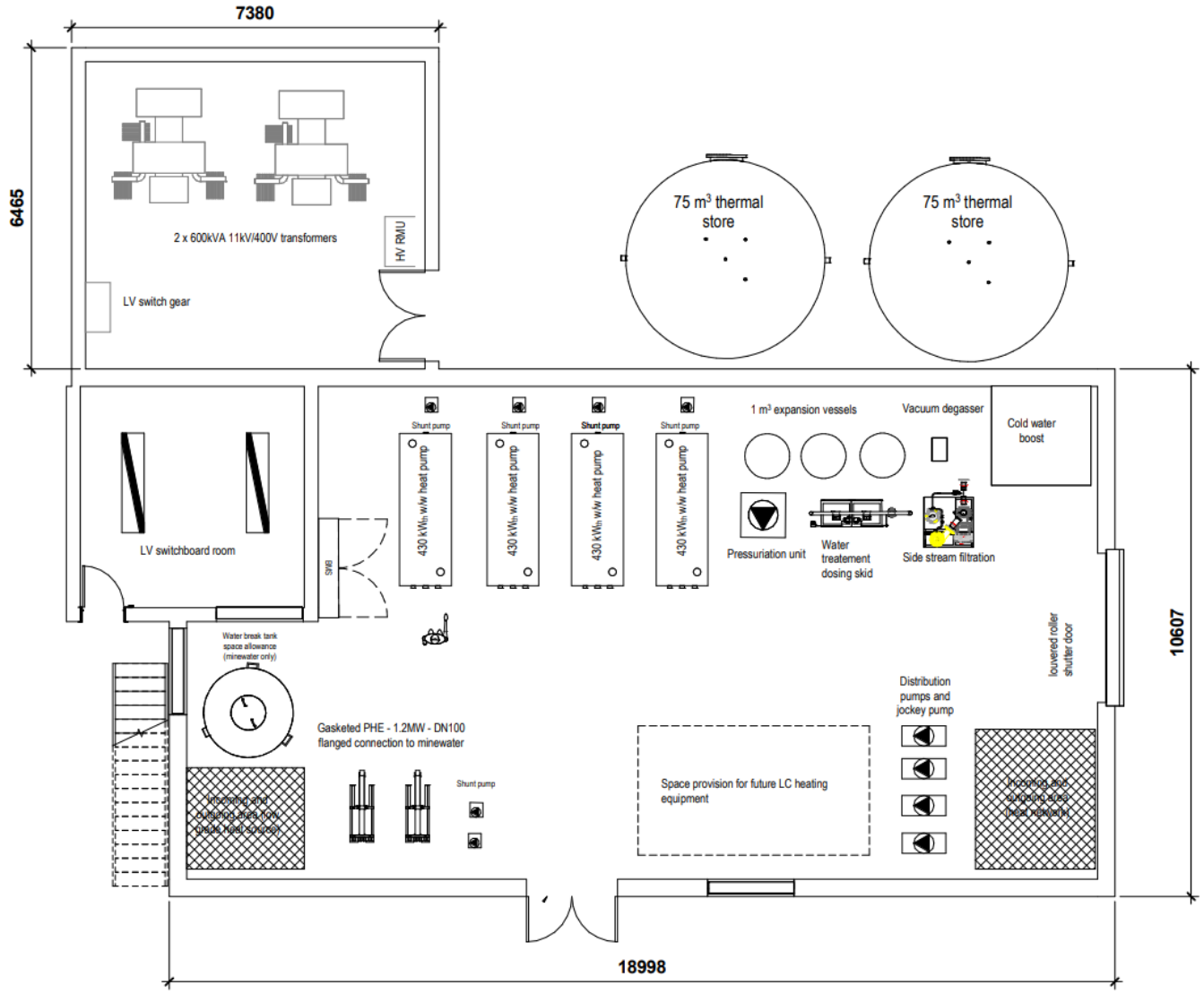

Figure A- 1 Propsosed Energy Centre layout - Core Heat Network scheme

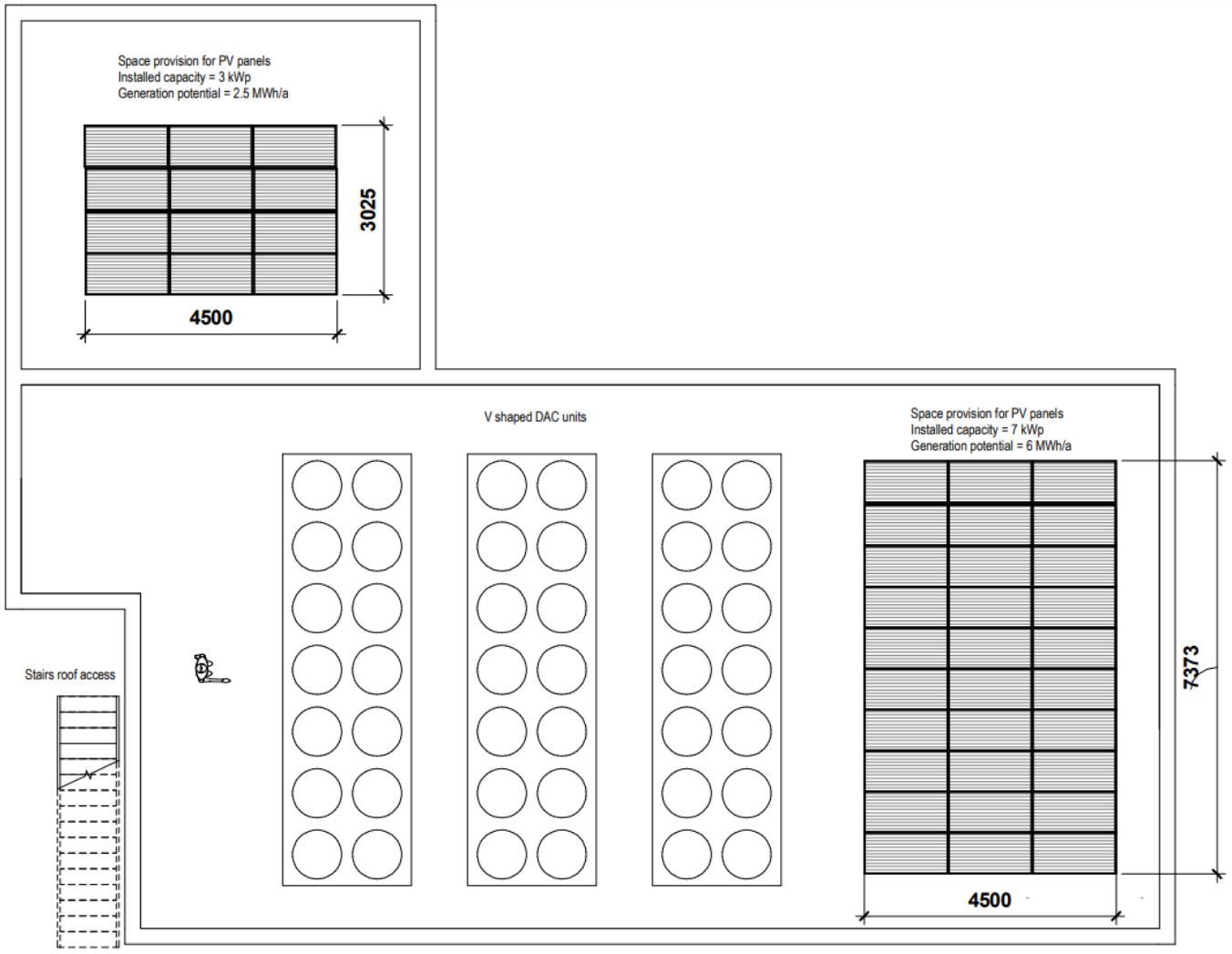

Figure A- 2 Propsosed Energy Centre roof layout - Core Heat Network scheme

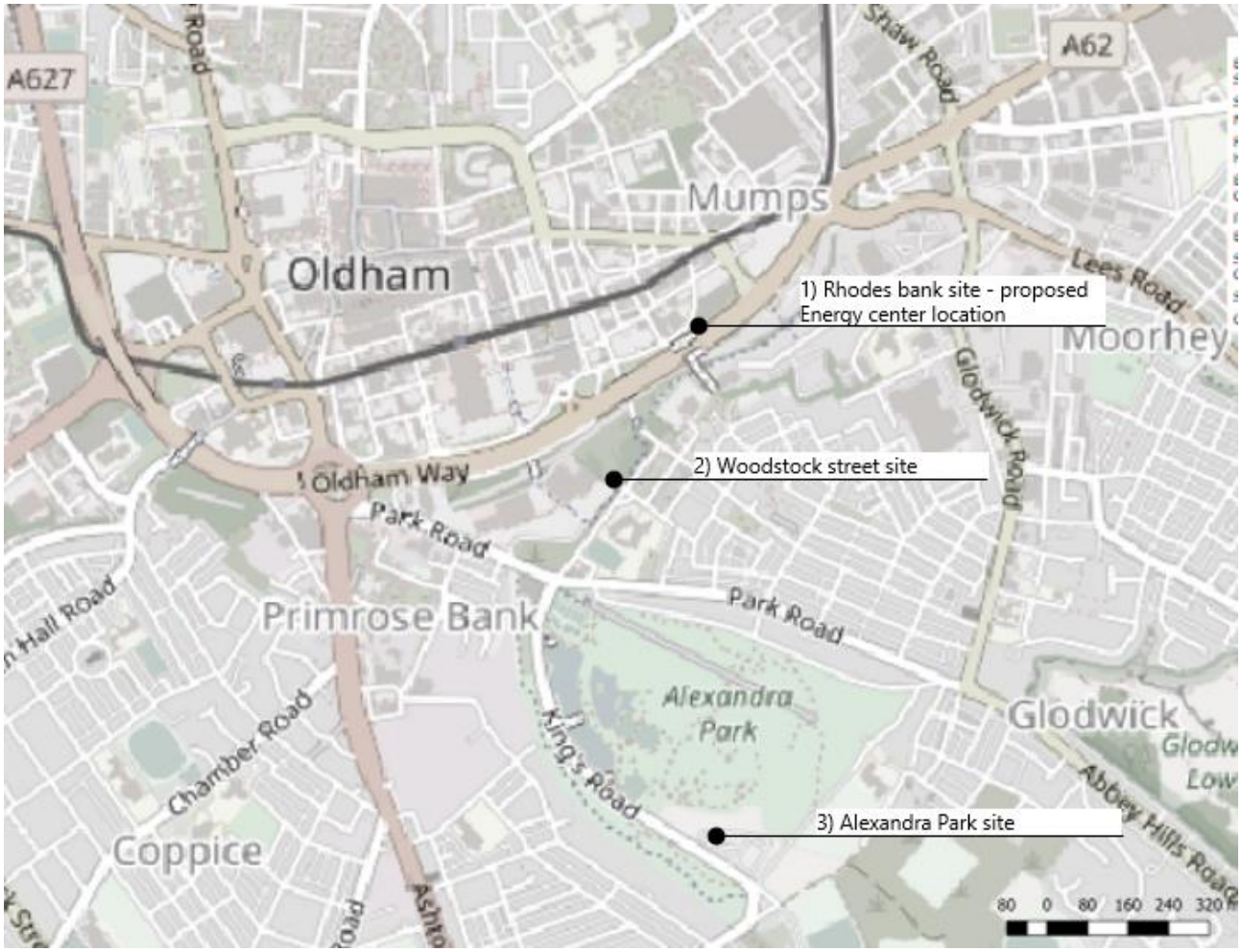

Figure A- 3 Minewater locations

Appendix B Commercial Case Appendices

A soft market testing exercise was undertaken with support from OMBC. The market engagement material was provided by BH for OMBC to publish on 'The Chest'. 15 responses were received from a range of companies who have experience in delivering heat networks. The companies who responded have experience with the following roles:

- Joint-Venture partnerships
- Concessionaires
- DBOM contractors

Further market engagement would commence during the commercialisation stage.

Appendix C Financial Case Appendices

Table C- 1 Input date assumptions

Input	Assumption
Year-end date in model	31 March
Start of Commercialisation	01 April 2023
End of Commercialisation	31 March 2025
Start of Construction	01 April 2025
End of Construction (all phases)	31 March 2034
Start of Operations	01 April 2026
End of Operations	31 March 2064
Length of Assessment Period	40 years

Table C- 2 Heat offtake assumptions

Heat Offtake	2027 (MWh)	2034 (MWh) – Maximum
Customer Offtake Requirements	17,714	27,429
Heat Loss in System	1,771	2,743
Total	**19,485**	**30,172**

Table C- 3 Source of heat supply

Source of Heat	2027 (MWh)	2027 (%)	2034 (MWh) – Maximum	2034 (%) – Maximum
Biomass Boiler	14,871	76%	-	-
ASHP	4,106	21%	27,788	92%
Gas Top-Up Boilers	509	3%	2,384	8%
Total	**19,485**	**100%**	**30,172**	**100%**

Table C- 4 Phasing of construction costs

Phasing of Construction Costs	
Construction Period	9 years (Across 5 phases)
Start of Construction	01 April 2025
End of Construction	31 March 2034
Spend Profile	CAPEX spend as incurred in project phases from 1st of January April 2025

Table C- 5 Indexation Assumptions

Income Indexation	Indexation
Heat Tariff (Variable)	See Section 6.5.2
Heat Standing Charge Income	OBR forecast until 2027 then CPI* at 2%

***CPI is predominantly used to index both operating costs, capital expenditure and revenues, with notable exceptions being variable heat revenue and business rates discussed in the relevant section. CPI is assumed as it remains the key indexation basis in most commercial contracts and is widely recognised and traded in the financial markets.**

Table C- 6 Operating working capital assumption

Operating Working Capital	
Creditors	30 days
Debtors	30 days

Appendix Note 1: Model Base Date Assumptions
The revenues, operating costs and construction costs in the TEM are in 2023 prices and therefore in the financial model the revenues, operating costs and construction costs have been set up with a base date of 1st April 2023.

Eliott Higgins, Mohammed Elmezoghi, William Lockhart, Will Ryan, Chris Glover, Andrew Dougans (QMPF), Gavin Donaldson (QMPF)
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