Finance and Resources Committee

10.00am, Tuesday, 21 November 2023

Award of Contract for Pre-Development Services for the proposed Granton Heat Network

Executive/Routine	**Executive**
Wards	**4 - Forth**

1. Recommendations

1.1 It is recommended that Finance and Resources Committee:

1.1.1 Approve the award of a contract to deliver pre-development services for the Granton Heat Network to Vattenfall Heat UK Ltd; and

1.1.2 Note that the fee payable for pre-development services is £885,040. Should the pre-development works lead to a viable concession contract which is entered into with Vattenfall Heat UK Ltd, then this fee will be waived.

Paul Lawrence

Executive Director of Place

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Finance and Resources Committee

Award of Contract for Pre-Development Services for the proposed Granton Heat Network

2. Executive Summary

2.1 The City of Edinburgh Council has completed a procurement exercise to identify the most economically advantageous bidder for the delivery of a proposed Granton Heat Network under a concession contract. The concession agreement consists of a first stage appointment for the successful partner to deliver pre-development services to support the Final Business Case prior to progressing to signing a concession agreement. Should the pre-development period conclude in a viable Final Business Case (FBC), but the Council chose not to progress to the concession agreement stage, the Council will be liable to pay £885,040 as payment for the pre-development services delivered. The most economically advantageous tenderer has been identified as Vattenfall Heat UK Ltd.

3. Background

3.1 On the 5 October 2021, Policy and Sustainability Committee approved the Outline Business Case (OBC) for the Granton Waterfront Development. As part of this, Committee approved progressing the business case stages for a low carbon heat network that could serve the new development and provide the potential to connect to existing anchor loads within the area.

3.2 A Granton Waterfront Heat Network OBC was completed in March 2023 and is included at Appendix 1. This proposes a heat network utilising sewer source heat pumps with proposed connections to include existing facilities in the area (owned/operated by the Council, Edinburgh College, National Museums Scotland, and National Galleries of Scotland) and the new Council-led development at Granton Waterfront.

3.3 The OBC also concluded that the preferred route to delivering the heat network is a concession model on the basis this delivery structure brings private sector expertise along with achieving a high degree of risk transfer whilst retaining Council control over key aspects. Under this model, the Council would enter a 40-year design, build, operate, finance and maintain concession agreement with a private sector concessionaire. This model would involve transferring full delivery of the heat

network to the private sector including design, build, finance, operation, maintenance, metering, billing, sales and customer service. Full demand risk will be transferred with the operator's return on investment being achieved through heat sales but with the Council retaining control over key aspects including price controls and capped returns. The Council will also participate as a customer of the heat network and a facilitator of public sector connections. The Council anticipates that it will be possible to expand the network to connect more customers in the Granton Waterfront and surrounding areas and this will be the responsibility of the concessionaire.

3.4 Following completion of the OBC, procurement of a concessionaire commenced with the most economically advantageous tender to design, build, finance, operate and maintain the proposed low carbon heat network using a two-stage process.

3.5 The successful tenderer will initially be appointed to work with the Council and its Granton Waterfront Phase 1 pre-development partner for approximately a nine-month period under a pre-development contract. This will allow a FBC to be produced and presented to a future Finance and Resources Committee for approval to enter into a concession agreement and the delivery stage of the heat network. This approach has been devised as part of the Council's procurement strategy to reduce the burden of tendering as much as possible for tenderers and to encourage collaboration, innovation, risk apportionment, and partnership between the Council and the potential concessionaire.

3.6 This procurement includes the opportunity to supply heat from the low carbon heat network to the Council; other specifically named public sector bodies and any Registered Social Landlords with properties in the Granton Waterfront development or surrounding area.

4. Main report

4.1 On 18 January 2023, the Council published a Prior Information Notice (PIN) to commence market consultation to support the development of a procurement strategy for the delivery of the Granton Heat Network (the Network) under a concession agreement.

4.2 The market engagement consisted of market responses to a questionnaire and a follow up discussion. The aim of the market engagement was to identify if there was sufficient market appetite, capacity and experience and to identify the most appropriate route to market.

4.3 The market consultation identified that there was sufficient interest and a wealth of experience and knowledge in the Network, albeit this was limited, and a low number of responses were expected. The market also outlined a desire for the procurement process to be efficient and that creating early partnership with one organisation would be beneficial. The Council subsequently identified that the Competitive

Procedure with Negotiation and use of a pre-development period was the optimum strategy, and a Contract Notice was published.

4.4 The pre-development service requires the preparation of all surveys, design work, feasibility, consultation, statutory consents, identification and securing of customers and financial modelling associated with the Network. This will identify the financial viability of a successful heat network which presents best value to customers and a high-quality service provision associated with the operation, maintenance, metering, billing and management of the Network. Extensive consultation will be required with potential customers of the Network to ensure the financial viability which is highly reliant on other public and private sector partners purchasing heat from it.

4.5 The Contract Notice was published on 16 May 2023 via Public Contract Scotland inviting interested suppliers to submit the Single Procurement Document (SPD). The responses to the SPDs were assessed based on the tenderers experience, capacity, skills and qualifications, financial strength and their business ethics in relation to community benefits, sustainability and fair work practices. The top four scoring tenderers from this process were invited to tender.

4.6 The four tenderers were invited to tender based on a 70% quality, 30% price ratio. The ratio was determined as it was identified that the higher the quality of tender there was more opportunity to maximise on the delivery of a heat network that represents value for money heat tariffs for customers.

4.7 The Quality Award Criteria is contained within Appendix 2.

4.8 The Price Award Criteria consisted of a number of components: the cost payable to the tenderer by the Council should the pre-development period complete and the Council does not progress to a concession contract, a discount on the counterfactual heat tariff (in this case this is delivering low carbon through an alternative solution based on communal air source heat pumps), a score for the financial robustness and viability of their financial model and a score for their approach to raising the finance necessary to carry out the project.

4.9 The tender results, combining the quality scores and the price evaluation to derive an overall score for each supplier out of a maximum of 100, are:

Tenderer	Price Score 1 (out of 15)	Price Score 2 (out of 15)	Quality Score (out of 70)	Total Score
Vattenfall Heat UK Ltd	**8.09**	**11.50**	**54.25**	**73.84**
Tenderer 2	**15.00**	**9.00**	**46.50**	**70.50**
Tenderer 3	**8.36**	**8.00**	**47.00**	**63.36**
Tenderer 4	**7.62**	**6.00**	**36.50**	**50.12**

4.10 Price Score 1 consists of the score achieved for the submitted pre-development fee and the discount to the counterfactual heat tariff. Price Score 2 consists of the score achieved based on financial robustness and viability of the submitted financial model and a score for the tenderers approach to raising the finance necessary to carry out the project.

4.11 As Vattenfall Heat UK Ltd (Vattenfall) submitted the most economically advantageous tender, they are recommended for appointment.

4.12 The procurement process was a Competitive Procedure with Negotiation therefore the Council had the ability to undertake negotiation with the top three scoring tenderers based on the outcome of the tender process. It was deemed that best value had been achieved based on the outcome of the initial process and the content of the bids could not be improved in a manner which could justify a delay to commencing the pre-development period.

4.13 Vattenfall scored in the 'very good' to 'excellent' category for the response to all quality award criteria and the robustness and deliverability of its financial model. The financial response demonstrated that it had given detailed consideration to what costs would be incurred and how pricing structures would work. This was backed up by a robust financial model. Financing has been pre-arranged through Vattenfall's parent company.

5. Next Steps

5.1 Subject to Committee approval, the pre-development services contract will commence following a successful 10-day standstill period.

5.2 Once established, the contract will be managed by the Granton Waterfront Development team ensuring that effective contract management is delivered throughout the contract. A Contract Management and Handover Report, detailing the necessary steps and measures, will be produced and agreed.

5.3 It is envisaged that proactive contract management, to include robust monitoring of all appropriate management information, key performance indicators and budget/savings tracking will assist in the delivery of an effective and efficient service.

5.4 The output of the pre-development period will result in a FBC for the Heat Network which will be presented to Finance and Resources Committee alongside a Final Business Case for Phase 1 of Granton Waterfront regeneration, both of which are targeted for winter 2024/25.

6. Financial impact

6.1 There is no initial financial impact in relation to the contract related to pre-development services. The Council will be liable to pay £885,040 to Vattenfall should the pre-development period conclude in a viable FBC, but the Council chooses not to progress to the concession agreement. There is no cost to pay if the concession agreement is signed or following a gateway review (to be carried out six months from the commencement of the pre-development period), it is deemed the project will not produce a viable FBC. Should this cost fall to the Council, it will be met and contained from within the Phase 1 development budget as approved within the Granton Waterfront OBC. In this scenario, the Council will own the rights to any work undertaken in this period.

6.2 The viability of the heat network is dependent on securing grant funding from the Scottish Government's Heat Network Fund and on the Council's ability to secure government grant funding to cover the delivery gap on the wider Phase 1 regeneration costs. In relation to the former, the Council has submitted a bid for up to £19.9m of grant funding and this has received Heat Network Fund stage 1 panel approval. Confirmation of a finalised grant funding offer will be subject to further due diligence and approval of the FBC by the Heat Network Fund. On the latter, as set out in 8.4 below, the Council is addressing this through ongoing funding co-ordination discussions with Government Ministers and Officials.

6.3 The concession agreement, which will be subject to future Finance and Resources Committee approval as part of the FBC, will be for a maximum term of 40 years and will contract Vattenfall to construct, finance, operate, manage and maintain the Network through distributing and selling heat to customers of the network which will include Council tenants, public sector and private sector partners within Granton or the surrounding areas.

7. Equality and Poverty Impact

7.1 The Heat Network is proposed to provide financial savings to customers including Council tenants through reduced heat tariffs compared with an alternative low carbon counterfactual solution. Through this and a fabric first approach to Council-led housing delivery, tenants will live in well insulated, energy efficient homes which will support those facing fuel poverty.

8. Climate and Nature Emergency Implications

8.1 As the largest regeneration project of its kind in Scotland, Granton Waterfront represents a once-in-a-lifetime opportunity to transition towards a greener economy. Granton Waterfront will set the standard for sustainable growth and mark a step change in how development can positively influence how we go about our daily lives.

8.2 Through exemplar urban design it will champion low carbon transport, active travel, and net zero sustainable development, supporting the Council's commitment to build new affordable homes over the next 10 years, achieve net zero carbon by 2030 and address the emerging themes of the City Mobility Strategy and City Plan 2030. The Heat Network will provide a cost-effective mechanism for decarbonising the heat supply for existing and new residential and non-residential buildings at Granton Waterfront.

9. Risk, policy, compliance, governance and community impact

9.1 Vattenfall have committed to delivering the following community benefits during the pre-development period:

9.1.1 Work experience for pupils in S4-S6: A minimum of four work experience placements for school pupils or unemployed people during the pre-development period;

9.1.2 promote opportunities locally including hosting at least three meet the buyer events to promote opportunities for local companies and/or SMEs;

9.1.3 development of a placemaking strategy including wider activities to enhance greenspaces;

9.1.4 host community engagement consultation events; and

9.1.5 community consultation activity that is accessible and in existing community facilities with a purpose of strengthening community relations.

9.2 Vattenfall have committed to paying the Real Living Wage.

9.3 Vattenfall will appoint a Principal Designer who is responsible for planning, managing and monitoring the pre-construction phase of the project. The Principal Designer will work with other designers, contractors and the Council to consider the health and safety risks, and plan how to eliminate or control them.

9.4 The main risk to the project is the Council's ability to secure government grant funding both for the delivery of the heat network and to cover the delivery gap on the wider Phase 1 regeneration costs. This is because the initial viability of the heat network will be dependent on Phase 1 of Granton Waterfront regeneration building out over the next 6 to 7 years. This risk is being addressed through ongoing funding co-ordination discussions with Government Ministers and Officials which seeks to secure a funding solution through the use of existing allocations.

10. Background reading/external references

10.1 None.

11. Appendices

11.1 Appendix 1 – Granton Waterfront Heat Network Outline Business Case.

11.2 Appendix 2 - Summary of Tendering and Tender Evaluation Process.

Appendix 2 - Summary of Tendering and Tender Evaluation Process

Contract	Award of Contract for Pre-Development Services for the proposed Granton Heat Network	
Contract period (including any extensions)	9 months	
Estimated Contract Value (including extensions)	£N/A	
Procurement Route Chosen	Competitive Procedure with Negotiation	
Tenders Returned	4	
Name of Recommended Supplier(s)	Vattenfall Heat UK Ltd	
Price / Quality Split	**Price (30%)**	**Quality (70%)**
Evaluation Criteria and Weightings	**Question**	**Weighting**
	Delivery Methodology	12.5%
	Design Philosophy & Innovation	12.5%
	Sub-contracting and Supply Chain	5%
	Operations Methodology	10%
	Presentation	5%
	Proposed Team	5%
	Fair Work Management Information	Not scored
	Fair Work Practices	10%
	Community Benefits	10%

Evaluation Team	Programme Director, City of Edinburgh Council Principal Accountant, City of Edinburgh Council Senior Accountant, City of Edinburgh Council Accountant, City of Edinburgh Council External Advisors – Brodies LLP & Ramboll

Granton Waterfront

Heat Network Business Case

March 2023

Contents

1. Introduction

Project background and overview

1.1. The City of Edinburgh Council is seeking to deliver a low carbon heat network supplying the Granton Waterfront of Edinburgh. The heat network will have the potential to supply both the large-scale new development proposed in Granton Waterfront and customers from within the surrounding neighbourhoods, delivering a model with potential to be scaled up and replicated where appropriate across Edinburgh and more widely.

1.2. The Granton Waterfront is a 140-hectare brownfield ex-industrial neighbourhood located in an economically disadvantaged area of Scotland. Over the next 10-15 years, the Council is leading on a major mixed-use regeneration of Granton Waterfront that will deliver around 3,500 net zero homes (over 1,000 of them affordable), a primary school, a medical centre and over 9,000m2 of commercial, retail, and leisure space. In line with the target of Edinburgh achieving net zero carbon by 2030, the Council wishes to progress the delivery of a low carbon heat network that will supply cost-competitive heat from low carbon sources to new and existing households and non-domestic properties throughout Granton Waterfront and the surrounding area.

1.3. The aims of the low carbon heat network are twofold: (A) to provide a cost-effective mechanism for decarbonising the heat supply for existing residential and non-residential buildings; and (B) to help provide a cost-effective route to deliver net zero new build housing and commercial space at Granton Waterfront.

1.4. The Council has assessed various options for delivering a low carbon heat network at Granton Waterfront. In February 2022, the Council (working with the engineering practice Buro Happold) finalised an options appraisal and detailed technical feasibility study that identified a preferred solution for the heat source: a 4-megawatt heat pump utilising heat from sewers, with a ground-mounted solar photovoltaic (PV) array helping meet the pump's electricity requirements.

Scope of Business Case

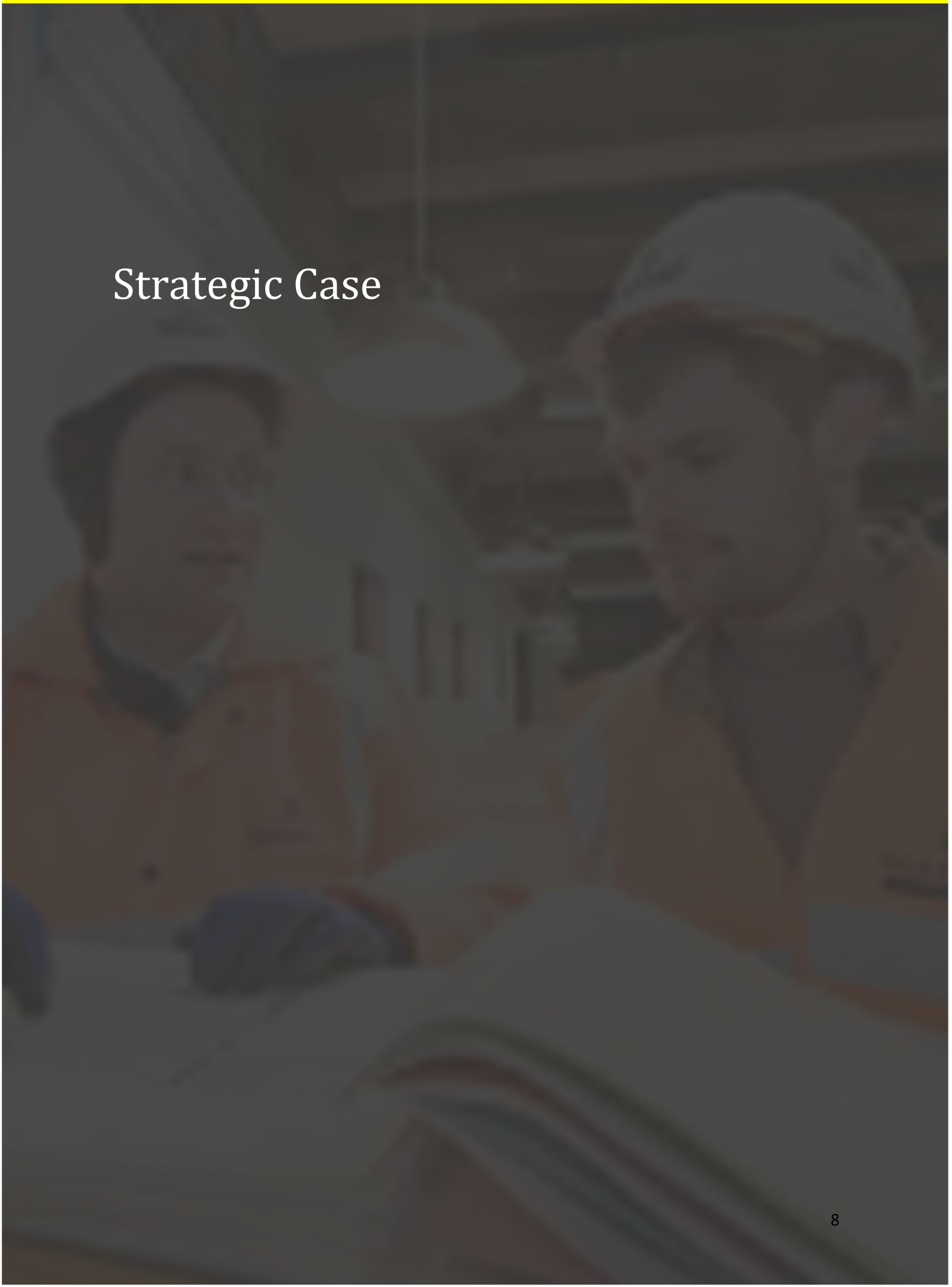
1.5. This Business Case has been developed in accordance with the HM Treasury Green Book guidance. It builds on the detailed technical feasibility study completed in early 2022. The elements of the Business Case are summarised below:

- A Strategic Case demonstrating the strategic fit of delivering a low carbon heat network project within local and national policy aims.
- An Economic Case demonstrating that the preferred option for delivering the heat network represents best value; this included techno-economic modelling to ensure that the preferred technical solution and preferred scenario is value for money and helps to fulfil the Council's strategic objectives. It has also been shown that the preferred scenario has a positive internal rate of return and net present value whilst also resulting in a comparable or potentially lower cost of energy when compared to a counterfactual.
- A Commercial Case demonstrating that there is a viable delivery structure and procurement and contracting strategy to deliver the Granton Waterfront heat network. The preferred project delivery structure is a private sector led concession model within a two-stage procurement process which is intended to bring the heat network operator on board earlier

to carry out the detailed development work, which may avoid abortive work by the Council and may shorten the overall delivery programme. This delivery structure and procurement method is deemed the most viable option in creating greater cost certainty whilst managing and sharing risk.

- A Financial Case demonstrating the attractiveness of a proposed heat network at Granton Waterfront to potential private sector investors. Modelling suggests that both the first phase of the proposed heat network and the full scheme would be self-financing. However, to be attractive to the private sector, a combination of public sector grant funding and a reduction in the total cost would need to be achieved. The cost of heat supplied would be in line with both gas and low carbon alternatives and as such relatively affordable to consumers; and
- A Management Case demonstrating that the Council has the resources and experience, and where required, will appoint suitable consultants to successfully deliver the proposed heat network and the associated wider regeneration of Granton Waterfront, ensuring targets in terms of cost, time, and quality are achieved.

Strategic Case



2. Strategic Case

Chapter summary

- A public sector-led regeneration project of the scale of Granton Waterfront provides an opportunity for Edinburgh and Scotland to help realise key sustainability targets through the introduction of a low carbon heat network. The proposed heat network will serve new and existing homes, along with commercial premises and public sector buildings within Granton Waterfront and in the surrounding areas.
- Granton Waterfront is identified in the emerging Local Heat and Energy Efficiency Strategy (LHEES) as an early action project that will help establish the technical and commercial principles for a wider roll-out of heat networks across Edinburgh.
- A climate emergency has been declared across Scotland. The current iteration of the Climate Change (Scotland) Act 2009, which was last amended in 2019, sets a statutory target of net-zero emissions of all greenhouse gases in Scotland by 2045.
- Statutory targets have been set around the reduction of fuel poverty in Scotland.
- Heat networks have been identified as a potential low carbon alternative to direct emissions heating systems such as gas boilers. Scotland has passed the Heat Networks (Scotland) Act 2021 in order to support the development of heat networks across the country.
- The fourth National Planning Framework (NPF4), adopted by the Scottish Ministers in February 2023, has designated "Edinburgh Waterfront" (including Granton Waterfront) as a National Development. One of the criteria in designating national developments is that the area in question will help to reduce emissions, contributing to Scotland's target of net zero emissions by 2045, and be emissions neutral or emissions negative.
- The Council's Business Plan and 2030 Climate Strategy both support the regeneration of Granton Waterfront, incorporating a low carbon heat network.
- The strategic rationale for the introduction of a low carbon heat network to serve Granton Waterfront and the surrounding area is presented within this chapter.

Introduction

2.1. The Strategic Case sets out the strategic rationale for investment in a low carbon heat network in Granton Waterfront: how the heat network will help Edinburgh and Scotland achieve key policy goals.

2.2. The overarching objective for the Granton Waterfront regeneration is to create a successful and sustainable place that addresses key needs in the city. This will be achieved through the delivery of a high-quality, mixed-use development providing space for people to live, work, and visit.

2.3. One of the core objectives identified for the Granton Waterfront regeneration within its Development Framework is to "deliver an integrated low carbon and climate resilient community centred on net zero carbon homes, active travel, and mass rapid transit." In addition, the Council (and other potential off-takers of the heat network) has corporate net zero objectives in respect of its own energy consumption, and the Council has set an ambitious target for Edinburgh to become a net zero city by 2030. A low carbon heat network will be a significant step towards

delivering these objectives and ambitions at a scale which will attract private sector investment, support scalability, and promote best practice.

2.4. In May 2019, the UK Climate Change Committee issued a report on the UK devolved administrations and its recommendations for carbon reductions, in line with the commitments made in the Paris Agreement. This report recommended that Scotland aim to be 'net zero' by 2045, in response to which the Scottish Government set a statutory target to achieve this goal and declared a 'climate emergency'.

2.5. The City of Edinburgh Council's City Plan 2030 aims to help deliver the Council's commitment to making Edinburgh a net zero city by 2030. As set out in the 2030 Climate Strategy, the energy used to heat and power Edinburgh's buildings currently accounts for around 68% of the city's total emissions. Given this, for Edinburgh to achieve the net zero target, carbon emissions from buildings must be reduced via a combination of making them more energy efficient (thus reducing their demand for heat) and meeting their heat demand using low and zero-carbon heating systems rather than direct emissions heating systems.

2.6. Heat networks are common in northern Europe. In Scotland they are currently less common; at present there are an estimated 1,080 heat networks supplying circa 1.18 TWh of heat to around 30,000 homes and 3,000 non-domestic properties nationwide. [1]

Decarbonisation of the UK electricity grid

2.7. The UK electricity grid is gradually decarbonising as a result of an increasing proportion of lower carbon and renewable technologies within the electricity generation mix. Policies aimed at limiting the use of carbon intensive fuels such as coal are assisting with decarbonisation. Carbon emission factors for annual reporting cycles produced by the government each year have shown significant reductions in the grid emission factor. Government forecasts show a continuing trend of grid decarbonisation,2 and the UK Government has committed to fully decarbonise the national electricity system by 2035.

2.8. Electricity supports the distribution of heat through heat networks and therefore decarbonisation of the electricity grid provides an opportunity to achieve net zero emissions at scale, helping the Council to achieve key sustainability goals.

National policies

Climate Change (Emissions Reduction Targets) (Scotland) Act 2019

2.9. Scotland has set statutory targets to reduce carbon emissions, requiring the country to reach net zero emissions by 2045, with interim targets of a reduction of 75% by 2030 and a reduction of 90% by 2040.

2.10. As part of a series of initiatives aimed at meeting these targets, the Scottish Government has committed to decarbonising the heating of homes and is setting out measures to ensure that

[1] Scottish Government Heat Networks Delivery Plan, 2022
[2] National Infrastructure Strategy, HM Treasury, 2020

from 2024, all newly built homes use only renewable or low carbon heating systems, rather than direct emissions heating systems such as gas boilers. The majority of homes being delivered at the Granton Waterfront regeneration will be built after this date, so the housing design and heating solutions must adhere to such requirements.

Heat Networks (Scotland) Act 2021

2.11. The Heat Networks (Scotland) Act 2021 introduces a regulatory regime for heat networks in Edinburgh and sets ambitious targets for the quantum of heat to be supplied by heat networks – 2.6 terawatt-hours of output by 2027 and 6 terawatt-hours of output by 2030: equivalent to 3% and 8% respectively of current heat supply. The targets are broadly equivalent to 120,000 and 400,000 typical homes currently being supplied from gas instead being connected to heat networks by 2027 and 2030 respectively. It has been quantified that the heat network project proposed would contribute 25,052 MWh/yr over its 40 Year lifetime.

2.12. The Heat Networks Delivery Plan provides guidance on development, capital programmes and the wider policy framework to implement the act.

Fuel Poverty (Target, Definition and Strategy) (Scotland) Act 2019

2.13. The Fuel Poverty (Target, Definition and Strategy) (Scotland) Act 2019 sets a statutory target that, by 2040, no more than 5% of households in Scotland (and in each local authority area) should be in fuel poverty; no more than 1% of households should be in extreme fuel poverty; and the median fuel poverty gap of households in fuel poverty should be no more than £250 (2015 prices). The Act sets interim national targets of 15%, 5%, and £350 by 2030 and 10%, 3%, and £300 by 2035.

2.14. For the purposes of the Act, fuel poverty is termed to be when a household spends over 10% of their net income after housing costs is spend on fuel needs where their residual income is less than 90% of the UK Minimum Income Standard. Extreme fuel poverty is where 20% of net income after housing costs is spent on fuel needs.

National Planning Framework 4

2.15. In February 2023, the fourth National Planning Framework (NPF4) was adopted by the Scottish Ministers. NPF4 designates “Edinburgh Waterfront” (including Granton Waterfront) as a National Development. National developments were designated by the Scottish Government on the basis that they will be emissions neutral or emissions negative, thus contributing to Scotland’s target of net zero emissions by 2045. The following NPF4 policies are directly relevant to the Granton Waterfront regeneration:

- Policy 19: Heat and Cooling. To encourage, promote and facilitate development that supports decarbonised solutions to heat and cooling demand and ensure adaptation to more extreme temperatures.
  Policy outcomes:
  - Development is connected to expanded heat networks which use and store heat from low or zero emission sources.
  - Buildings and places are adapted to more extreme temperatures.
- Policy 11: Energy. To encourage, promote and facilitate all forms of renewable energy development onshore and offshore. This includes energy generation, energy storage, new

and replacement transmission and distribution infrastructure, and emerging low-carbon and zero emissions technologies (including hydrogen and carbon capture utilisation and storage). Policy outcome:

- Expansion of renewable, low-carbon and zero emissions technologies.

Local policies

Edinburgh 2030 Climate Strategy

2.16. The City of Edinburgh Council has declared a 'climate emergency' and set a target of reducing emissions to zero by 2030. To achieve that goal, there is a need to improve air quality; protect and enhance green spaces; support sustainable travel; and continue to create energy efficient, good quality places to live and work.

2.17. The Council's 2030 Climate Strategy (and the associated Implementation Plan) was approved at the Council's Policy & Sustainability Committee in November 2021. The Climate Strategy sets out an Edinburgh-wide approach to reducing carbon emissions in Edinburgh by 2030. The key actions to reduce emissions are as follows:

- Unlocking and accelerating energy efficiency in homes and buildings;
- Enabling the development of a citywide programme of heat and energy generation and distribution infrastructure;
- Accelerating the decarbonisation of public transport;
- Renewing the focus on climate resilience and accelerating adaptation of the city;
- Supporting citizen empowerment, behaviour change, and community activism; and
- Supporting business transition and the green economy.

2.18. The Climate Strategy states that demand for energy is set to increase as Edinburgh's population grows and notes: "There is a need to ensure the city's energy networks can meet demand and provide clean, affordable energy for our citizens and businesses". The Climate Strategy has a strong focus on buildings, with "net zero energy generation and energy efficient buildings" being one of the key themes.

City Plan 2030

2.19. City Plan 2030 sets out the strategy for the spatial development of Edinburgh over the next decade. The proposed City Plan was submitted to Scottish Ministers for examination in December 2022.

2.20. Policy Env 7: Sustainable Developments of City Plan 2030 mandates that all detailed proposals involving the construction or change of use of one or more buildings must incorporate "all reasonably practicable measures to address the climate emergency". For change of use proposals, the applicant must set out how the proposal incorporates "measures to increase resilience to future climate change and minimise greenhouse gas emissions such as built fabric efficiency improvement and low and zero carbon generating technology".

2.21. Policy Env 8: New Sustainable Buildings of City Plan 2030 mandates that new building developments for which a building warrant is required must "[achieve], predominantly through ultra-high fabric energy efficiency, a 'net zero' level of operational greenhouse gas emissions", with this requirement to be controlled via planning conditions. The policy further states that "all

new development requires to embed ultra-high fabric energy efficiency into its design and construction, with the optimal approach being for it to be built to Passivhaus standards" and that "the incorporation of low and zero carbon generating technologies into the new development is also supported."

2.22. Policy Inf 16: Sustainable Energy and Heat Networks of City Plan 2030 states that "all new developments should connect to an existing or planned heat network or other significant heat source wherever possible to do so", that "where this is not possible then all substantial development must, subject to a viability and feasibility study, instead include a source of renewable/low carbon heat generation […] and associated heat network", and that any developments not heated through heat networks must be future proofed to allow a future connection to be made.

City of Edinburgh Council Business Plan

2.23. In February 2021, the Council published its Business Plan, Our Future Council, Our Future City, with an updated version approved in December 2022. The Business Plan covers the period 2023 to 2027. The Business Plan sets out three core priorities; "Becoming a net zero city", alongside "Ending poverty in Edinburgh" and to "Create good places to live and work". An outcome for delivery is "Edinburgh is a climate adapted city, with biodiverse green space, and cheaper cleaner networks for energy use" and includes the new development of climate ready regeneration in Granton Waterfront. The Business Plan also notes the need to develop city-wide heat and energy plans to expand renewable energy generation in the city.

Local Heat and Energy Efficiency Strategy

2.24. A Local Heat and Energy Efficiency Strategy (LHEES) is a long-term plan for decarbonising heat in buildings and improving energy efficiency across a local authority area. The central drivers of an LHEES are the statutory national targets of achieving net zero emissions by 2045 (with a 75% reduction by 2030, and 90% by 2040) and so far as is reasonably possible, eradicating fuel poverty by 2040.

2.25. The Council is in the process of preparing the LHEES for Edinburgh. The Council is under a statutory duty to publish the LHEES by 31 December 2023, along with a delivery plan that will cover the period 2024 to 2028.

2.26. The LHEES will comprehensively assess the existing building stock of Edinburgh and identify pathways for decarbonisation. These pathways are expected to include the delivery of new heat networks serving domestic and non-domestic off-takers in Edinburgh. The LHEES will undertake analysis of considerations such as heat demand, net zero heat sources, grid capacity, and potential anchor loads to arrive at recommendations for potential heat network zones in Edinburgh. These recommendations will help inform the formal designation of heat network zones in Edinburgh as part of the regulatory regime introduced by the Heat Networks (Scotland) Act 2021.

2.27. Granton Waterfront is identified in the emerging LHEES as an early action project that will help establish technical and commercial principles for the roll-out of heat networks across Edinburgh generally. The delivery plan will set out how the Council proposes to support the delivery of this and other heat networks in the context of the LHEES.

Granton Waterfront regeneration

2.28. Granton Waterfront is included within the City of Edinburgh Council's City Plan which aims to help deliver the Council's commitment to net-zero by 2030.

2.29. The development is strategically located in terms of the potential to utilise the environment for harnessing low carbon energy. The site is in north Edinburgh next to the Firth of Forth, and the development site has areas of large green space with potential for solar meadows. It is also located at the intersection of two major sewers. All of these existing resources represent vast potential sources of low carbon heat. In the absence of these resources, meeting heat demand via low carbon means would entail utilising less efficient means of low carbon heat generation (e.g., building-level air source heat pumps).

2.30. The Council has assessed various options for delivering a low carbon heat network. In February 2022, the Council (working with the engineering practice Buro Happold) finalised an options appraisal and detailed technical feasibility study that identified a preferred solution for the heat source: a wastewater source heat pump utilising heat from the sewers beneath Granton Waterfront.

Strategic objectives and benefits

2.31. In line with HM Treasury Green Book guidance, the strategic objectives associated with the project and the outputs and benefits stemming from these are summarised within the table below (Further information on how benefits will be measured and monitored is set out in the management case)

Table 1: Strategic objectives and benefits

Strategic objective	Output	Strategic benefit
Objective one: Meet heat demand in Granton Waterfront from net zero sources.	Delivery of a district heating network in Granton Waterfront that will supply heat and hot water to the new development and existing buildings utilising a zero direct emissions source of energy generation.	The heat network proposed will achieve carbon savings of approximately 5,166 tonnes of CO_2 over the 40-year period of assessment when compared to the counterfactual of communal air source heat pumps. The reduction will be significantly greater in the case of existing buildings currently heated using fossil fuels.
Objective two: Supply households and non-domestic customers in Granton Waterfront with affordable heat.	Delivery of a low carbon heat network and a fabric first approach to buildings will promote energy efficiency.	The unit cost of heat and hot water to end users through the heat network is assessed to be broadly comparable to the cost under a counterfactual of communal air source heat pumps.
Objective three: Contribute to a city-wide programme of heat generation, attracting private sector investment with the potential to scale up and replicate.	A heat network in Granton Waterfront will allow the new development and existing buildings to be connected to a low carbon energy source and will represent a step towards Edinburgh's target to be net zero by 2030.	Beyond the connections that have currently been identified, the heat network offers the opportunity to connect future new development and other existing buildings in the area maximising the potential to achieve Edinburgh's net zero carbon target. It also represents

Strategic objective	Output	Strategic benefit
		an opportunity in the future to expand, replicate and connect to other heat networks that may be developed across the city.
Objective four: Utilise Granton Waterfront's natural heat resources	The heat network will utilise a waste-water heat pump solution to extract heat from the existing sewer in Granton Waterfront.	Use of this resource provides an excellent source of existing heat that can be tapped into. Doing so would reduce carbon emissions compared with existing gas solutions. Using this resource also provides the opportunity to provide a centralised low carbon solution that minimises the footprint of infrastructure required across the Granton Waterfront regeneration area.

Risk

2.32. The greatest risks to the delivery of the heat network are set out below:

Table 2: Summarised risks

Risk description	Intrinsic score (0-25)	Mitigations	Residual score (0-25)
Failure to close the funding gap on the wider Phase 1 Granton Waterfront regeneration will delay proceeding with the heat network.	20	A Scottish Government funding co-ordination group has been established to help ensure the development meets key strategic targets germane to securing funding from current Scottish Government programmes. This group will consider the funding of the Granton Waterfront regeneration holistically to ensure that the separate component parts progress together.	15
Risk to programme and overall viability due to the concessionaire being unable to secure anchor load customers. This could delay the wider Phase 1 regeneration and delivery of the new homes and non-domestic properties that the heat network is intended to serve.	12	A Memorandum of Understanding is currently in place with key anchor load customers. There will be ongoing engagement with key anchor load customers by the Council during the procurement and pre-development stages. The Council will work with the concessionaire to ensure a competitive pricing strategy which will in turn ensure there is a customer base. The concessionaire will engage additional potential customers through the pre-development period. The emerging regulatory regime will help give confidence in terms of demand.	8
Risk to programme due to the concessionaire being unable to secure a heat offtake agreement with Scottish Water Horizons (SWH). This could delay the wider Phase 1 regeneration	10	The Council has undertaken early engagement with SWH as part of the business case preparation to understand parameters and requirements and help ensure that the solution meets needs.	5

Risk description	Intrinsic score (0-25)	Mitigations	Residual score (0-25)
and delivery of the new homes and non-domestic properties that the heat network is intended to serve.			
A concessionaire cannot be secured due to the internal rate of return not being attractive enough.	15	Progress a two-stage procurement process allowing a partner to take forward a pre-development period where design optimisation, heat supply negotiations and procurement of its supply chain can be progressed at the earliest opportunity. Scope bids to the Heat Network Fund and other funding opportunities.	10
Financial viability is not achieved due to an inability to secure the level of identified Scottish Government Heat Network Fund grant support required either due to not meeting their criteria for investment or their timescales for delivery (May 2026).	15	Continue dialogue and agree funding in principle with the Scottish Government. Progress a two-stage procurement process allowing a partner to work on design, heat supply agreements and procurement of its supply chain at the earliest opportunity to maintain delivery timescales.	10
The heat network is not operational in time for the first set of homes delivered within Phase 1 of the regeneration of Granton Waterfront.	12	A master programme will be maintained and managed by both the Phase 1 development partner and the concessionaire.	8
A lack of expertise or capacity in market means a suitable concessionaire cannot be identified and appointed.	12	Soft market testing has been carried out to ensure a procurement process is designed that is attractive to the market in a bid to ensure the best candidates come forward. The procurement process will be carried out as quickly and efficiently as possible, ensuring bidders remain in the process and do not leave for other competing market opportunities.	8
Concessionaire fails to operate successful HN	10	Robust procurement and pre-development period will allow for risk and mitigation at early stage.	5

2.33. The project risks are quantified in the Financial Case, considered how to be allocated in the Commercial Case, and managed in the Management Case.

Dependencies

2.34. The delivery of the heat network has areas of dependency as set out below where decisions are to be made outwith the scope of the project. It will be vital to manage these dependencies, particularly where transitioning from the development phase to the delivery phase to maximise connections from new developments and maximise commercial feasibility and viability. Dependencies will be managed through the framework as set out in the Management Case.

Table 3: Key dependencies

Affected activity	Key dependency
Delivery Programme – delay to development of Phase 1 of the Granton Waterfront regeneration and the delivery of new homes, commercial, primary school etc.	The Council requires to close a funding gap to enable Phase 1 of the Granton Waterfront regeneration to proceed. If the development agreement to take forward the construction of homes, commercial and supporting infrastructure is delayed due to an inability to secure required funds and produce a viable business case, this will have a knock-on effect of a delay to the appointment of a concessionaire for the heat network.
Delivery programme – delay to appointment of concessionaire to deliver heat network.	There is a requirement for the concessionaire to secure commercial agreements with key anchor customers and heat offtake terms with Scottish Water Horizons. Failure to achieve this within the required timeframe will delay the delivery programme.
Delivery programme – pipework and energy centre construction.	The programme of the Council – and its development partner, Cruden Group –for delivering Phase 1 of the Granton Waterfront regeneration will have a direct bearing on the delivery programme for the heat network including both the pipe laying and energy centre construction.
Design of energy centre.	The wider place making design of Phase 1 by the Council and Cruden Group will have a direct bearing on how the energy centre will need to be designed to successfully interact with its urban setting.
Pipework route.	The third-party anchor load connections that are secured will have an impact on pipework routes.
Commissioning - SPEN Primary Sub-station	The Council require SPEN to upgrade their current infrastructure to allow for the increased energy demand resulting from the new development. This requires a new primary sub-station within Granton to be built and operational in line with the construction of the energy centre and commissioning of the Heat Network.

Conclusion

2.35. The delivery of a low carbon heat network in Granton Waterfront will make a substantial contribution to key local and national policy objectives. As determined in the Economic Case, the Granton Waterfront heat network has the ability to save over 180,000 tonnes of CO_2 versus the counterfactual position over a 40-year period. The Granton Waterfront regeneration is fully consistent with, and supports the delivery of, key local and national strategic goals that will shape the future development of Edinburgh and the wider region, including:

- The statutory targets of making Scotland carbon neutral by 2045 and greatly reducing fuel poverty by 2040.
- Scotland's commitment to decarbonising the heating of homes to ensure that from 2024, all newly built homes use only renewable or low carbon heating systems, rather than direct emissions heating systems such as gas boilers.
- The Council's commitment to making Edinburgh net zero by 2030.

2.36. The City of Edinburgh Council Business Plan 2023-2027 which sets out three core priorities; "Becoming a net zero city", alongside "Ending poverty in Edinburgh" and to "Create good places to live and work". The Business Plan notes the need to develop city-wide heat and energy plans to expand renewable energy generation in the city.

Economic Case

3. Economic Case

Chapter summary

- The Economic Case sets out the rationale for the Granton Waterfront heat network project in terms of best value. It evaluates a number of different scenarios of connected buildings in a techno-economic model, and using a set of critical success factors that have been determined, a preferred option is chosen.
- The techno-economic modelling carried out suggests that the preferred technical solution and preferred scenario is value for money and helps fulfil the Council's strategic objectives.
- The preferred scenario has a positive internal rate of return (IRR) and net present value (NPV).
- The preferred scenario was taken forward as part of this economic case for further detailed financial modelling which determined the attractiveness of the proposed heat network from a financial perspective.

Introduction

3.1. The Economic Case sets out the process that was undertaken to identify a preferred option for delivering a heat network to serve the Granton Waterfront, including an options shortlisting and techno-economic analysis. A feasibility study, carried out by Buro Happold, identified sewer source heat pumps as the preferred technology and identified a number of demand profile scenarios based on varying numbers of connected customers. Each of these scenarios were modelled for their economic performance and a preferred option selected for further detailed modelling which would then input into the financial and commercial cases. Outline economic analysis was carried out using a techno-economic model, evaluating each scenario over a project life of 40 years.

Purpose

3.2. The purpose of the Economic Case is to identify the optimal solution to meet the targets set by the Council's strategic objective of delivering affordable heat through a low carbon heat network. The process of technical and economic assessment begins with identifying and agreeing the critical success factors to enable technical proposals to be quantitatively assessed. The critical success factors are used to reduce shortlisted options to a preferred option which can be finalised to evaluate value for money ahead of commercial and financial assessment.

Critical success factors

3.3. The Economic Case takes longlisted options and develops a shortlist of options and a preferred option based on critical success factors developed by the project team.

Shortlisted options

3.4. Shortlisted options are developed through techno-economic assessment to determine the demand for each scenario and the technical solution required to deliver the proposal to determine key economic inputs such as capital expenditure (CAPEX), operating expenditure (OPEX) and revenue. These inputs determine the cashflow for the scenarios. The shortlisted option which scores best in these critical success factors progresses to the preferred option stage.

Preferred option

3.5. The preferred option is the solution which performs best against the economic appraisal at shortlist stage. The economic factors derived at this stage are delivered to the Commercial Case and Financial Case sections of the business case to develop the proposal further.

Updating of shortlisted options

3.6. Prior to the preparation of this business case, the Council produced a feasibility study[3] for a heat network at Granton Waterfront. This used demand assumptions for existing buildings that could be connected to a heat network and anticipated new developments. The feasibility study determined that a sewer source heat pump solution was the preferred technology for a heat network when compared to the alternative low carbon options of air source heat pumps, sea source heat pumps, and electric boilers. The study devised a series of potential development and connection scenarios which, as part of this business case analysis and following further connection investigations, were assessed. These scenarios were:

- Scenario 1: Core, consisting of existing buildings and Phase 1 of the Granton Waterfront regeneration.
- Scenario 2: Core + East, consisting of the core existing buildings and new development and additional new development to the east.
- Scenario 3: Core + West, consisting of the core existing buildings and new development and additional new development to the west.
- Scenario 4: Combined, consisting of all existing buildings and all new development.
- Scenario 5: Granton Waterfront regeneration new builds only.

Table 4 shows the buildings connected in each of these scenarios.

Table 4: Building connections by scenario

Building	Scenario 1: Core	Scenario 2: Core + East	Scenario 3: Core + West	Scenario 4: Combined	Scenario 5: New builds only
Edinburgh College campus	✓	✓	✓	✓	
National Galleries of Scotland building	✓	✓	✓	✓	
National Museum of Scotland campus	✓	✓	✓	✓	
Forthview Primary School		✓		✓	

[3] Granton Energy Strategy Options Appraisal, March 2022

Building	Scenario 1: Core	Scenario 2: Core + East	Scenario 3: Core + West	Scenario 4: Combined	Scenario 5: New builds only
Ainslie Park Leisure Centre		✓		✓	
Craigroyston Community High School			✓	✓	
St David's RC Primary School			✓	✓	
Granton Waterfront regeneration new builds	✓	✓	✓	✓	✓

3.7. Figure 1 shows the heat network map for the fullest extent of the network (scenario 4), including the new builds within the regeneration area and the existing buildings. The different colours highlight the development phases of the Granton Waterfront regeneration.

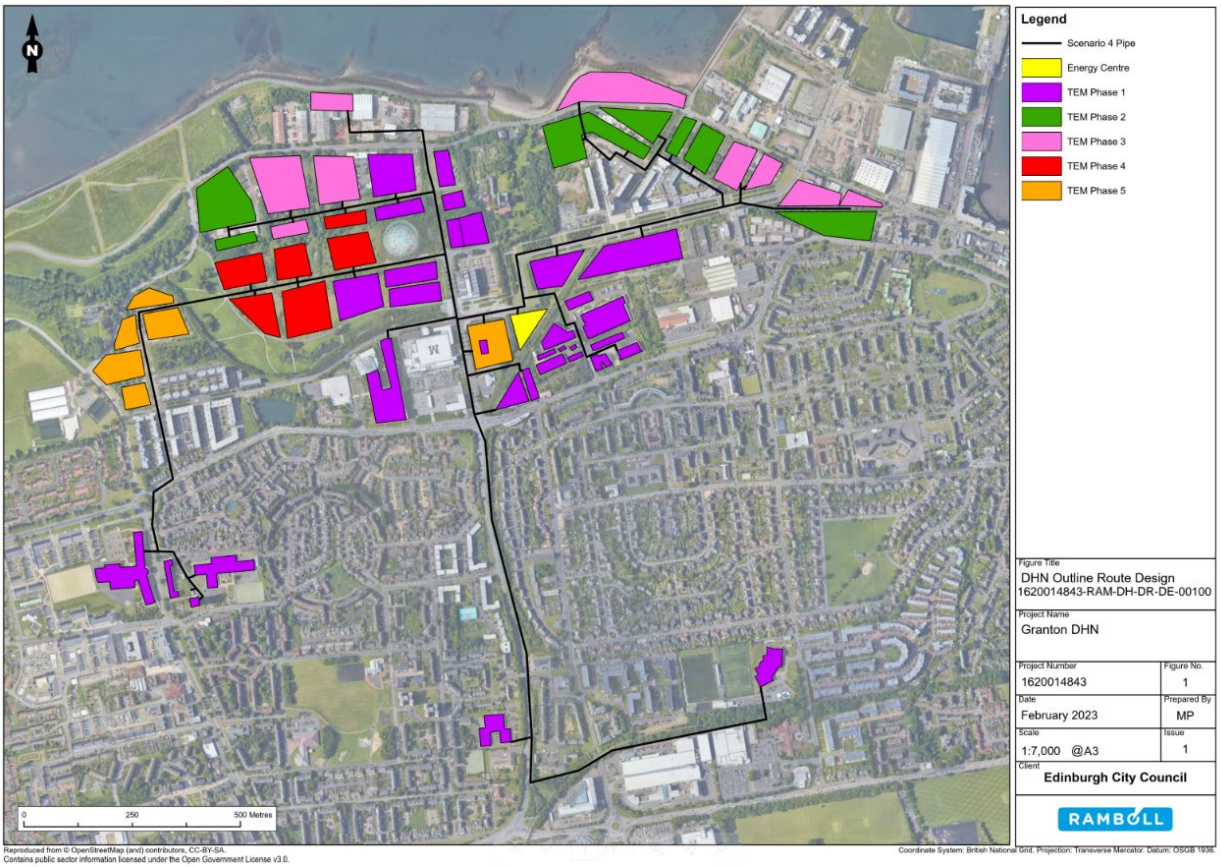


Figure 1: Granton Waterfront heat network phasing map

3.8. The scenarios in Table 4 were used as the basis for this economic case compared with a counterfactual scenario based upon an alternative low carbon method of heat delivery. The scenarios were appraised using critical success factors developed for the project and cost-benefit analysis in line with HM Treasury Green Book guidance.

Critical success factors

3.9. To evaluate the performance of each of the options quantitatively, critical success factors for the project were developed by the project team. The critical success factors are the attributes that are essential for the heat network business case to be delivered successfully; they are distinct from the project goals, projects objectives, and benefits. The five critical success factors for the Granton Waterfront regeneration are:

- **Meeting carbon emission reduction targets** – the anticipated lifetime carbon reductions delivered by the solutions as compared to one another and to the counterfactual (communal air source heat pumps). Measured as lifetime carbon emission reductions.
- **Combating fuel poverty** – where the solutions must demonstrate value for money (although factors other than the cost of energy like household income can impact this). Measured by levelized cost of energy.
- **Creating a project that meets financial viability criteria for investors** – assessing the viability of each of the options' cashflow models through determination of pay back term as well as NPV and IRR assessment to determine the viability of the options. Measured by NPV, IRR, and payback term.
- **Delivering a heat network in time for the Granton Waterfront regeneration phasing –** expected build-out timeline is in line with the Granton Waterfront regeneration to allow for heating on prior to occupancy. This is an essential criterion for determining the technical solution.
- **Spatial co-ordination** – heat generation can be physically accommodated within the available area provided within the development. A ranking by the anticipated energy centre land area required to meet the network demand.

3.10. The weighting of each critical success factor was developed by the project team through workshops and is shown in the final assessment (Table 11).

3.11. The levelized cost of energy and financial viability of the project were identified as the highest-ranking success factors for the continued development of a preferred option.

Techno-economic analysis

Technical assumptions

3.12. The completion date of each phase of the Granton Waterfront regeneration was updated based on the current anticipated timescales for delivering Phase 1 of the regeneration. The updated phasing and floor area for the development was combined into a diversified demand profile for each construction phase.

3.13. The existing building stakeholders provided heat and/or gas consumption data where possible and following site inspections an expected diversified load was developed. Appetite for the stakeholders to connect has been investigated along with the connection site suitability.

3.14. The operators of the Leonardo office and industrial complex at Crewe Road North, who formed part of the discussions at feasibility stage, were not forthcoming through this subsequent stage of stakeholder engagement and so for the time being, the demand associated with this complex has been discounted from the modelling work.

3.15. The National Galleries of Scotland (NGS) met with the project team to discuss "The Art Works", a future building on NGS' existing Granton Waterfront campus which is expected to be developed by 2025. It was found that the building is intending to be built to Passive House standards with temperatures and flow rates unlikely to be compatible with the heating network. For the time being, connection to this has also been discounted from the modelling carried out.

3.16. The existing high temperature loads identified and assumed for the network are:

- National Museums Scotland buildings B1, B14, B15, and B17
- Edinburgh College campus
- Craigroyston Community High School
- Ainslie Park Leisure Centre
- National Galleries of Scotland (NGS) existing building
- St David's RC Primary School

Table 5: Buildings by anticipated year of connection to heat network

Buildings	Connection year
2,864 new Homes (Phase 1- 4)	2026 - 2036
New commercial building (Phase 1-4)	2027 - 2032
St David's RC Primary School	2026
Craigroyston Community High School	2026
National Museums Scotland complex	2026 - 2032
Edinburgh College campus	2026
Ainslie Park Leisure Centre	2026
National Galleries of Scotland building	2026
New school	2027
Medical centre	2027
Granton Station enterprise hub[4]	2038
New commercial buildings (Phase 0)[4]	2038
519 new homes (Phase 0)[4]	2038 - 2041

3.17. The feasibility study had provided an energy centre configuration for full build out that met the anticipated demand. This was confirmed for this Economic Case with the updated demand profile through energy modelling.

3.18. The energy centre delivers heat through a sewer source heat pump (SSHP) sized at 4 megawatts and is supplemented by electric boilers which are sized at full peak capacity for resilience. Optimum utilisation of the heat pump is achieved through two 225m3 thermal stores which allows the base heat demand of the network to be met through the SSHP.

[4] Connection at end of existing air source heat pumps' useful life

3.19. The electrical demand of the Granton Waterfront regeneration area will be significantly increased by the requirement for the heating network energy centre and will require a new connection through Scottish Power Energy Networks. The proportion of this demand and the capital costs associated with the energy centre have been developed into a phased installation approach aligned with the wider Granton Waterfront regeneration including commercial developments and tram routes.

3.20. The distribution pipework required to meet the demands for the full build out was assessed and sized to meet the anchor loads connections and future developments in full. For assessment of the Core, West, East, and new build only scenarios, the pipe lengths were reduced to meet the furthest branch of the network, but their diameter retained in the assumption that future demand in the area should be expected beyond that assumed to connect in these scenarios.

3.21. The energy centre location is restricted to a relatively close proximity to the sewer extraction site. The sewer heat exchange supplier noted that they are not limited to distance but a preference for proximities below 100m was expressed through the design development as this will reduce design risk and the pumping distance for sewage.

3.22. In December 2022, the Council and its development partner Cruden Group proposed a relocation of the energy centre away from the feasibility site location towards a more industrial location on the site between Waterfront Avenue and the NMS buildings. The new proposal has been agreed with the project team. This not only reduces the pumping distance and therefore pump capacity required but could allow the wet well for sewer recovery to be located within the energy centre boundary. The exact final location is to be determined but an approximate boundary has been provided. Figures 2 and 3 show the indicative energy centre locations and size.

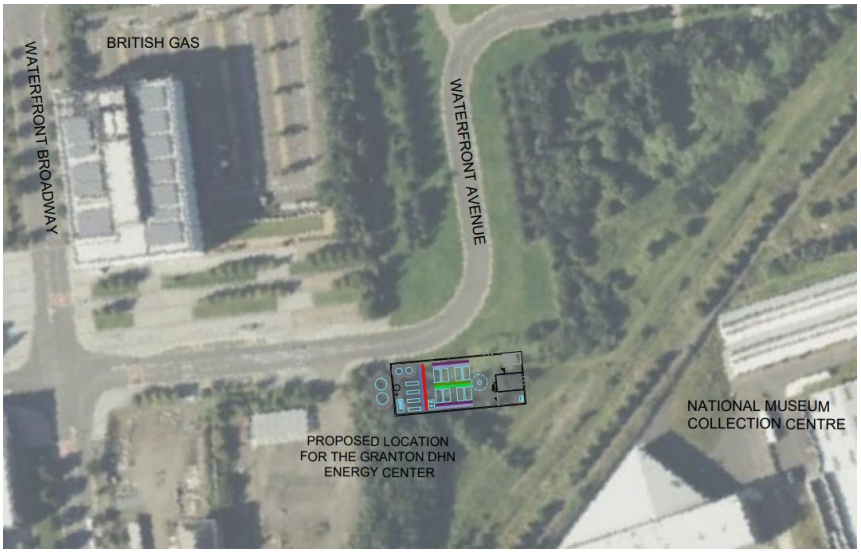


Figure 2: Proposed energy centre location (approximate)

Figure 3: Proposed energy centre location (sketch prepared by Cruden Group)

Methodology

3.23. For each of the shortlisted scenarios identified at paragraph 3.6, a bespoke, compliant techno-economic model was developed, to provide an initial economic assessment of the identified scheme options. The models took inputs from the concept design (RIBA stage 1). These include equipment schedules and details and energy modelling which were further developed to RIBA stage 2 to enable high-level modelling of costs and revenue stream areas for each scenario.

3.24. The metrics used to determine the financial cashflow performance of the project are the net present value, internal rate of return, and payback term. Note that these are pre-tax which is addressed in the Financial Case.

- A Net Present Value (NPV) - compares the amount invested to the future cash amounts after being discounted by specific rates of return. A discount factor of 3.5% has been utilised for all options as the base assumption for the first 20 years, dropping to 3% thereafter.
- Internal Rate of Return (IRR) – indicates the financial performance of a project and is the discount factor required to break even on the project duration. Due to the discount factor used on NPV calculations, a project IRR of 3.5% would result in a 40-year project NPV of approximately £0.
- Payback Term (PBT) (Discounted) – Indicates the number of years required to break even on the project.

3.25. The model also estimates CO2 savings against the counterfactual and social NPV and IRR which includes the remedial value of the project's impact on carbon emissions.

3.26. The counterfactual for this project has been agreed with the Council and its development partner Cruden Group to be the installation of communal air source heat pumps at block level. The counterfactual for this project has assumed installation at 1 MW increments per block and used a notional estimation of the building works, pumping, and ancillaries required per block.

3.27. The heat network market is currently unregulated (albeit regulation is emerging as a consequence of the Heat Networks (Scotland) Act 2021) and so heat tariffs for heat network customers are usually assessed based on the prevailing costs of heat supplied by other means, which are represented by the counterfactual scenario.

3.28. An initial estimation of the heating tariff for the heat network has been derived based on the cost required to deliver the same amount of energy without the heat network.

3.29. The use of the counterfactual cost of energy as heat network tariff calculation allows for a baselined comparison of the cost of the heat network to the counterfactual and an estimation of the reduction in cost to operate the heat network determined. Throughout the project the cost of energy for the counterfactual has been termed the levelized heating tariff (LHT) as it is the cost that would otherwise be incurred and is used as the revenue stream to support the heat network.

3.30. Levelized Cost of Energy (LCOE) is the rate at which consumers must be charged for the solution to meet the costs to operate the network and recover costs over 40 years only. LCOE is broken into three components:

- Variable charge – this is a £/kW rate which must be charged to pay for fuel costs of the network (OPEX).
- Fixed charge – this is a £/kW rate which must be charged to cover replacement expenditure (REPEX) including lifecycle costs for the network.
- Connection charge – this is a £/kW rate which must be charged to pay for the capital costs (CAPEX) associated with connection to the heating network. For this project at the preferred option stage, it was determined that residential customers will not be subject to this rate and that it will instead be paid as a single connection fee at the time of connection by the developer of the building to further meet the critical success factors of delivering low cost and low carbon heat to residences.

3.31. Levelized Heating Tariff (LHT) **–** This is the term used to refer to revenue available by applying the LCOE (cost of energy) for the same scenario but where heat is delivered via the counterfactual communal air source heat pump and equates to the avoided cost of operating a more efficient system. The levelized heating tariff is the revenue generated by the higher LCOE required to satisfy the heat demand through the use of the counterfactual communal air source heat pump divided by the total demand and is calculated separately for each scenario.

Modelling assumptions

3.32. Modelling assumptions around key financial criteria are summarised in Table 6 below.

Table 6: Modelling assumptions

Item	Assumption
Capital expenditure (CAPEX)	Based on Ramboll's (technical consultant) internal supplier database and quotes received specific to the Granton Waterfront regeneration project. CAPEX refers to energy centre build, solar PV, thermal stores, heat pumps, heat exchangers and pumps along with all energy centre equipment required for an operational energy centre, buried pipework, and electrical upgrades to the network.

Item	Assumption
Replacement expenditure (REPEX)	
Electric boiler	80% of CAPEX after 15 years
Water source heat pump	80% of CAPEX after 20 years
Sewer heat exchanger	80% of CAPEX after 20 years
Solar PV	80% CAPEX after 30 years
Pumping equipment	100% of CAPEX after 20 years
Water treatment and pressurisation equipment	100% of CAPEX after 20 years
Heat substations	100% after 20 years
pipework and thermal store	100% after 60 years
Secondary system upgrades	Cost by others
Operation and maintenance expenditure (OPEX)	Based on a database of supplier data gathered by Ramboll in several previous heat network projects.
Huber SSHP	2% CAPEX
Parat electric boilers	1% CAPEX
Water treatment	£/annum
Thermal store	2% CAPEX every seven years
DH network variable operation and maintenance	1.5% CAPEX
Solar PV	1% CAPEX

3.33. District heat network variable O&M – A percentage is included within the CAPEX calculations to include potential uplifts, overheads, and contingencies that will be required to deliver the project. These are presented in Table 7.

- **Builders work in connection (BIC)** is an allowance made for works such as building access, clearance, lighting, and painting.
- **Contractor costs** are costs associated with delivering the works such as materials, equipment, deliveries, and labour.
- **Optimism bias** is based on Green Book guidelines for construction projects and was set at 20%.
- **Contingency** is a factor applied to account for cost uncertainty at this stage of proposal. Workshopping with the project team has determined it be set to 20%, for a combined 40% uplift in price to allow for optimism bias and uncertainty.
- **Preliminary works** are works required to complete a project that do not form part of the completed work such as building preparation, site setup, making good of services and similar activities required prior to works that do not fall within contractor costs.

Table 7: Heat network variable operating and maintenance costs

Item	Energy centre items	Network and substations items
Builders work in connection	5%	5%
Testing and commissioning	5%	5%
Consultancy fees	8%	8%
Design costs	10%	10%
Contractor costs	10%	10%

Item	Energy centre items	Network and substations items
Project management and legal costs	5%	5%
Contingency	20%	20%
Preliminaries	15%	15%
Optimism bias	20%	20%

3.34. The economic life of the project is set to 40 years, with initial investment assumed to take place in year 0. It should be noted that financial years (April to March) have been used in the energy modelling and TEM. A 40-year project life cycle has been selected in line with industry best practice (e.g. as used in the Green Heat Network Fund).

3.35. The investment required to connect the building to the heat network is assumed to take place the year before heat is required. The regeneration is broken into four phases, but for the purposes of the modelling, the unit completion per year has been used as the phases span multiple years with different domestic, non-domestic and school heating demands. Demand is therefore assumed to be delivered in phases completing annually from 2026 to 2036 with final connection completing in 2041.

3.36. No VAT is included for any costs. No cost of borrowing is included, nor a sinking fund (sinking fund is money continuously set aside for future expense or emergency cover; this is a usual mechanism in special purpose vehicles to manage cashflows). Bad debts are not included through the cashflow calculation in the economic model.

3.37. OPEX, REPEX and operating and maintenance costs are included.

3.38. The modelling includes indexation for fuel and heat sale prices, CO2 content of the grid based on projections, and air quality impact projections published by the former Department for Business, Energy, and Industrial Strategy.

3.39. Heat extracted from the sewer is charged at a rate of £6 per MWh based on energy cost proposals supplied by Scottish Water Horizons for this project.

3.40. Electricity day and night tariff rates are based upon UK average variable unit costs and fixed costs for “Economy 7” electricity in 2019 as published by the former Department for Business, Energy, and Industrial Strategy.5

3.41. Costs of Electricity generation are based on the the medium band prices of fuels purchased by non-domestic consumers in the UK as published by the former Department for Business, Energy and Industrial Strategy.,6

[5] assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49374/qep224.xls (table 2.2.4)

[6] https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector (table 3.4.1)

Scenario economic appraisal

3.42. The critical success factors for this project are not limited to CAPEX, OPEX or REPEX independently and are tied to the performance of the cashflow including the levelized cost of energy to provide beneficial IRR and NPV. Key economic performance indicators derived for the five scenarios are shown in Table 8, comprising of LHT, LCOE, NPV and IRR calculated over the project period of 40 years.

3.43. The summary in Table 8 below shows that all five scenarios have a positive IRR and NPV and so are viable compared to the counterfactual scenario. The IRRs below are preliminary and refined in the later sections.

3.44. A graphical representation of the cashflow comparison for revenue and expenditure is shown in Figure 4. This demonstrates how little variance there is in the expenditure and how valuable increased revenue through additional connections are.

Table 8: Shortlisting Scenario expenditure summary

Item	Scenario 1: Core	Scenario 2 Core + East	Scenario 3: Core + West	Scenario 4: Combined	Scenario 5: New builds only
CAPEX (£m)	40.408	43.618	43.618	45.368	39.631
Levelized heat tariff (£/MWh)	248	244	247	243	276
Levelized cost of energy (£/MWh)	202	193	199	199	251
NPV (40 years) (£m)	16.262	18.324	17.320	18.495	3.749
IRR (40 years)	5.8%	6.2%	6.1%	6.2%	4.1%
Discounted payback (years)	25	25	25	24	36

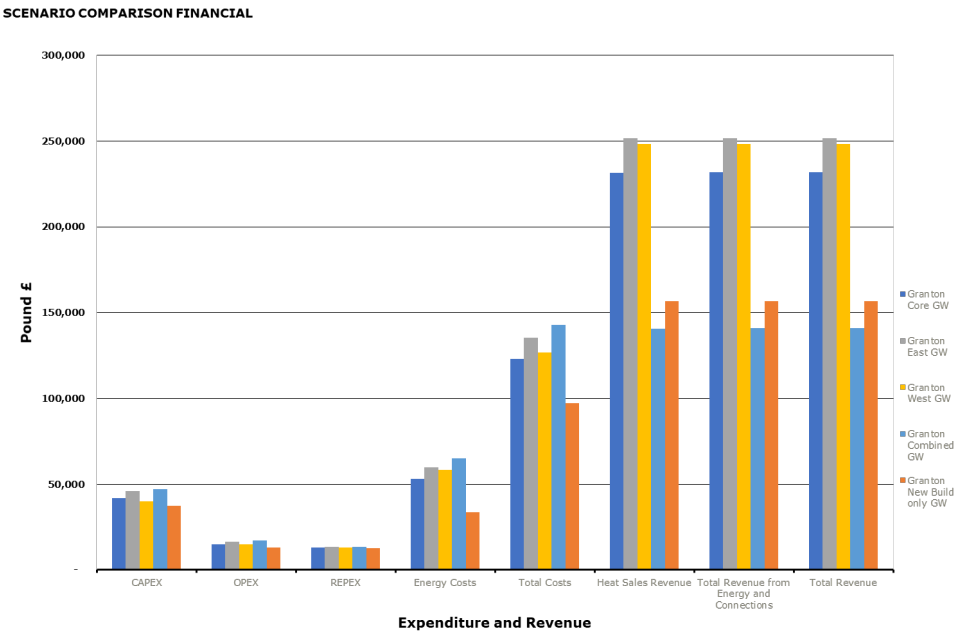


Figure 4: Shortlist Cashflow Comparison

3.45. The heating tariff for each scenario is higher than scenarios considering conventional heating plant (gas), however when compared to the higher energy costs of an all-electric counterfactual (air source heat pumps at communal level) the costs are in the favour of the economies of scale afforded by a heat network.

3.46. The critical success factor of reducing property energy costs opened the discussion around reducing the heating tariff for residential customers through the removal of connection charges, on the assumption that connection charges will be paid on connection completion by the developer for the connected building.

3.47. In line with the desire to measure the impact of cost to residential, commercial, and school energy costs, the economic model was adapted to derive the breakdown of component energy costs for each of the connection types. Table 43 to 46 in Appendix 1 show the counterfactual and individual scenario cost of energy when separated into the three main demand categories - residential, schools, and non-residential for comparison to the expected LCOE for each. The tables also show the overall scenario cost of energy and the resulting heating tariff when compared to the counterfactual revenue. Each table demonstrates that each of the connection types in each of the scenarios results in a lower cost of energy for the scenario when compared to the cost of energy for the counterfactual. Each table also summarises the overall levelized costs of energy for the scenario and the derived heating tariff to indicate the viability of providing energy at a lower cost when compared to the counterfactual.

3.48. A summary of the resulting LCOE for the counterfactual and each scenario's residential component is shown in Table 9. Each scenario's LCOE remains below the counterfactual costs and the removal of the connection components shows a further reduction in the cost of energy for each residential/domestic consumer. In practice this results in a lower heating tariff for the consumer with the same revenue for the project.

3.49. The connection charge is also recorded to be lower for the counterfactual, but this is outweighed in the levelized energy cost by the lower operating and maintenance costs attributed to the heat network.

3.50. In terms of cashflow, the heating tariff average over the network connection types in either scenario remains the same while the time and rate of revenue is varied resulting in a change in IRR, NPV and payback term. The economic modelling at this stage has assumed the proportional charge for consumers as per Table 9. The final breakdown of tariffs is further refined in the financial model.

Table 9: Summary of residential LCOE less connection charge for scenario versus the counterfactual position

	Core		West		East		Combined		New Build	
	LCOE Scenario	LCOE Counterfactual	LCOE Scenario	LCOE Counterfactual	LCOE Scenario	LCOE Counterfactual	LCOE Scenario	LCOE Counterfactual	LCOE Scenario	LCOE Counterfactual
Connection (capital) Cost **(£/MWh)**	96.75	51.55	92.57	51.25	93.13	51.55	91.02	51.25	136.30	51.55
Variable (energy) cost **(£/MWh)**	65.44	78.30	67.79	78.32	68.16	78.30	70.20	78.32	59.32	78.30
Standing (O&M)) **(£/MWh)**	32.84	179.68	31.45	178.83	31.34	179.68	30.47	178.83	45.16	179.68
Total costs **(£/MWh)**	195.03	309.52	191.81	308.40	192.62	309.52	191.69	308.40	240.78	309.52
Domestic without connection **(£/MWh)**	98.28	257.98	99.24	257.15	99.49	257.97	100.67	257.15	104.48	257.97

3.51. The final critical success factor for comparison is the lifetime carbon impact of each of the proposals. A summary of the carbon reductions when compared to the counterfactual are presented in Table 10 below. The "Combined" scenario saves the greatest amount of CO_2 over the project lifetime due to delivering the largest number of connections.

Table 10: Shortlist lifetime CO_2 savings vs gas boiler

Scenario	t/CO2 saved
Core	163,578
Core + East	175,633
Core + West	173,082
Combined	185,233
New builds only	116,514

3.52. Each of the shortlisted options were weighted and evaluated against the defined critical success factors and their associated weighting, a summary of the findings is shown in Table 11.

Table 11: Shortlist scoring against weighted critical success factors

Weighting scoring criteria	Ranking by LCOE 25% score	Ranking by IRR 7% score	Ranking by NPV 7% score	Ranking by Payback Term 7% score	Ranking by Time to beneficial use 25% score	Ranked by Spatial Requirements 10% score	Ranked by carbon emissions 20% score	Final ranking
Scenario 1: Core	4	4	4	1	1	2	4	4
Scenario 2: Core + East	3	1	2	2	1	2	3	3
Scenario 3: Core + West	1	3	3	3	1	2	2	2
Scenario 4: Combined	1	1	1	1	1	2	1	1
Scenario 5: New builds only	5	5	5	5	1	1	5	5

3.53. Each of the core development proposals require an energy centre with little variation in physical size to meet the heat demand of the heat network and so score evenly against this critical success factor (spatial requirements).

3.54. Scenario 5 (new builds only) identified a significantly higher LCOE as a result of lower demand profiles for the new build properties. This would bring the heat network solution cost of energy to a cost greater than the counterfactual communal heating systems at block level and is thus not considered a viable solution.

3.55. The higher energy cost for new builds only highlights network reliance on the existing buildings as anchor loads as the lower energy demand profile of the new build scenario is insufficient to make full use of the heat network infrastructure.

3.56. The critical success factor exercise identified scenario 4: combined as the best option for the heat network; scoring highest in the weightings attributed to the revenue viability criteria.

3.57. The combined scenario is also shown to have the greatest carbon emissions impact when compared to the gas boiler counterfactual, this is reflected in the social LCOE developed in the TEM model but is not necessarily required to validate the commercial case. This is the scenario that is taken forward to preferred option development.

Preferred option techno-economic development

3.58. The "combined" scenario was identified as the preferred option to be carried forward for final cashflow, commercial, and financial development due to its performance against the project's critical success factors. This further development will update the scenario's key economic indicators (such as NPV and IRR) as well as carbon emission savings and social impact. These indicators can then be used to analyse the preferred scenario against an alternative low carbon counterfactual scenario and will provide the basis for the Financial Case.

3.59. Capital costs, risk allowance and pipework routing were adjusted in line with further supplier engagement to provide greater accuracy in the Economic Case.

3.60. Electrical connection costs associated with the heating network full build out were added in phases to align with the Granton Waterfront phased installation and the demand of the energy centre required to meet each phase.

3.61. Assumptions for CAPEX, OPEX and uplifts remained as per Table 6.

Cashflow

3.62. A summary of the capital cost for the heat network can be seen in Table 12; a summary of expenditure is shown in Table 13.

Table 12: Summary of preferred option capital costs

Cost item	Cost (£m)
Energy centre equipment CAPEX	17.327
Network CAPEX	15.652
Total extra energy centre and network costs (uplift rates as per Table 7)	18.196
Risk uplifts	13.192
Total (ex VAT)	**64.367**

Table 13: Summary of expenditure

Expenditure item	Cost (£m)
Nominal capital costs	64.367
Nominal annual O&M costs	15.829
Nominal total REPEX	13.647
Total energy cost	54.909
Total expenditure	148.752

Table 14: Summary of Revenue

–Revenue source	Cost (£m)
Heat sales revenue	205.150
Capital funding revenue	-
Total revenue from energy and connections	205.293
Total revenue from funding and incentives	6.064
Total revenue	**211.357**

3.63. Revenue assumptions remain as per the original scenario modelling with the modification of connection costs for residential properties. Residential connection costs are assumed to be paid in full in the year of connection for all domestic properties. While connection charges for non-domestic buildings continue to be modelled as a component of the heating tariff, it is expected that the new primary school connection may also be paid in the year of connection. This has been developed in the financial model presented in the financial case and has a minimal impact on the IRR and NPV presented in this economic case, as the charges in the heating tariff are adjusted to take account of the time value of money.

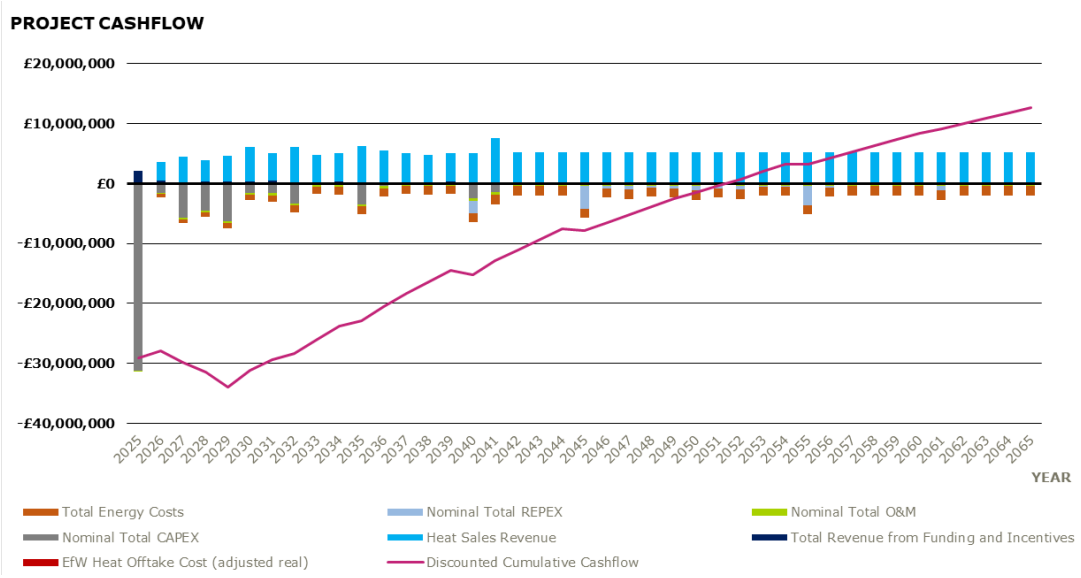


Figure 5: Preferred option cashflow

3.64. Table 14 and Figure 5 compare the key revenue factors of the preferred option to the counterfactual. The key savings to the installation of the heating network result in a more beneficial levelized cost of energy and resultant revenue.

3.65. Table 15 shows that when compared to the counterfactual communal ASHP option there are comparatively higher carbon emissions. This is as a result of the use of electric boilers to meet

the demand for the site. The counterfactual assumes the same demand us met through a heat pump which operates with a higher efficiency at higher capital cost.

Table 15: Preferred option CO_2 comparison

Option	CO_2 emissions (tonnes) per annum	Equivalent to gas
SSHP heat network	10,839	6%
Communal ASHP counterfactual	6,755	4%
Gas boiler counterfactual	181,537	100%

3.66. Figure 6 illustrates the comparison in costs for the heat network versus the counterfactual. While the CAPEX of the heat network is higher for the heat network, the OPEX and REPEX is lower. The energy cost is comparable for the two.

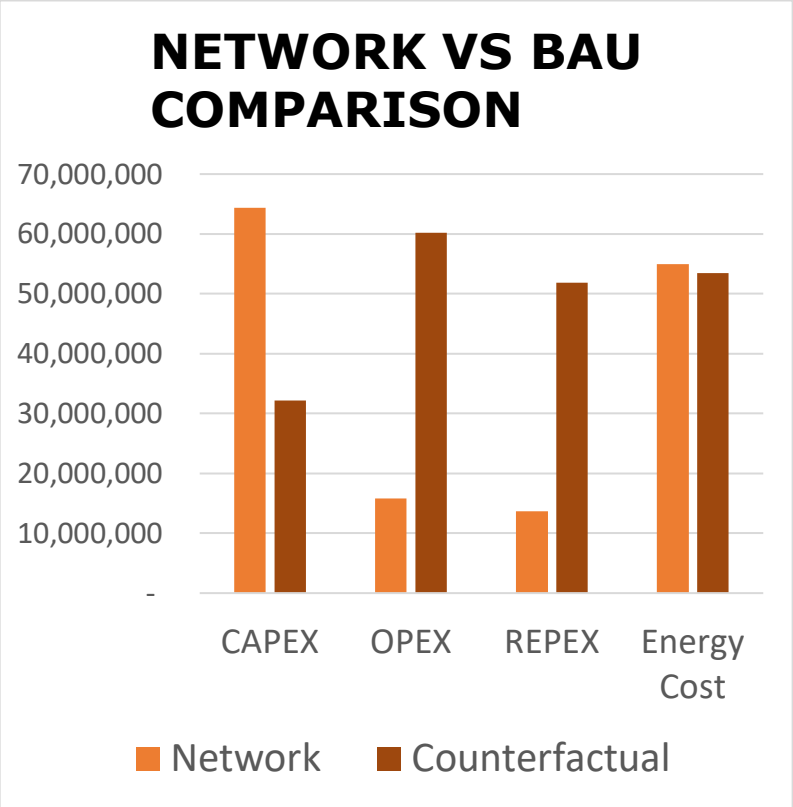


Figure 6: Preferred option revenue comparison

3.67. Table 16 shows the preferred option and counterfactual LCOE comparison to bring into focus the benefit to revenue that can be achieved through use of the preferred option as a whole through the network.

3.68. The cashflow uses the counterfactual LCOE against the cost of energy for the scenario to generate revenue. The lower OPEX and REPEX figures result in a lower fixed cost for the scenario which over the 40-year term results in a lower cost of energy.

Table 16: Preferred option LCOE comparison

Heat sales/LCOE comparison (£/MWh)	Total LCOE	Variable component	Fixed component	Connection component	Total LCOE after uplifts
Preferred option	236	65	33	138	236
Counterfactual	254	64	122	68	254

3.69. A summary of the key economic assessment factors is shown in Table 17. The summary shows that the preferred network has a positive IRR and NPV at 40 years without external funding or investment. Additionally, the heat network LCOE is lower than the counterfactual LCOE, which means that the heat network has the benefit of providing energy for a lower cost and has the potential to recover capital costs at a higher rate by charging up to the avoided costs figure.

Table 17: Average Economic Assessment Results

Metric	Value
CAPEX (inc. VAT) (£m)	64.367
Levelized heat tariff (£/MWh)	254
Levelized cost of energy (£/MWh)	236
NPV (40 years) (£m)	12.630
IRR (40 years) (%)	5.3%
Discounted payback (years)	27
Saved CO_2 Emissions year 40 vs gas boilers (tonnes)	170,697
Saved CO_2 Emissions year 40 vs ASHP Counterfactual (tonnes)	(4,081)

3.70. Social NPV and Social IRR values consider the net benefit of heating costs, emissions savings, and air quality advantages versus the counterfactual. Social NPV and IRR are evaluated against the ASHP counterfactual to show the difference in electrical options and against individual gas boilers. Table 8 shows the project's economic performance (base) along with the social values when heating cost, emissions and air quality benefit/cost are quantified for both a gas boiler counterfactual and ASHP counterfactual. The social impact compared to gas boilers is significant due to the much higher heating cost which the benefits from lower emissions and air quality improvements do not make up for. For the ASHP counterfactual, the impact of the social costs is comparatively lower due to lower variations in heating cost and emission savings.

3.71. Social assessment has determined that the counterfactual of ASHP at communal level is more expensive to install but has a lower environmental impact. The cost of the increased environmental impact through the SSHP adoption is measured and deducted from the NPV and found to still result in a higher NPV for the scenario and thus proving value for money.

Table 18: Social values for network against counterfactual positions

Metric	Base	Social (gas boiler counterfactual)	Social (ASHP counterfactual)
NPV 40 years (£m)	12.630	(63.987)	6.590
IRR 40 years (%)	5.3%	(10%)	5%

Sensitivity analysis

3.72. Sensitivity analysis for the key project criteria has been carried out to determine the effect of any variation in these criteria to the IRR of the project, as a measure of the project's ability to pay back within the project term and profitability.

3.73. Sensitivity assessment of the below criteria has been carried out to measure the impact of either an increase or decrease in value of 30%, 20%, or 10%. The impact on the IRR for each of the sensitivities at 40 years is shown in Table 19 and summarised in Figure 7.

3.74. An IRR lower than 5.3% performs worse than the preferred option, and an IRR of 3% represents a project which does not break even in the 40-year period.

Table 19: Resulting IRR from sensitivity analysis of key project criteria

Key project criterion	Resulting IRR compared to base case of 5.3%						
	-30%	-20%	-10%	0	10%	20%	30%
CAPEX	9.8%	7.9%	6.5%	5.3%	4.4%	3.6%	2.9%
Energy demand	1.7%			5.3%			-1.9%
Residential variable heat price	4.7%	4.9%	5.1%	5.3%	5.5%	5.7%	6.6%
Residential standing	3.9%	4.4%	4.9%	5.3%	5.8%	6.2%	6.6%
Electricity price change	5.3%	6.0%	5.7%	5.3%	5.0%	4.6%	4.3%
Grid export price	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%

3.75. Sensitivity analysis has found that the preferred option is critically sensitive to:

- CAPEX increase by ≥30%, resulting in an IRR of 2.9%
- Variation to energy demand, a reduction of 30% results in an IRR of 1.7%

Impact of five year delay

3.76. The Council identified a notional risk of delayed connection of some of the demand scenarios. It was decided that a sensitivity of the model to the potential delay to investment and build out of the second phase by five years be carried out. For the purposes of the sensitivity testing, it has been assumed that development ceases through 2030-2034 and that capital expenditure and revenue are delayed until 2035 to determine the impact of delay on overall cashflow, the sequencing of following developments remain sequential in line with the preferred option scenario.

3.77. Cashflow for the preferred option and the five year sensitivity are represented in Figure 7, the impact of the loss of revenue due to a delay of Phase 2 does not have a significant impact on the payback term with only a 0.1% change in IRR and £465,000 increase in NPV.

Table 20: Five year delay economic performance comparison

Economic assessment comparison	Preferred option	Five year delay
Levelized heat tariff (£/MWh)	258	251
Levelized cost of energy (£/MWh)	236	235
NPV 40 years (£m)	12.630	13.095
IRR 40 years (%)	5.3%	5.4%

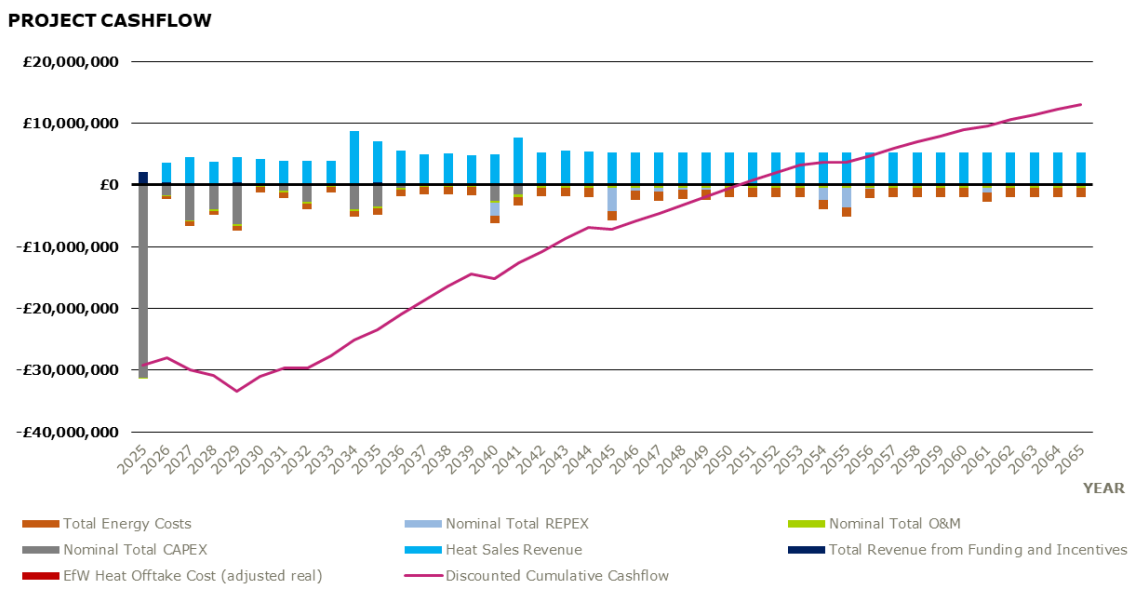


Figure 7: Five year delay sensitivity cashflow

3.78. The sensitivity testing of a five-year delay to Phase 2 of the Granton Waterfront regeneration found:

- Project performance is largely unaffected.
- LHT and LCOE show benefits through the reduced energy demand resulting in lower energy costs.
- NPV and IRR show improvement aligned with the LHT and LCOE.

Impact of loss of anchor loads

3.79. A sensitivity analysis of the dependency on the anchor loads was carried out to determine the effect on economic viability of the preferred option. Modelling assumed that all three anchor loads failed to connect to the network.

3.80. The anchor load connections removed during the sensitivity analysis were:

- National Museums Scotland campus
- Edinburgh College campus
- National Galleries of Scotland building

3.81. For this assessment it is assumed that the Council-owned properties of St David's RC Primary School, Craigroyston Community High School and Ainslie Park Leisure Centre connect to the heat network.

3.82. Removal of these three anchor load properties reduces the peak heating demand by 2,562 kW and annual demand by 4,419 MWh. Pipework does not change for the network as connections extend beyond these buildings for other demands. The reduced peak demand is not within the modular sizing of electric boilers proposed and so energy centre CAPEX is unchanged.

Table 21: Loss of Anchor Load Economic Comparison

Metric	Preferred scenario	Anchor load sensitivity
Annual heat demand (MWh)	25,052	21,489
Levelized heat tariff (£/MWh)	258	275
Levelized cost of energy (£/MWh)	236	308
NPV 40 years (£m)	12.630	(6.180)
IRR 40 years (%)	5.3%	2.6%
Discounted payback (years)	27	No Payback

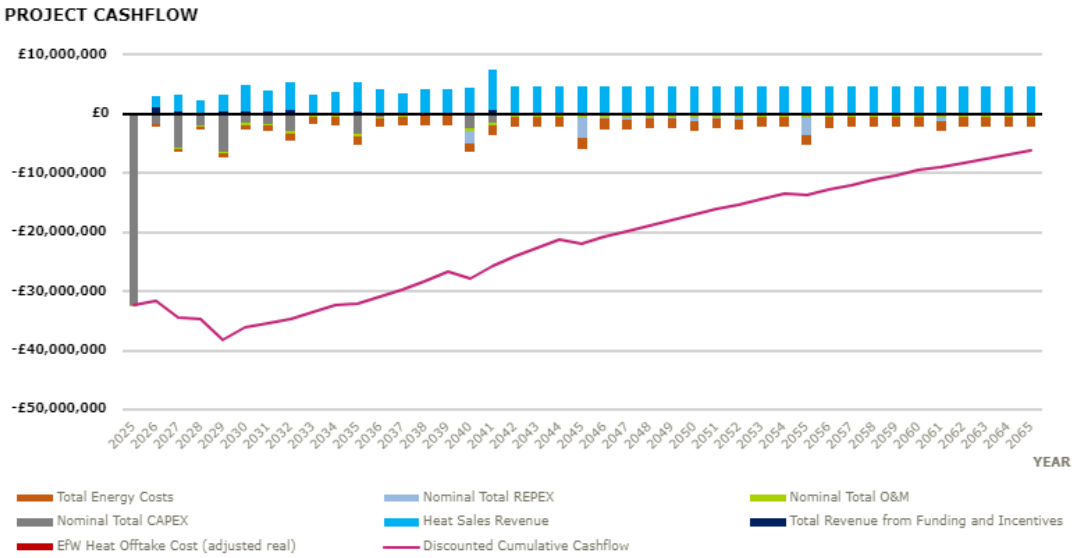


Figure 8: Loss of anchor load cashflow

3.83. Sensitivity analysis has found that the preferred option is critically sensitive to the loss of the National Museums Scotland campus, National Galleries of Scotland building, and Edinburgh College campus.

3.84. The loss of these anchor loads results in the cost of energy exceeding the counterfactual cost of energy and resulting heating tariff.

3.85. The NPV and IRR are critically impacted to the point of being below positive at year 40.

3.86. The loss of these anchor loads causes the payback term to fall beyond 40 years for the project and highlights the importance of retaining these connections.

Conclusion

3.87. The Economic Case sets out the process that was undertaken to identify a preferred option for delivering the heat network that will serve the Granton Waterfront and other local demands, including an options shortlisting and techno-economic analysis.

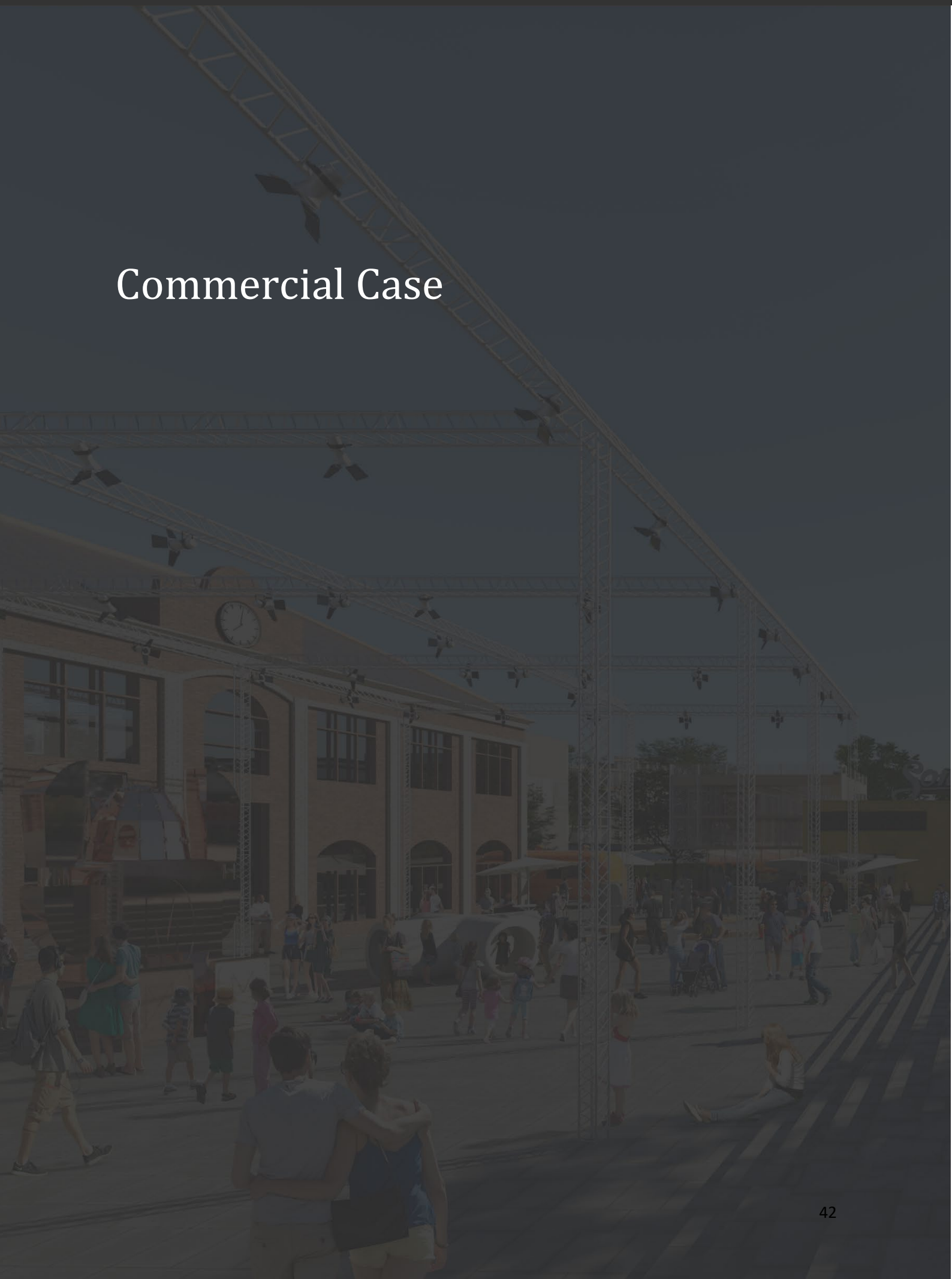
3.88. The preferred technological option, sewer source heat pump, has been observed to provide value for money for the network when compared to a communal air source heat pump solution and provides a broadly similar scale of carbon reduction when compared to gas boiler alternatives.

3.89. Shortlisting assessment against the critical success factors identified the “Combined” scenario, utilising a sewer source heat pump, as the preferred option. It has been evaluated to have best met the critical success factors identified for the project, and to be competitive in cost and carbon benefit when compared to the counterfactual technology of block level communal air source heat pumps. It is shown to have a positive IRR and NPV whilst also resulting in a lower cost of energy when compared to the counterfactual resulting in a healthy revenue stream through avoided costs. It is therefore recommended to continue to the financial model.

3.90. Sensitivity analysis shows that the project can permit a delay of five years between the completion of Phase 1 and connection of Phase 2 without negatively impacting the viability. The project is vulnerable to the loss of non-Council anchor loads.

3.91. Sensitivity analysis also noted that the project is critically sensitive to the combined loads of Edinburgh College, National Museum of Scotland, and the National Galleries. Should all of these demands fail to connect, the network does not prove viable when compared to the counterfactual air source heat pump selection.

Commercial Case



4. Commercial Case

Chapter summary

- The preferred option for the project delivery structure is a private sector-led concession model. This model entails a private sector partner being responsible for delivery of the heat network and for its ongoing operation, including sales and customer service. The Council will participate primarily as a customer of the heat network and a facilitator of public sector connections. Private sector interest in this model was confirmed through market engagement.
- The intention is to achieve a high degree of risk transfer to the private sector while retaining Council control over key aspects. This will be achieved through a concession contract with the chosen private sector partner. The duration is anticipated to be 40 years. The contract would require the heat network operator to deliver minimum standards for customers and would include some price controls. The contract should also include a mechanism to ensure that returns are capped, and excess surpluses are invested in keeping prices low and/or supporting wider community initiatives rather than being retained as profits.
- Stakeholder engagement was carried out with potential anchor load customers of the network to mitigate demand risk for the project. All potential customers are supportive of the project and expressed a desire to connect subject to agreeing commercial terms. The team also engaged with Scottish Water Horizons as owner of the preferred heat source for the project to understand the potential terms of supply. Engagement with Cruden Group – the development partner for Phase 1 of the Granton Waterfront regeneration – continued in parallel with the heat network project.
- The proposed procurement strategy is to use a two-stage model. A competitive procurement with negotiation will be used to appoint a private sector partner to develop the heat network project further with a view to awarding the private sector partner the concession contract.
- There are examples of two-stage procurements being used successfully by the Council in other major projects. Potential bidders were positive about this approach through the market engagement. The main benefit of this model is that a heat network operator is brought in earlier to carry out the detailed development work which may avoid abortive work by the Council and may also shorten the overall delivery programme.

Introduction

- The purpose of this Commercial Case is to demonstrate that the 'preferred option' (as identified in the Economic Case) will result in a deliverable project from a commercial perspective.
- The Commercial Case describes the preferred delivery structure and seeks to demonstrate a viable procurement and contracting strategy for the project. The structure and strategy have been developed taking into account the Council's strategic objectives for the project and any project constraints and following discussions with key stakeholders.

- The Commercial Case is part of the overarching five case model used in this outline business case and should be viewed in conjunction with the Strategic Case, Economic Case, Financial Case, and Management Case.

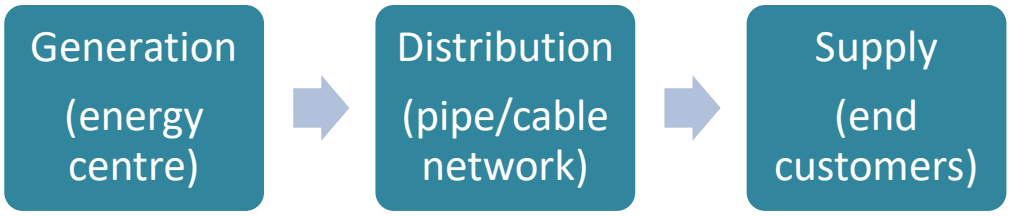
Delivery structure

Delivery structure: introduction

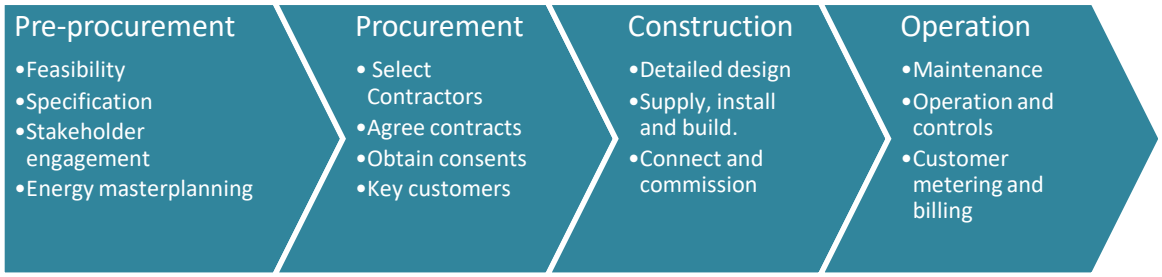
4.1. There are a wide range of potential delivery structures for a heat network project. Projects can be wholly public sector or wholly private sector. Projects can be delivered by joint ventures or using "unbundled" structures wherein supply and generation are separate from the network infrastructure. Joint ventures can involve public and private investment and can involve a corporate joint venture, a contractual relationship, or a range of collaboration measures. In each case, the project may be delivered with or without a specific project vehicle (SPV) or energy services company (ESCO).

4.2. There are several examples of different structures being used successfully to deliver heat network projects. There is no settled delivery model or best practice structure. The optimum delivery structure for each project is identified based on the strategic objectives of the project sponsors and stakeholders and any project constraints such as identified heat source or availability of funding.

4.3. Each project can be separated out into different core businesses and activities. A project will also develop through different stages. The core business areas for a heat network project are:



4.4. The key phases of project development are:



4.5. These various project elements lead to a range of roles and responsibilities on the project and there are a variety of means by which these may be allocated. That allocation is usually based on a range of factors, including each party's appetite for risk and desire for control of the project.

4.6. The project team has considered the full range of options from wholly public sector led models through concession and joint venture models to wholly private sector models and potential variants. This included considering the use of an ESCO as a delivery vehicle for the chosen model.

4.7. To derive a shortlist for delivery structures the project team and advisers considered the following key items:

- The critical success factors identified for the project as set out in the Economic Case. (Note that the Strategic Case describes the project objectives in more detail and identifies other benefits that could be delivered by carrying out this project.) For ease of reference here, the critical success factors are recorded as:
  - Meeting carbon emission reduction targets.
  - Reducing property energy costs – compared to the alternative of local air source heat pumps.
  - Financial viability – the project is self-supporting with a positive NPV and IRR although it is recognised that the project will require capital grant funding to be investable.
  - Delivers a heat network in time for delivery and occupancy of properties in the Granton Waterfront regeneration.
  - Spatial co-ordination – the energy centre can physically be accommodated in the available land within the development.
- The Council's appetite for risk and desire for control of the project as well as its desire and capacity to invest in the project and share in project returns. Generally, the more control a party obtains over the project or a particular aspect of it, the more risk it will have to accept. Consequently, if it is important for a large degree of risk transfer to be achieved, that may mean giving up a large degree of control.
- Identified constraints and interdependencies. There are limited items that are considered to impact the delivery model discussions. Specific items identified are:
  - Integration with the wider Granton Waterfront regeneration. It is critical that the heat network is built out in time to provide heat to properties at the development. Therefore, timelines are a key factor in determining the best commercial strategy. This is explored in more detail in the procurement section.
  - The preferred heat source identified for the project is to abstract heat from the Scottish Water sewer near the development. This means that the involvement of Scottish Water Horizons is critical to the project.

4.8. Initial discussions with the project team concluded that none of these factors drive a particular delivery structure and there was no basis on which to exclude delivery models. Many delivery models would be capable of delivering the project objectives. All of the following models were therefore taken forward for further consideration. Note that these options are described by reference to the 'owner' of the project at a relatively simple level. However, it is important to consider ownership models as a continuum from public to private with a full joint venture in the middle, with delivery structures moving back and forth along the continuum depending on the desired level of risk transfer versus control.

Option one – Public ownership model

4.9. The Council is responsible for delivering the entire project including heat generation, distribution and supply to customers. Assuming that the Council does not have sufficient resource or expertise to carry out the works, the Council would be responsible for procuring the necessary contracts to deliver the project. The Council would also be responsible for providing or sourcing finance for the project.

Option two – Private sector ownership model

4.10. The Council identifies the potential heat project and procures a private sector company to deliver the entire project: heat generation, distribution, and supply to customers. The Council and other public sector bodies may participate in the project by committing their heat load to the project and facilitating agreements required by the private sector e.g. wayleaves for pipes.

Option three – Public private partnership or joint venture model

4.11. The Council procures a private sector partner to deliver the entire project (heat generation, distribution, and supply) through a joint venture vehicle in which both the Council and the private sector partner invest.

Option four – Unbundled model

4.12. As stated earlier, a district heat project can be split into three discrete business functions: generation, distribution, and supply. One option for the project might be for the network infrastructure to be built, owned, and operated by the public sector with the private sector taking responsibility for heat generation and heat supply to end customers. There would be a charge for connecting to, and using, the network infrastructure.

4.13. With each option a separate delivery vehicle (or SPV/ESCO) could be used to deliver the project but there is no legal requirement to do so.

Delivery structure: process

4.14. The commercial models were presented and discussed with Council stakeholders informally and at two formal commercial workshops in September and November 2022. These discussions involved a range of Council officers from key service areas including finance, legal, procurement, regeneration, and energy. The second workshop included input from Executive Director level within the Council. Discussions took place considering the project objectives, interdependencies, and the Council's wider net zero carbon ambitions including the 2030 net zero carbon target. A note of the relative benefits and advantages of each option was provided in advance of commercial workshops with accompanying questions for participants to consider. Attendees' ideas and views were presented and discussed at each meeting and workshop.

4.15. Discussion focused on the level of involvement the Council might want to have in the project (ownership, control, investment) and the extent of the desire to bring in the private sector. While Council ownership and investment was not ruled out, a clear preference for a private sector delivery model emerged. Some key themes from the workshops in addition to discussion around the critical success factors included:

- **Delivery risk:** whilst it is recognised that the Council has established an ESCO (Energy for Edinburgh Limited), it was felt that the Council has no experience of delivering a heat network or running a licensed energy company which suggests it may be prudent to procure delivery from a private sector partner with capabilities in this area.
- **Reputational risk:** the Council will bear some reputational risk whatever the structure given that the Council is currently leading the project and that Council-owned residential and operational properties will be supplied. However, there was general support for energy supplies being made by an energy company rather than the Council as an energy company

would be experienced in delivering energy services and therefore better equipped to respond to customer demands and manage reputational risk.

- **City-level consistency:** ideally the model for Granton Waterfront might be replicable across the city to build efficiency into future network deployment. It is also important to ensure some level of price consistency for end customers across the city which will require a degree of Council control.
- **Council investment:** this was not ruled out if a return on investment could be made but would need to be considered against other priorities for the Council's capital budget.
- **Surplus profits:** there is also a desire to include anti-embarrassment / super profit provisions in a private sector model so that the Council and/or heat network customers can share in upside, particularly if the Council secures anchor load customers for the project.

Delivery structure: preferred option

4.16. Following the workshops, it was confirmed that the preferred delivery model for the project would be a private sector-led concession model. This model would involve full transfer of delivery risk for the heat network to the private sector including design, build, finance, operation, maintenance, metering, and billing. Full demand risk would be transferred with the operator's return on investment being achieved through heat sales. The Council and other public sector bodies may participate in and support the project by committing their heat load to the project.

4.17. This approach was further tested through a market engagement exercise via a prior information notice (PIN) published on Public Contracts Scotland in January 2023. Market respondents were all generally supportive of a private sector concession model, however, some were also keen to see a level of co-investment by the Council via a joint venture model. Most respondents were also comfortable with a high level of risk transfer, including demand risk. However, this depends on sufficient anchor loads being assured at Phase 1 of the project (see customer engagement below).

4.18. Feedback from the market engagement exercise showed potential investors would be looking for a financial return that is commensurate with the level of financial risk undertaken. In this context, the forecast project IRR as presented in the financial case is unlikely to support private sector investment under the Council's preferred delivery model (i.e. a concession) without subsidy. The Heat Network Fund is a potential source of match funding that could be used to bridge the viability gap and raise the project IRR to a level that would be of interest to the private sector, although further modelling and network development work would be required by the private sector to achieve a final investment decision.

4.19. The relative benefits and challenges with the preferred option are set out below.

- Benefits and opportunities:
  - Minimal resources are required from the Council except running initial procurement. The procurement could be single point as the private sector concessionaire would deliver all aspects of the project from design through to billing.
  - The project can benefit from private sector expertise from the development and specification stage of the project through to delivery. This can include technical and commercial capabilities.

  - There is scope for major risk transfer including overall delivery and timing risk from the Council to the private sector. There will also be a degree of demand risk transfer to the private sector, although the Council will facilitate the connection of key anchor loads (see paragraphs 4.28 to 4.33 for further information on customer engagement).
  - No or very limited Council funds are required (except potentially Scottish Government grant funding) in the delivery of the network and there may be access to a wider range of private investment. Funding may still be required from the Council and its public sector partners as customers to meet connection charges.
- Downsides and barriers:
  - Limited control for the Council over the project and its objectives although some degree of contractual control may be possible through a concession arrangement.
  - Limited control over future expansion albeit expansion may in fact be attractive to the private sector concessionaire.
  - Very limited opportunity for the Council to generate income from the project although the Council may still benefit as a customer of the scheme from reduced energy costs, assuming that the level of heat pricing can be controlled.
  - The project needs to be attractive to a private sector delivery partner and therefore needs to be able to deliver a commercial return on investment. This may conflict with the strategic objective to deliver affordable heat to a range of customers. The private sector may only want to include profitable elements of the project and may be reluctant to oversize the heat network.
  - A procurement process (or procurement mitigation) will be required to enable the Council and other public sector bodies to purchase heat from the network as customers.

4.20. Each of these risks and barriers are capable of management and mitigation as described above.

Project stakeholders and partners

4.21. The following key stakeholders /partners have been identified.

Table 22: Key stakeholders/partners

Stakeholder/partner	Role	Detail
City of Edinburgh Council	Project sponsor and key customer	The Council is the initiator and main driver of the project. They will also be a key customer for Council homes and non-domestic buildings.
Scottish Water Horizons	Heat source provider	This a core part of the project. The preferred technical option for a low carbon heat source is to abstract heat from the sewer infrastructure in Granton Waterfront which is owned and operated by Scottish Water.
Cruden Group	Development partner	Cruden Group is developing the first phase of new homes at Granton Waterfront. They are therefore a critical delivery partner in the build out and connection of properties to the heat network.

Stakeholder/partner	Role	Detail
National Museums Scotland, National Galleries of Scotland, Edinburgh College, Edinburgh Leisure	Key customers	All these customers are in principle keen to purchase low carbon, cost effective heat for their buildings in the Granton Waterfront area. (See paragraphs 4.28 to 4.33 for further information on customer engagement.)
Scottish Government	Potential funder	The intention is that Heat Network Fund grant support will be sought for the project.

Contractual relationships with stakeholders

4.22. There are expected to be several contractual relationships with identified stakeholders. (See also the contract map at paragraph 4.52 to see the full contractual arrangement for the private sector delivery model.)

4.23. There will need to be a long-term bulk heat supply arrangement with Scottish Water Horizons to enable, as a minimum, the connection to, and abstraction of, heat from the sewer infrastructure in Granton Waterfront. Commercial discussions with Scottish Water Horizons have already taken place and proposed pricing for the connection to the sewer and abstraction of heat has been included in the financial model. The Council has been provided with a form of use of sewer agreement as a basis for discussion. Scottish Water Horizons is generally supportive of the project and have offered the option of building an energy centre and providing bulk heat supply to the network if that is of interest to a network operator.

4.24. The Council will enter into a development agreement with Cruden Group for the delivery of Phase 1 of the Granton Waterfront regeneration. This will include an obligation on Cruden Group to ensure that both the private and public sector elements delivered via Phase 1 of the regeneration connect to the heat network.

4.25. Ultimately, Cruden Group will also need to enter into a connection and supply arrangement with the network operator to agree phasing and connection arrangements for individual properties. Based on evidence from other heat networks, there is a recognised risk that that these arrangements can take time to negotiate which may lead to delay. This could be mitigated by appointing a heat network operator as soon as possible or enabling bidders for the heat network to engage with Cruden Group during procurement. The potential timescales for procurement and then developing contracts will be factored into the master programme for the overall Granton Waterfront regeneration.

4.26. Heat supply agreements will be needed between the network operator and each of the key customers. (See paragraphs 4.28 to 4.33 for further information on customer engagement.)

4.27. Agreements will be required with any third-party funders. At present this may include a grant agreement with Scottish Ministers if the project is successful in being awarded funding under the Heat Network Fund (see the Financial Case for details of grant funding being sought).

Customer engagement

4.28. Demand risk is a significant risk for any heat network project and must be managed as part of the Commercial Case. Demand risk for this project is mitigated in several ways as detailed in this section.

4.29. Firstly, there has been good engagement with potential anchor load customers (as summarised in Table 36). The overall attractiveness of the scheme is dependent on these customers signing up to long term offtake agreements for heat. Securing formal commitment from these customers will be a key requirement for the early stages of project delivery and will be required before any significant capital spend is made. The intention is for public sector anchor load customers to be expressly named in the procurement contract notice as purchasers of heat from the network so that their heat supply is procured alongside the procurement of the heat network operator.

Table 23: Customer engagement

Customer	Progress
National Museums Scotland (NMS)	Positive commercial meeting held to discuss potential connection of NMS buildings to the network. NMS are supportive of the project. A Memorandum of Understanding between NMS and the Council has been signed to express support and commit to further engagement to agree terms for a heat supply.
Edinburgh College (EC)	Positive commercial meeting held to discuss potential connection of EC buildings to the network. EC is supportive of the project and has previously explored a similar solution for its campus. A Memorandum of Understanding between EC and the Council has been signed to express support and commit to further engagement to agree terms for heat supply.
National Galleries of Scotland (NGS)	Positive commercial meeting held to discuss potential connection of NGS buildings to the network. NGS are supportive of the project. A Memorandum of Understanding between NGS and the Council has been signed to express support and commit to further engagement to agree terms for a heat supply.
Public Private Partnership (PPP) Schools 2	Positive commercial meeting held to discuss potential connection of Craigroyston High School to the network. Connection would need to be instructed through a variation to the PPP2 contract. There are limited grounds for the operator to object to a variation.
PPP Schools 1	Positive commercial meeting held to discuss potential connection of Forthview and St David's primary schools to the network. Connection would need to be instructed through a variation to the PPP1 contract. There are limited grounds for the operator to object to a variation.
Edinburgh Leisure	Positive commercial meeting held to discuss potential connection of Ainslie Park Leisure Centre to the network. EL are supportive of the project.

4.30. Secondly, the Council will be able to mandate, through its development agreement with Cruden Group, that all the new homes to be built in the first phase of Granton Waterfront will connect to the heat network. This provides a high level of demand assurance. For future phases, the

Council, as landowner, expects to be able to mandate similar connections with any future development partner for those phases.

4.31. Thirdly, there is potential for the Council to designate the Granton Waterfront area as a Heat Network Zone under regulations expected to be introduced under the Heat Networks (Scotland) Act 2021 over the next two years. It is not expected that connections in a Heat Network Zone will be mandatory under the regulations, however, creating a Heat Network Zone in the area is anticipated to encourage future connections to the network.

4.32. Fourthly, as set out at paragraph 2.15, the City Plan 2030 mandates that "all new developments should connect to an existing or planned heat network or other significant heat source wherever possible to do so". This would in principle oblige new developments in the vicinity to connect to the heat network.

4.33. Finally, there is potential for future network expansion and this assumption was supported through the market engagement exercise. The Council does not intend to restrict the concession area for the heat network so that the heat network operator will have the ability to connect additional customers in future. Provision will be made as part of the procurement strategy to allow any such public sector customers to participate in the project at a later stage. The Council also considered the potential to procure an energy partner to deliver multiple heat networks across Edinburgh to expand the scale of the opportunity. However, the Council decided not to pursue this route, given the likely impact on programme of doing so, and the critical timing constraints for alignment with Phase 1 of the Granton Waterfront regeneration.

Property strategy

4.34. Based on initial reviews of the outline design for the project much of the project is anticipated to be within land owned or controlled by the Council, including the energy centre land and the heat network pipes to serve Phase 1 of the Granton Waterfront regeneration. Where possible, use will be made of the public highways for network pipes to serve the wider network, although additional wayleaves or servitudes may be required to be obtained for some connections as heat network operators do not yet have statutory powers to obtain necessary wayleaves. Necessary rights will need to be granted to the appointed network operator in due course.

Procurement and contracting strategy

4.35. There are three key procurement points for delivery of the project.

1. The procurement of heat to the network from Scottish Water's sewer from Scottish Water Horizons.

- The utilities procurement rules apply to the provision or operation of networks intended to provide a service to the public in connection with the production, transport or distribution of heat and the supply of heat to such networks and therefore to this element of the project. The public procurement rules do not apply to matters that are covered by the utilities procurement rules.
- The utilities procurement rules state that they do not apply to procurement for the award of a contract by a heat network operator for the supply of energy i.e. a heat network operator can procure the supply of energy in the form of heat onto its network without running a competitive process. Therefore, no procurement process is required.

2. The delivery of the heat network and the energy centre (including metering and billing of customers) i.e. the appointment of a concessionaire.

- A competitive procurement will be required to appoint the private sector concessionaire. The precise procurement route depends in part on the contracting strategy and the risk allocation. This is covered in more detail under the 'Choice of Process' section below.

3. The procurement of heat by the Council and its public sector partners as a customer.

- The Council's preference is to deliver the heat network through a private sector delivery model. The procurement rules would then apply to the supply of heat by that private sector operator to the public sector customers. This presents a procurement risk to the project where the public sector customers are providing key anchor loads to support the project and where a competitive process may result in an energy solution which doesn't involve purchasing heat from the network.
- It is therefore important to manage this risk by ensuring the supply of heat to the Council and the other public sector customers is included as part of a single point procurement of the private sector operator. How this impacts the procurement route is covered in more detail below.

Choice of process

4.36. A competitive procurement will be required to appoint the private sector concessionaire and to buy heat from that concessionaire. The most efficient option to achieve the overall project outcome is to run a single point procurement that covers both elements with all public sector customers named on the contract notice. This approach drives the applicable procurement regulations. The procurement regulations are mutually exclusive. The concession regulations apply to the procurement of a concession contract. However, the public contract regulations apply to the procurement of a heat supply. Based on the modelling done to date, the value of the heat supply contracts would be over the threshold for supplies under the public contracts regulations. Therefore, if the concession and the heat supply is procured together the recommendation from legal advisers is to use the public contracts regulations.

4.37. The project team and advisers have analysed the procurement approach for a heat network concession alongside the Phase 1 of the Granton Waterfront regeneration and market feedback received through the PIN process to help determine the most appropriate procurement process to use. A heat network concession is a complex project which requires a significant amount of development work to achieve final price certainty including detailed design work, further customer engagement and fundraising. The most appropriate procurement processes would involve a degree of dialogue or negotiation with bidders to deliver the best tenders.

4.38. The project team reflected that the Council is not sufficiently resourced to carry out an effective competitive dialogue or negotiation process on a single stage basis through to detailed design at the same time as progressing the development and delivery of Phase 1 of the Granton Waterfront regeneration. At the same time, the Council is experienced in running successful two-stage procurements for major projects and this approach has already been adopted for Phase 1 of the Granton Waterfront regeneration procurement. The project team also recognise the need to allow time for a pre-construction development phase for a heat network concession even if a single stage procurement is used as the concessionaire needs time to finalise customer

contracts, complete supply chain procurement and agree programming and interfacing with Cruden ahead of starting construction. This places additional pressure on the programme and the project's ability to meet the critical success factor of getting a heat network built in time to serve Phase 1 of the Granton Waterfront regeneration.

4.39. The market engagement demonstrated that most potential bidders were keen to be fully engaged in discussions with stakeholders and customers as early as possible to finalise the design for the heat network. Potential bidders also wanted to take control of and progress designs and financial modelling themselves at the earliest opportunity to provide greater certainty on deliverability and avoid abortive work.

4.40. All of these factors strongly support running a shorter process to appoint a heat network development partner to deliver the final design and package of customer/ stakeholder contracts under a joint development agreement before finally appointing the heat network concession operator. The proposal is therefore to procure the project using a two-stage procurement model similar to that used for Phase 1 of the wider Granton Waterfront regeneration. The outputs of a joint development agreement would include:

- Full design of the heat network to connect the public sector anchor loads and the Phase 1Granton Waterfront homes and retail spaces.
- Procurement of the full delivery supply chain for the heat network.
- Heat tariffs and connection charges finalised and confirmed within target range/ benchmarked.
- Customer contracts agreed with public sector anchor loads.
- Connection and supply agreement agreed with Cruden Group including finalised programme.
- Use of sewer agreement negotiated and agreed with Scottish Water Horizons.
- Concession agreement negotiated and agreed with the Council.

4.41. The benefits and challenges of a two-stage procurement model can be summarised as follows.

Table 24: Benefits and challenges of a two-stage procurement model

Benefits	Challenges
• Potential programme savings through early appointment and shorter procurement which enables the development partner to start collaborating with Cruden Group and customers earlier and brings forward the development phase. • Early procurement of supply chain to enable input on heat network design which may avoid abortive or duplicate design	• Potential additional development fee (but this could be wrapped into overall project cost). • No competitive tension at second stage pricing making it more difficult to evidence best value and lowest heat tariffs although this can be mitigated through benchmarking and setting an agreed target range for tariffs. Some competitive tension can also be

work being carried out by the Council which the concessionaire does not use. • More cost certainty for construction (but may just benefit operator). • More robust negotiation and better engagement with customers can take place based on actual design with a specialist energy provider. • Better understanding of risk and lower bid costs may reduce overall project cost and hence keep heat tariffs lower. • May increase attractiveness of procurement to the market and allow more bidders to be shortlisted thereby increasing competitive tension at the first stage.	maintained through detailed negotiation of the concession contract. • Potential for lack of transparency on costs unless open book methodology is required. • Development process will still require input and resource from Council and consultants to test what the operator is doing, similar to longer procurement.

4.42. The overall programme benefits and the benefit of engaging an experienced partner early in the process to design and finalise the network and customer contracts supports the proposal to use two-stage procurement model. The challenges identified with using this approach above are capable of mitigation through good procurement design and robust contracts. For example, one of the key challenges associated with this approach is the lack of competitive tension at the point in time when the final heat tariffs will be derived based on actual costs. This challenge is mitigated by the fact that the development agreement and ultimate concession contract will require tariffs to be competitive against a low carbon counterfactual. The current intention is to require bidders to propose a discount to the counterfactual tariff and the discount would be preserved through to concession appointment. The concessionaire is also incentivised to deliver heat tariffs that will ultimately be attractive to customers or customers will decline to connect. The concession contract will also include minimum requirements on service standards and arrangements with customers and ultimately the concessionaire will need to negotiate commercially acceptable terms with the heat network anchor load customers and with Cruden Group as the development partner.

4.43. The project team then considered with advisers the most suitable procurement process to run to deliver the project using the two-stage approach.

4.44. An open procedure is not recommended because the tender process would be open to all, and all bids received must be evaluated. This is a large, complex project and resource should be invested in evaluating credible bids only. A process with bidder pre-qualification is recommended.

4.45. If the Council's requirements could be adequately specified at the outset of the procurement, then a restricted procedure could be run. It is quick and includes pre-qualification. However, there is limited flexibility. If there needs to be interaction with the contractor on the Council's requirements and/or significant negotiation around the contract terms, then it may be more appropriate to use a process that permits negotiation or dialogue. Given that the procurement strategy ultimately involves procurement of a concession for the full design, build, finance, and operation of the heat network, competitive negotiation/dialogue is likely to be more appropriate.

4.46. Consideration was given to using either competitive dialogue or competitive procurement with negotiation (CPN). The processes are similar in the early stage however, competitive dialogue involves dialogue to develop a solution and CPN involves negotiation to improve tenders. With a two-stage approach the development of detailed design will happen during the development phase rather than during the procurement process itself. On that basis the main benefit of using CPN is that there is no requirement for the Council to negotiate with bidders if acceptable bids are received in response to the initial request for tenders. Even if negotiation is required, the scope can be determined by the Council and restricted by focusing on key issues. There is no need to negotiate all aspects of the tender. CPN therefore offers flexibility with the potential to appoint a preferred bidder quickly.

4.47. The procurement timetable can be controlled by the design and preparation of a robust and well developed set of procurement documents and contracts and by actively managing the procurement process. Sufficient resource would have to be dedicated to the procurement by the Council. The Council procurement service is very experienced in running procurement processes for significant projects.

4.48. An indicative timeline for the key procurement steps taking into account internal governance processes is shown below:

Table 25: Timeline for key procurement steps

Procurement stage	Estimated timeline	Programme
Drafting contract notice, invitation to tender (ITT), and draft contracts	8 weeks	Week 0 - 8
Publication of contract notice	Once ITT and draft contracts are close to ready	Week 6
Shortlisting (PQQ) responses returned	Minimum 30 days after contract notice	Week 11
Shortlisting (PQQ) evaluation and decision	2 weeks allowing for clarification plus any internal governance	Week 13
Issue of ITT	Following decision on shortlist	Week 13
Tender submissions	6 weeks	Week 19
Negotiation meetings	4 weeks depending on items for discussion (if required)	Week 23
Final tender document issued	Following close of negotiation	Week 23

Procurement stage	Estimated timeline	Programme
Final responses returned	2 weeks after final tender invited	Week 25
Final evaluation and decision	3-4 weeks plus any internal governance	Week 29
Notice of intention to award contract	2-4 weeks after decision (contract finalisation).	Week 33
Standstill period	10 days following notice of intent to award	Week 35
Contract award and contract signature	Following standstill period	Week 35

Subsidy control

4.49. The current subsidy control regime will apply to this project and therefore any financial support or investment in the project by the public sector must be analysed for subsidy control purposes. The project has been developed to be compliant with subsidy control principles. The only subsidy currently anticipated under the private sector model is a capital grant from the Heat Network Fund. It is assumed that grant funding sought through Heat Network Fund in accordance with the intensity levels contained within the Heat Network Fund rules are likely to be subsidy control compliant. Formal confirmation has been sought from Scottish Government on this point.

Contracting strategy

4.50. The contracting strategy for delivery under the private sector model will be determined by the appointed heat network operator. This will be developed through the development phase with supply chain procurement being a key output of that phase. On that basis, the approach to downstream delivery contracts is not considered further in this business case. However, an indicative contract map for the project is inserted below.

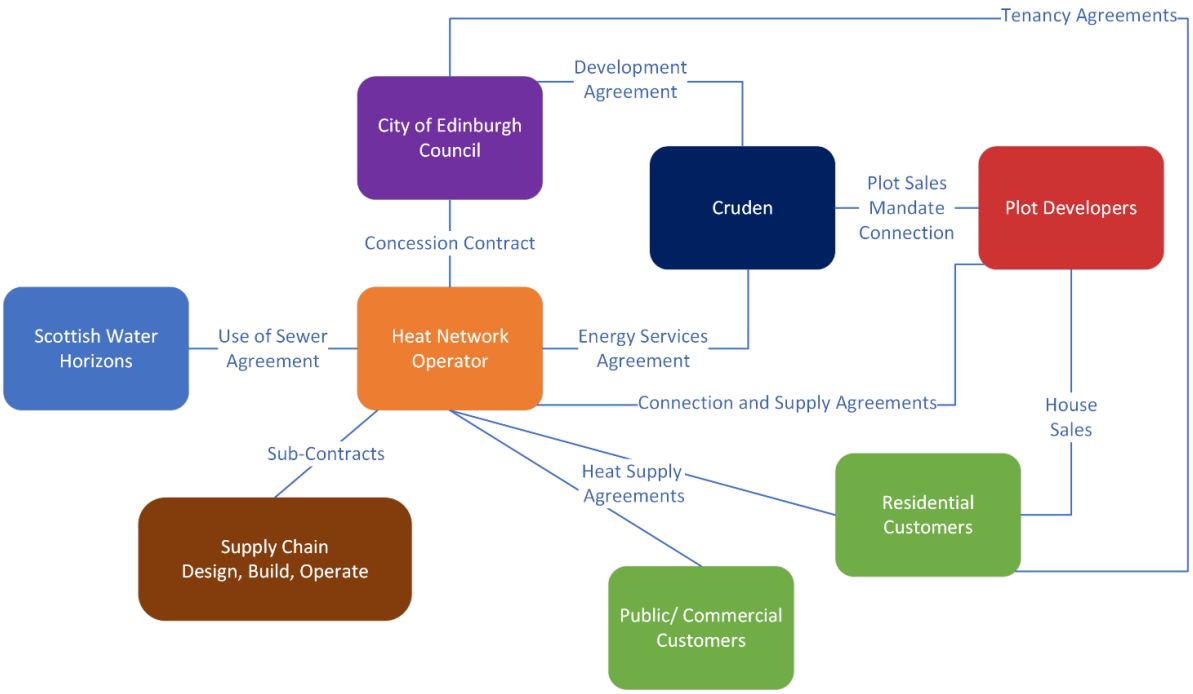


Figure 9: Contract map

4.51. The key contract for the Council in this structure is the concession contract with the appointed heat network operator. At the core of the concession contract is the opportunity for the heat network operator to supply heat to the Council, to public sector partners and to residents and businesses in Granton Waterfront. As can be seen from the contract map, the heat network operator will need to separately agree connection agreements and heat supply agreements with individual customers. Beyond the supply of heat, the concession contract terms need to balance the desire of the Council to retain control over securing certain key outputs such as: tariff levels, service standards, programme delivery, and alignment with strategic objectives while allowing the heat network operator sufficient flexibility and freedom to build and expand a heat network business to serve Granton Waterfront.

4.52. The concession contract will be drafted as part of the competitive procurement process to appoint a partner to develop the heat network, albeit it will not be finally agreed and signed until the development phase is completed. While there remains scope for development and negotiation during the development phase, the intention is that the concession contract will contain the following points:

- **Term:** The duration of the concession contract is intended to be 40 years. This has been the traditional period chosen for the financial modelling of heat network projects in recent years. Market feedback suggests that a longer duration would be welcome, but 40 years strikes a balance between allowing the concessionaire to make a business return and flexibility to respond to new market structures in the future. The options for the heat network assets on expiry will be discussed further but could include reversion to the Council for a future concession, although the residual value of those assets would need to be further considered.
- **Controls:** the concession contract is not a construction contract; it will be up to the concessionaire to design and build the network to meet the terms of the heat supply

agreements with customers. However, the Council will want to ensure that basic terms of those heat supply agreements are fair and market standard with minimum service standards and customer protection – at least until heat networks are fully regulated. This will include mechanisms to ensure the prices charged to off-takers remain competitive.

- **Default:** Ultimately, if the network operator's performance does not meet the minimum standards, then the Council will want to reserve the right to step-in to the concession and ultimately replace the network operator. The grounds for doing this will need to be carefully calibrated because the Council does not have the experience or resources to run a heat network.
- **Rights:** The Council will need to grant the concessionaire the necessary property rights to run the heat network.
- **Reward:** It is accepted and expected that a concession arrangement will generate a fair profit for the private sector. If the network operator is able to grow the network and build economies of scale, then there is the potential for that profit to increase. As the project is being facilitated by the Council and public sector partners, including potential Scottish Government grant funding, the intention would be to ensure that returns are capped at a certain level with surpluses beyond this cap being used to offer cheaper heat tariffs to customers, or potentially to support other community initiatives. This will be developed further in drafting the concession contract at the next stage.

4.53. It is also important to recognise that Scottish Government are in the process of implementing the Heat Network (Scotland) Act 2021 by introducing secondary legislation including regulations on heat network zoning and permits (effectively statutory concessions). The Council will engage with the Scottish Government to ensure that new rules do not conflict with the concession arrangements put in place for Granton Waterfront as these are likely to be in place before the regulations are passed. Equally, the Council can build in specific change in law provisions to the concession contract so that it can be adjusted to match the new statutory concession rules where this is desirable and appropriate.

Potential for risk transfer

4.54. The main opportunities for risk transfer have been identified in the sections above and as part of the detailed risk assessments of the delivery and contracting structure. Each of the risk sections above set out the mitigation and management options for the identified risks. The overall private sector delivery model selected by the Council ensures a high degree of risk transfer to the private sector on all aspects of the project. The Council retains a high degree of pre-delivery risk e.g. procurement risk and an element of reputational risk as the original project sponsor, landowner and core customer.

Plans for managing contracts

4.55. Dedicated project management resource will need to be allocated to the delivery of this project to manage the concession contract through construction and thereafter throughout operations. The need for a dedicated staff team is recognised as an essential resource to mitigate risks throughout the development and design stages and will need to be retained through the construction and operation stage but on a less intensive basis.

4.56. The overall programme for project delivery will be developed further alongside key stakeholders, including Cruden Group, both pre-procurement and in the development phase. A final business case will be brought for the necessary Council approvals once design is developed and final costs, and therefore heat tariffs, are known before the contracts are signed and construction commences.

4.57. The proposed internal governance arrangements for the project are set out in the Management Case.

Conclusion

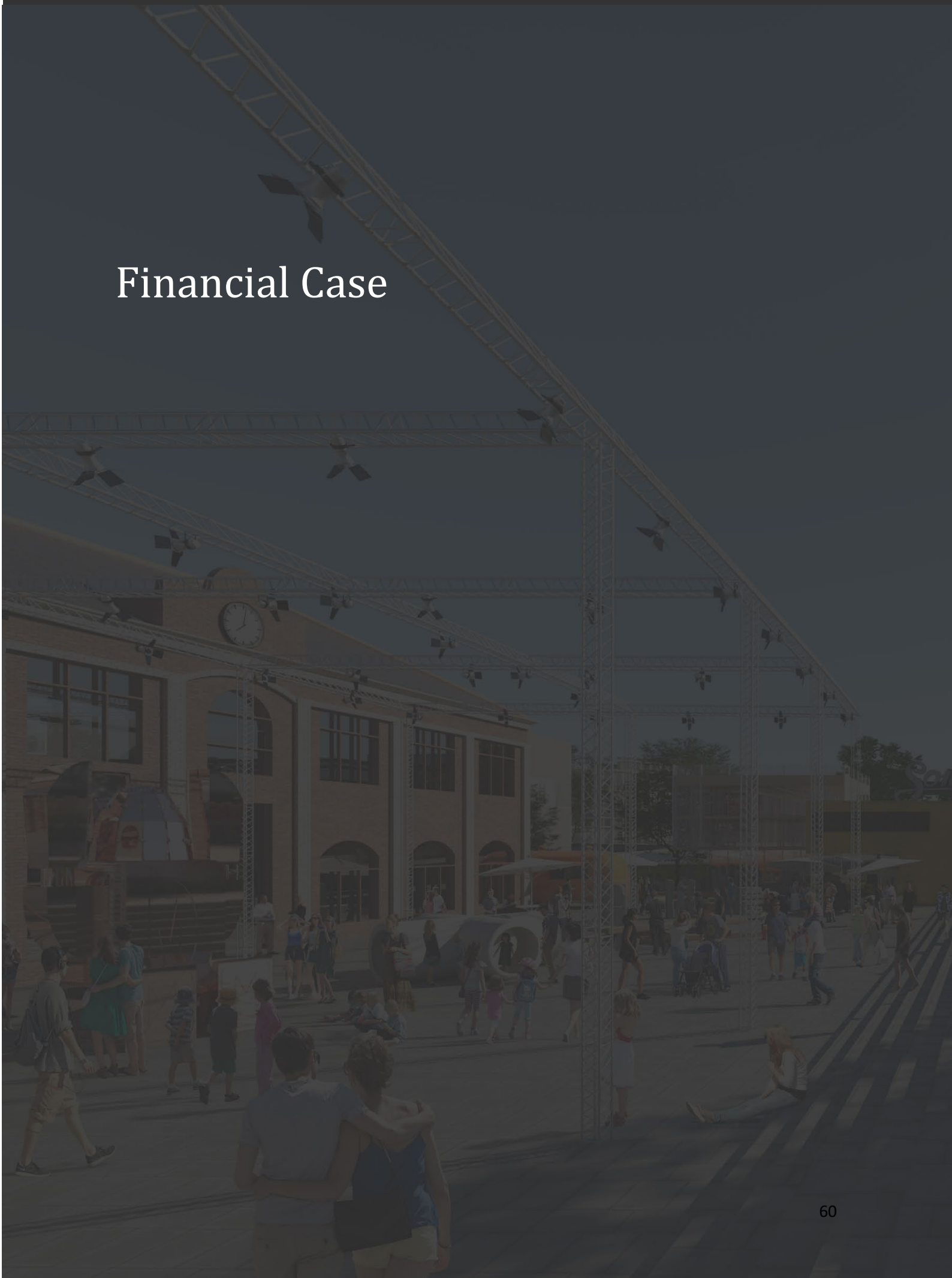
4.58. This Commercial Case demonstrates that there is a viable delivery structure and procurement and contracting strategy to deliver the Granton Waterfront heat network project.

4.59. The preferred project delivery structure of a private sector-led concession model has been identified and considered with stakeholders and confirmed through market engagement. This model is intended to achieve a high degree of risk transfer to the private sector.

4.60. All potential anchor load customers identified are supportive of the project and expressed a desire to connect subject to agreeing commercial terms. Engagement with Cruden, as the development partner for Phase 1 of the Granton Waterfront regeneration is also ongoing. This helps to mitigate demand risk for the heat network project.

4.61. The proposed two-stage procurement model is intended to bring the heat network operator on board earlier to carry out the detailed development work which may avoid abortive work by the Council and may shorten the overall delivery programme. The Council has positive examples of using this model in other major projects and this approach was supported through market engagement.

Financial Case



5. Financial Case

Chapter summary

- Modelling has been undertaken to determine the attractiveness of the proposed heat network at Granton Waterfront to a potential private sector investor.
- The modelling suggests that both the first phase of the proposed heat network and the full scheme would be self-financing. However, to be attractive to the private sector a combination of public sector grant funding and a reduction in the total cost would need to be achieved.
- The cost of heat to the consumer as assumed in the model is in line with other developments (both gas and low carbon alternatives) in the nearby area and as such results in a cost that would be affordable to consumers.

Introduction

Financial model

5.1. The purpose of this Financial Case is to determine whether the project would be attractive to the private sector, i.e. whether the project is financially viable on commercial terms.

5.2. In order to do this, a financial model has been built which takes the output of the techno-economic model (TEM) defined in the Economic Case and combines this with the preferred commercial option identified the Commercial Case. In doing so, the model takes account of all costs and income set out in the TEM and also includes allowances for inflation, tax, financing, and general company overheads.

5.3. The model produces a full set of financial statements over a 40-year period, which can be used to assess attractiveness to the private sector.

Commercial structure

5.4. The commercial case sets out the preferred delivery option to be a private sector-led concession model, whereby a private sector entity would receive all income from heat sales and use this to finance the costs associated with designing, building, financing, operating, maintaining, and metering/billing of the network.

5.5. While in practice, different entities would structure their operations and financing differently, for modelling purposes, the Heat Network Operator is assumed to be a simple special purpose vehicle (SPV). This SPV is assumed to be a UK limited company funded by a combination of a £1 equity share and a shareholder loan. Earnings are distributed to the investor in the form of loan interest, repayments, and dividends. To establish viability, the funding requirement is assessed alongside the earnings generated over time.

5.6. The key metric of viability is the internal rate of return (IRR). This is the discount rate at which the net present value of the investor's cash flow is zero, and as such represents the net rate of return for the investor.

Heat pricing

5.7. The Financial Case also looks at affordability from the point of view of a potential off-taker to ensure that pricing is both competitive and provides value for money for the consumer.

Project costs and revenue

Capital expenditure

5.8. Capital expenditure (CAPEX) assumptions have been taken from the TEM phased according to the wider Granton Waterfront regeneration programme (as can be seen in Table 12).

5.9. The TEM CAPEX figures are based on 2022 prices and so the financial model has added inflation where CAPEX is assumed past this point. While the short-term forecast has been assumed to peak at 4.5%, the steady state construction inflation rate has been assumed at 3.5% per annum.

Table 26: Financial model key dates

Item	Assumption
Construction start date	April 2025
Operations start date	April 2026
Anchor loads connection	2026-2027
Phase 1 connection	2026-2028
Phases 2-4 connection	2029-2036

5.10. The capital expenditure assumed in the TEM includes both risk and non-risk uplifts. The base capital cost has been uplifted by a total of 40% to account for risk, which comprises 20% contingency7 and 20% optimism bias8. Non-risk uplifts include provisions for items such as consultancy fees, design costs, contractor costs, and project and legal costs. This results in an uplift of between 52.5% and 57.5%.

5.11. Additionally, the cost of replacing key assets at the end of their economic life ("REPEX") has been included. Only REPEX relating to the energy centre has been capitalised, whereas REPEX relating to the network itself has been treated as a revenue cost. This is due to the assumed depreciation profile(as set out in paragraphs 4.20 to 4.22).

5.12. Capital expenditure with and without inflation for the project is detailed in 27.

Table 27: Capital cost requirements summary

Cost element	Base capital cost (£m)	Capital cost (Inc. non-risk uplifts) (£m)	Capital cost (inc. risk uplifts) (£m)	Capital cost (inc. inflation) (£m)
Energy centre construction	17.327	26.524	33.455	39.898
Heat network construction	15.652	24.651	30.912	41.150
Energy centre REPEX	7.977	7.977	7.977	19.525
Heat network REPEX	5.671	5.671	5.671	15.961
Total excl. REPEX ("eligible CAPEX")	32.979	51.175	64.367	81.048
Total incl. REPEX	46.627	64.823	78.015	116.534

[7] Contingency relates to unexpected costs arising during construction of the project, for example due to timing delays or changes to construction materials.
[8] Optimism bias refers to the innate bias that project sponsors have to underestimate costs for their projects. As such, an allowance has to be made to compensate for this.

Operating costs

5.13. The TEM covers most of the operating costs including the cost of running the energy centre and the cost of maintaining the physical network. Other than purchasing electricity which has been inflated by adjusting for assumed changes in energy pricing as per the Green Book valuation, the remaining costs have been inflated in the financial model at CPI.

5.14. Additionally, the financial model accounts for costs relating to company overheads, metering and billing, and business rates. The model has assumed that company overheads would include audit, insurance and asset management, and an allowance of £100,000 per annum (inflated at CPI) has been made. An allowance of £50 per unit per annum has been assumed to cover the cost of metering and billing for both residential and non-residential units. This is equal to the cost the Council incurs for this service in other developments and has also been inflated at CPI.

Tax

Non-Domestic Rates

5.15. Non-Domestic Rates are calculated by applying both a capitalisation rate and a rates multiplier to the eligible capital cost of the energy centre. Additionally, district heat networks can be eligible for business rates relief. While there are currently two different rates relief regimes, only one overlaps with the construction timetable, namely a 50% relief in rates up to March 2032. As such this relief has been assumed up to 2032, but not beyond.

Corporation Tax

5.16. The Heat Network Operator has been assumed as a limited company and so it would be liable to pay Corporation Tax on its taxable profits. As such, a full set of financial statements have been created within the financial model, alongside a detailed tax calculation.

5.17. The Corporation Tax rate is currently 19% but the model accounts for government plans to incrementally increase this to 25% beginning in the 2023/24 tax year.

5.18. To calculate taxable profits, the model takes the net profit/loss before tax and adds back non-taxable items such as depreciation and deducts the following allowances:

- Shareholder loan interest, with the deduction amount equal to the lower of (A) 30% of the taxable profit for the year, or (B) the lower of the *de minimis* allowance of £2m and the interest charge.
- Capital allowances in the form of a one-off annual investment allowance (AIA) of £200,000 and writing down allowances (WDA).

VAT

5.19. The model makes no allowance for unrecoverable VAT. It is assumed that customers will pay VAT on energy supplies at the relevant rate and that the Heat Network Operator will be able to recover all VAT paid on its expenditure.

Depreciation

5.20. To calculate depreciation, assets have been split into two broad categories and depreciated based on their estimated useful lives. Energy centre spend was depreciated on a straight line

basis over a 20-year period. Accordingly, REPEX relating to the energy centre has been capitalised and depreciated in the same manner.

5.21. Heat network spend has been depreciated over a 40-year period. As the asset has not been fully depreciated by the time replacement expenditure is due, REPEX cannot be capitalised.

5.22. As mentioned previously, this results in the network REPEX cost being charged to the profit and loss account rather than an addition to the non-current assets section of the balance sheet.

Revenue and heat pricing strategy

5.23. The majority of the revenue from the heat network is generated by charging off-takers for the supply of heat, with an additional amount raised via the sale of excess solar energy back to the grid (at a rate of £45.10/MWh).

5.24. The starting point for calculating tariffs is the cost of a low carbon alternative (the counterfactual or BAU), in this case an air source heat pump (AHSP)-based solution.

5.25. Off-takers are split into three categories: residential properties, non-residential properties, and schools.

5.26. Charges are split into three elements:

- an upfront **connection charge** that is equal to the capital cost of the installation of ASHPs, as well as the amount due to Scottish Power Energy Networks (SPEN) to upgrade the electricity network so that it can meet the increased demand for electricity for heating purposes.[9]
- a **standing charge** or fixed tariff set at a £/property/per annum (inflated at CPI);
- and a **variable tariff** set at a £/MWh (inflated at an adjusted CPI rate that accounts for the expected fluctuation in electricity prices).

5.27. It should also be noted that the model treats the connection income as deferred income in the balance sheet and releases it to the statement of profit and loss over a 20-year period, matching the write down of the energy centre CAPEX. Variable and fixed income is treated as revenue in the statement of profit and loss.

5.28. The proposed connection charge was compared to the capital cost of the community ASHP heating system currently being installed at the Western Villages development in the Granton Waterfront regeneration area. The connection charge was found to be considerably cheaper, which suggests that it may be possible to increase this element of the tariff.

5.29. The counterfactual standing charge and variable tariff for both residential and non-residential10 customers were compared to current heat tariffs and those proposed for the Western Villages development to determine whether this represented value for money for the consumer, as set out in Tables 28 and 29.

Table 28: Residential tariff analysis

[9] The amount SPEN will charge is likely to differ between different phases of development as the need to upgrade infrastructure is not only linked to the heat network, but also other developments in the Granton Waterfront area. For the purposes of modelling the charge has been distributed evenly among customers so the charge is the same, irrespective of connection date.

[10] For the purposes of this analysis tariffs for the schools are the same as for non-residential properties

Residential comparison, year one costs	Units	Granton Heat Network BAU	Typical gas 85% efficiency, low maintenance	Typical gas 85% efficiency, high maintenance	Western Villages development
Demand kWh/year	kWh	3,670	4,318	4,318	3,670
Variable charge	£/year	287	423	423	389
Standing charge	£/year	621	102	102	249
REPEX included?		Yes	No	No	No
Maintenance Cost	£/year	(included above)	150	300	No
Total cost	£/year	**909**	**675**	**825**	**724**
REPEX estimate (BAU equivalent)	£/year	-	146	146	146
Total comparative cost	**£/year**	**909**	**821**	**971**	**870**

Table 29: Non-residential tariff analysis

Non-residential comparison	Units	Granton Heat Network BAU	Council tariff	Small-medium commercial gas
Variable	***p/kwh***	**4.98**	**5.67**	**16.20**
Standing Charge - heat network OPEX/maintenance	*£/kW/year*	*17*	-	-
Standing charge - REPEX	*£/kW/year*	*114*	Not included	Not included
Standing charge total	***£/kW/year***	**131**	**21**	**26**
REPEX estimate (BAU equivalent)[11]	*£/kW/year*	-	114*	114*
Comparative Standing Charge	***£/kW/year***	**131**	**135**	**140**

5.30. This analysis shows that the BAU tariff is comparable to other tariffs once full maintenance costs and REPEX costs are taken into account. On this basis, it is considered appropriate to use the BAU tariff as the basis of the heat pricing for the heat network.

5.31. Using the financial model, analysis was carried out to understand how the financial risk and performance for the heat network operator might change when varying the proportion of each element of the tariff, variable and standing charge, and how each may be indexed overtime. The aim was to have a robust charging structure which remained commercially viable when tested under different market scenarios, focussing on general inflation, energy price movements and

[11] For comparison a cost equal to the GHN REPEX has been assumed.

heat volumes as these are the key drivers for future changes in the cost of operating the heat network.

5.32. The objective of the exercise was to determine a set of tariffs where changes in cost –either through demand fluctuations or inflationary pressures – were matched with corresponding changes in income. A well-balanced set of tariffs would limit the heat network operator's exposure to risk and also reduce the likelihood of significant windfall profits, thus protecting consumers. Analysis shows that a heat tariff which has a fixed element or standing charge of 67% is required to meet the fixed cost base for the project. Linking the variable tariff to electricity price movements would result in a more commercially viable balance of risk and reward with the network as a whole.

5.33. This fixed element (67%) is higher than the comparable tariffs assessed in Tables 28 and 29 and consumers are likely to seek a larger proportion of variable costs as it provides them greater control over their heat bills. While any increase in the variable element will expose the heat network operator to greater risk, both on demand and electricity pricing, they may be willing to accept some more risk on the basis that there may be more upside opportunity should demand increase. The upper bound on the level of variable risk an investor may accept could be around the point where all of the fixed costs, excluding capital expenditure, are recovered through the standing charge, i.e. a 30% fixed tariff.

5.34. On this analysis, an appropriate tariff structure should comprise a fixed proportion of between 30% and 67%. As the BAU pricing, with a fixed element of 42.5% falls in the middle of this range and is the proportion consumers are willing to accept for the BAU heating solution, it is proposed that this is used for the heat network. Heat tariffs and indexation bases for customers are set out in below.

Table 30: Initial heat tariffs and indexation bases

Scenario assumptions	Measure	42.5% variable tariff, electricity linked
Tariff Prices		
Residential - variable	p/kWh	10.5
Residential - standing charge	£/day	1.4
Non-residential - variable	p/kWh	5.4
Non-residential - standing charge	£/kW/year	123.3
Uplift method		
Residential - variable		Electricity price
Residential - standing charge		CPI
Non-residential - variable		Electricity price
Non-residential - standing charge		CPI

5.35. A detailed report from the project financial advisers, QMPF, on the heat pricing strategy is included as a supporting document to this business case.

Funding

Sources

5.36. Four sources of funding have been used within the financial model:

- **Equity** – A nominal £1 shareholding is assumed.
- Shareholder loans - These are cash injections from the owners of the company that are treated from an accounting point of view as loans with no set payback date. The interest rate paid on the loans is in the gift of the shareholders, with the only caveat that charging under market rates has tax implications on the shareholder and not the company. For the purposes of the model a rate of 4% has been assumed. The benefit of using shareholder loans rather than pure equity is that it allows investors to receive a cash return in years when the company may not have generated sufficient accumulated accounting profits to permit the payment of dividends.
- Surplus cash – cash surpluses generated by earlier phases of the network are reinvested to provide capital for later phases.
- Public sector grant funding - public sector grants may be available to assist projects where they are otherwise unviable, for example from the Scottish Government's Heat Network Fund.12 This grant is currently limited to a maximum of 50% of eligible CAPEX for projects being commissioned up to May 2026. Due to the proposed timings of this project, there is eligible CAPEX later than May 2026. It may, however, be possible to receive more than 50% in year, so long as the total grant received is less than or equal to 50% of the total CAPEX. Eligible costs are defined as:
    - Financial costs incurred for the purchase of physical assets
    - Costs of project build, installation and construction
    - Costs of project deployment and commissioning; and
    - Non-reclaimable VAT for eligible capital costs.

5.37. For modelling purposes, eligible costs are equal to the total construction CAPEX including inflation (i.e., excluding REPEX) as seen in Table 31. Grant funding has been treated as deferred income within the balance sheet and as such the value is amortised as income to the statement of profit and loss over a 20-year period to match the write down of the energy centre CAPEX. Table 31 sets out the level of funding assumed in the base case.

Table 31: Sources and uses of funding

Funding	£	Total £
Sources		
Equity	1	
Shareholder loan	30,382,228	
Working capital	250,000	
Internal surplus cash	86,151,389	
		116,783,618

[12] www.gov.scot/publications/heat-network-fund-application-guidance/

Uses		
Capital expenditure	116,534,618	
Working capital	250,000	
		116,783,618

Model outputs

Cash waterfall

5.38. To repay interest and principal on the shareholder loans, and to pay dividends where appropriate, a cash waterfall has been utilised. This involves creating a cash hierarchy within the model that prioritises certain transactions over others. The interest payable on the shareholder loans comes first, then the loan principal, future CAPEX and REPEX requirements and finally dividends payable.

5.39. If at any point there is not enough cash available, the waterfall stops, with the maximum amount of cash less the working capital amount of £250,000 used to pay the topmost item in the hierarchy. This means that at points where there is not enough cash to pay the interest due, the remaining amount is accrued onto the total loan balance.

5.40. In addition, a proxy Maintenance Reserve Account (MRA) has been created. This utilises a four year look forward period to siphon leftover cash before dividends into the account to try and cover future phases of CAPEX as well as REPEX.

5.41. This in effect means the net cash flow for the project over the 40-year period is the minimum cash balance of £250,000. This can be seen in Table 32.

Table 32: Project Cashflows

Item	£m	£m
Operating revenue	322.370	
Equity funding	0.000[13]	
Shareholder loan received	30.382	
Interest on positive cash balances	1.503	
Total project income		**354.256**
Operating cost	(171.883)	
Corporation Tax	(2.834)	
Energy centre and heat network CAPEX	(81.048)	
Energy centre and heat network REPEX	(35.486)	
Total project costs		**(291.250)**
Shareholder loan repayment	(29.063)	
Shareholder loan interest	(33.692)	
Total investor earnings		**(62.755)**
Net cash flow		**0.250**

[13] This is the nominal £1 equity.

Investor returns

5.42. In order to ascertain the IRR, a separate cash flow must be constructed from the point of view of the investor. In this, the amount invested (equity plus shareholder loans) is compared to the amount received in relation to the investment (loan repayment, loan interest, and dividends). This can be seen in Table 33.

Table 33: Investor cashflows

Item	£m	£m
Shareholder loan	(30.382)	
Equity funding	(0.000)	
Total investor cost		**(30.382)**
Shareholder loan repayment	29.063	
Shareholder loan interest	33.692	
Total investor income		**62.755**
Investor's net cash flow		**32.373**

5.43. Given the investor cash flow shown in Table 33, the IRR has been calculated to be 3.13%. This shows that the investor recoups their investment and makes a modest profit. The level of return sought by the investor will differ from company to company and will depend on the level of perceived risk, but for the purposes of this analysis, it is assumed that investors will be targeting an IRR in the region of 10%, i.e. a minimum IRR of 10% is required for the project to be viable on a commercial basis.

5.44. Therefore, the impact of public sector grant funding on commercial viability has been analysed, as can be seen in Table 34.

Table 34: Impact of grant funding on investor outcomes

	No Grant	Maximum Grant up to May 2026	Grant required for 10% IRR
Eligible CAPEX	£81.048m	£81.048m	£81.048m
Grant funding amount	£nil	£17.648m	£19.892m
Grant as % of Eligible CAPEX	0%	21.77%	24.54%
Investor cashflow IRR	3.13%	8.00%	10.00%

5.45. As can be seen, under the current grant regime the project would not achieve a 10% IRR for the investor. However, with a £2m increase in grant, 10% IRR could be achieved.

Scenario and sensitivity testing

5.46. Feedback from commercial research also suggests that a key scenario for investors would be a "Phase 1 only" build out. This assumes that the energy centre and network build out would

proceed as planned to begin with, but that the Council would not complete phases 2-4 of the Granton Waterfront regeneration, and hence both heat demand is reduced, and additional asset build out is not required. This represents the level of demand the Council can assure an investor.

5.47. To assess this scenario, assumptions have been made that the energy centre would be built out as set out in the base case, however subsequent construction, both upgrading the energy centre and building out the network, would not happen. A summary of the CAPEX requirements in this scenario can be seen in Table 35 .

Table 35: Capital cost requirements for Phase 1 only build summary

Cost element	Base capital cost (£m)	Capital cost inc. non-risk uplifts (£m)	Capital cost inc. risk uplifts (£m)	Capital cost Inc. inflation (£m)
Energy centre construction	12.545	19.231	24.249	27.177
Heat network construction	12.170	19.167	24.035	30.470
Energy centre REPEX	7.549	7.549	7.549	18.454
Heat network REPEX	5.671	5.671	5.671	15.961
Total ex. REPEX ("eligible CAPEX")	24.714	38.398	48.284	57.648
Total inc. REPEX	37.935	51.618	61.504	92.062

5.48. Otherwise, all assumptions made within the full build scenario were kept the same, i.e. heat pricing strategy, capital structure, inflation etc.

5.49. Therefore, the same tests carried out on the full build out have been carried out for a Phase 1 only build out, as can be seen in Table 36 and Table 37.

Table 36: Investor cashflows in Phase 1 only scenario

	£m	£m
Shareholder loan	(27.818)	
Equity funding	(0.000)	
Total investor cost		**(27.818)**
Shareholder loan repayment	5.292	
Shareholder loan interest	26.926	
Total investor income		**32.221**
Investor's net cashflow		**4.403**

Table 37: Impact of a Phase 1 only build out on investor outcomes

	No grant	Maximum grant up to May 2026	Grant required for 10% IRR
Eligible CAPEX	£57.648m	£57.648m	£57.648m
Grant funding amount	£nil	£17.648m	£17.925m
Grant as % of Eligible CAPEX	0%	30.61%	31.09%
Investor cashflow IRR	0.67%	8.26%	10.00%

5.50. As can be seen, just like the full build out scenario, without public sector grant funding the project would not be attractive to the market, neither would it be with the maximum grant

available. However, a small increase in grant funding would achieve the desired IRR. Alternatively, if tariffs were increased across the board by 0.7% the same result would be achieved.

5.51. The level of grant required for Phase 1 is only slightly less than that required for the full scheme. This suggests that if funding could be provided for the first phase, future phases could be developed with little or no subsidy.

5.52. Using the scenario that assumes 50% public sector grant up to May 2026 for both the full and Phase 1 only build outs a series of sensitivities have been tested for percentage changes in the following areas: +/-10% change to heat demand; +/-10% change to CAPEX including REPEX; +/-10% change to the operating cost.

5.53. The outcomes from this testing can be found in Table 38.

Table 38: Sensitivity outcomes on maximum grant for both full and Phase 1 only build outs

Scenario / sensitivity	IRR %[14]
Full build: CAPEX +10%	4.79%
Full build: CAPEX -10%	18.05%
Full build: heat demand +10%	9.82%
Full build: heat demand -10%	6.30%
Full build: operating cost +10%	5.96%
Full build: operating cost -10%	10.18%
Phase 1 only build: CAPEX +10%	2.01%
Phase 1 only build: CAPEX -10%	1549%
Phase 1 only build: heat demand +10%	21.00%
Phase 1 only build: heat demand -10%	3.54%
Phase 1 only build: operating cost +10%	2.90%
Phase 1 only build: operating cost -10%	23.11%

5.54. As can be seen, both build out scenarios are sensitive to changes in CAPEX, with a 10% reduction in the total capital cost resulting in both scenarios achieving IRRs that are greater than the target. This, alongside the increased grant scenarios, shows that under both scenarios small changes to either CAPEX or how the CAPEX is funded would make the project attractive to investors on a commercial basis.

5.55. The model assumes a full connection of all anchor loads and relevant phases of homes. There is a risk that this demand is not achieved, and as can be seen the IRRs are lower under a downside demand scenario for both full and Phase 1 only build outs.

Investor opportunities

5.56. The current CAPEX estimates are inclusive of significant risk. A well-managed project can minimise the requirement for use of contingency, and detailed design and costing work in future

[14] Heat Network Fund grants are only available for properly evidenced gap funding. If there is no gap to investibility there would be no grant. If grant is provided and a very high IRR is achieved, some/all grant may need to be repaid and/or a sharing mechanism put in place for excess profits.

stages can reduce the scale of optimism bias required. It should be noted, however, that it is still pragmatic to assume that the project will ultimately cost more than the no-risk CAPEX figure.

5.57. It would be expected that as a partner is brought on board at the next procurement stage there would be a reassessment of the CAPEX. This would potentially include a different design, or a different approach to phasing that would allow for value engineering and as such a reduced cost estimate.

5.58. The heat network operator may have a different approach to funding structures. The financial model assumes a reasonably simplistic corporate structure, with the majority of the funding coming via shareholder loans with only a nominal amount of equity assumed. There is the potential that a more complex structure, involving debt for example, may maximise investor returns in a way not envisaged within the current financial model assumptions.

5.59. Demand management will also be a large factor for a potential investor. As stated above, a potential investor would require a viable business case for Phase 1, as this represents the level of demand that can be assured at this stage. However, for both this demand scenario and the full build out scenario, the investor would have the opportunity to engage with more customers in the wider area around Granton Waterfront than has been assumed in this business case. This could lead to higher revenues, and therefore an enhanced return.

Impact on Council finances

5.60. Provided the project were to employ the proposed concession model as set out in the Commercial Case, no direct investment would be required from the Council. However, as an assumed heat off-taker, social housing landlord, and procuring authority, there would be some costs to cover.

General Fund

5.61. The Council would need to meet the cost of heat and connection charges for three schools (Craigroyston Community High School, Forth View Primary School, and Pirniehill/St David's RC Primary School), either directly or through its PPP contracts. The variable cost and standing charge can be met from within existing energy budgets, but the Council will need to reprioritise its capital programme to meet the connection charge. Public sector grants and loan schemes may also be available, for example the Green Public Sector Estate Decarbonisation Scheme and Scottish Public Sector Energy Efficiency Loan Scheme.

5.62. The heat network also assumes that the Ainslie Park Leisure Centre, operated by Edinburgh Leisure, will connect. As the asset owner it may be that the Council will need to contribute to the connection charge. Public sector grants and loan schemes may also be available for this property.

Housing Revenue Account

5.63. The connection charge for Council-owned social housing is included within the overall business case for the Granton Waterfront regeneration. The model currently assumes that variable and standing charges will be met by directly tenants. However, it may be that the HRA provides a contribution to maintenance and REPEX, to ensure consistency with other developments. This cost would be met from HRA maintenance budgets.

5.64. As unlocking the regeneration of Granton Waterfront is essential for the delivery of new social homes, the costs of procurement and business case development are currently met from the HRA. The cost of the next stage of heat network procurement is estimated at £500,000 and can be met from the overall budget for the Granton Waterfront business case preparation.

Conclusions

5.65. Modelling suggests that the business case for the heat network is in theory financially viable without grant and would provide competitively priced heat for consumers. However, based on the proposed commercial strategy of procuring the heat network through a design, build, operate and maintain concession agreement, it is unlikely to be attractive from an investor's point of view. This is even more pronounced when a Phase 1 only build is considered.

5.66. While the availability of grant to May 2026 improves the viability, it may not attract sufficient bidders to sustain a competitive procurement as the IRR is still slightly too low compared to the expectations of most market participants.

5.67. However, sensitivity analysis shows that an IRR that is acceptable to the market could be achieved by a combination of enhanced grant funding above the current specified intervention level and/or a reduction in the CAPEX, via either value engineering or improved CAPEX phasing. This is true for both a full build and a Phase 1 only build.

5.68. The viability of both scenarios provides both an attractive initial investment opportunity as well as the potential to generate further returns from future network expansion. In addition, there are opportunities for a private sector partner to improve upon some of the assumptions set out in the model, for example increasing revenues by connecting additional properties beyond those assumed in this business case.

5.69. On this basis, it is considered there is a Financial Case to proceed to procurement.

Management Case

6. Management Case

Chapter summary

- Three key stages require to be undertaken to deliver the low carbon heat network: procurement, pre-development, and development.
- The procurement stage will commence in April 2023 with the intention to appoint a prospective concessionaire to undertake the pre-development period in January 2024. The pre-development period will further inform the business case with the intention to seek approval to appoint the concessionaire in summer 2024. This will allow for the completion of the energy centre and commissioning of the heat network in October 2025 to coincide with the first phase of new homes.
- During the three stages, a series of key activities sit on the critical path to completion including securing funding, approval of the business case and appointment of the concessionaire. There are also key interdependencies that require careful management to ensure successful delivery which include appointment of a development partner for Phase 1 of the homes, and also the delivery of a primary sub-station to ensure that the energy demand can be met.
- A risk management strategy has been developed to promote clear ownership across the programme.
- Strong programme governance and programme management arrangements are in place which includes the wider stakeholder management.

Introduction

6.1. The purpose of the Management Case is to set out clearly how delivery of the preferred option for the SSHP heat network serving Granton Waterfront – as outlined in paragraph 3.63 of the Economic Case – can be effectively managed.

6.2. The case concentrates on next steps and resources required to for procurement and delivery of the heat network.

6.3. The following items are covered:

- Programme
- Risk management
- Project management
- Benefits realisation
- Governance
- Stakeholder management

Preferred option

6.4. The preferred option is based on the techno economic analysis as set out in the economic case. The properties proposed to be served by the heat network under the preferred option are set out in table 39.

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Table 39: Proposed heat network connections

Buildings	Year (connection and supply)
2,864 New Homes (Phase 1- 4)	2026 - 2036
New commercial building (Phase 1-4)	2027 - 2032
519 new homes (Phase 0)[15]	2038 - 2041
New commercial buildings (Phase 0) [15]	2038
New schools	2027
St David's RC Primary School	2026
Craigroyston Community High School	2026
National Museums Scotland complex	2026 - 2032
Edinburgh College campus	2026
Ainslie Park Leisure Centre	2026
National Galleries of Scotland building	2026
Granton Station enterprise hub [15]	2038
Medical centre	2027

Programme

6.5. The programme below sets out three key stages in the delivery of the preferred option. The procurement activities required to secure a concessionaire to design, build, operate and manage the heat network, predevelopment activities and development activities with the aim to commence construction in September 2024 and commence operation of the heat network in September 2025 to align with the first letting of new homes.

6.6. A finalised business case for the heat network will be prepared during, and informed by, the procurement and pre-development activities with a view to seeking final approval by May 2024 in advance of the Council signing a development agreement for Phase 1 of the Granton Waterfront regeneration with Cruden Group.

Table 40: Programme

Stage	Estimated timeline/ comments	Programme w/c
Procurement		
Legal consultants (contract documents)	8 months - Legal consultants will be required to input into the procurement process.	03/04/23 – 03/12/23

[15] Connection at end of existing air source heat pumps' useful life

Stage	Estimated timeline/ comments	Programme w/c
Technical consultants (mechanical, electrical, structural, and architectural)	5 months - Technical consultants will be required for further analysis of economic model and potential design development	03/04/23 – 11/09/23
Drafting contract notice, ITT and draft contracts	8 weeks	03/04/23 – 29/05/23
Publication of contract notice	Once ITT and draft contracts are close to ready	15/05/23
Shortlisting (PQQ) responses returned	Minimum 30 days after contract notice	19/06/23
Shortlisting (PQQ) evaluation and decision	2 weeks allowing for clarification plus any internal governance	03/07/23
Issue of invitation to tender	Following decision on shortlist.	03/07/23
Tender submission	8 weeks	25/08/23
Negotiation meetings	4 weeks depending on items for discussion (if required)	25/09/23
Final tender document issued	Following close of negotiation	25/09/23
Final responses returned	2 weeks after final tender invited	09/10/23
Final evaluation and decision	3-4 weeks plus any internal governance	06/11/23
Notice of intention to award contract	2-4 weeks after decision (contract finalisation)	04/12/23
Standstill period	10 days following notice of intent to award	18/12/23
Contract award and Contract signature (pre-development period)	Following standstill period and Board approval	18/12/23
Pre-Development Period		
Refinement of design to RIBA 3 by proposed concessionaire		Jan 24 – March 24
Proposed concessionaire will negotiate heat supply agreements with Council and third parties. They will also negotiate heat off-take terms for abstraction of heat from the Sewer with Scottish Water Horizons.	The Council will help facilitate and support discussions with third parties.	Jan 24 – June 24
Full planning submission	16 weeks	March 24 – June 24.

Stage	Estimated timeline/ comments	Programme w/c
	(Cruden's planning with red line boundary for energy centre will be approved April 24).	
Committee approval of finalised business case seeking delegated authority to award contract subject to final price being within affordability envelope.	Need to get approval prior to Cruden signing Dev agreement in Aug 24	May 24
Statutory consents RIBA 4	Feedback from statutory consultees	May 24 – July 24
Award of concession agreement and entering into heat supply agreement.		Aug 24
Development Period		
Construction of energy centre and primary distribution network. Pipework to align with Cruden Group's enabling works.	12 Months	Sept 24 – Sept 25
Heat network commences operations	4 Weeks	Sept/ October 25

Interdependencies with other projects

6.7. There is a need to effectively manage interdependencies with other projects as set out in Table 3 within the Strategic Case. As set out within the governance section of this Management Case, the Council's project team will manage the interdependencies between the heat network concessionaire and the programme of delivery for Phase 1 of the Granton Waterfront regeneration. This will include co-ordination of laying of pipework at the enabling stage to allow connection and supply to existing and future buildings and also design and build of the energy centre. The concessionaire will ultimately be responsible for securing third party anchor loads outwith Council control and co-ordination of pipework to enable connection and supply although the Council will support this process with public sector partners.

6.8. The Council will manage the interdependencies with securing a grant from the Heat Network Fund, which will align with approvals for the finalised business case. As outlined in the Finance Case, based on current financial modelling the project is likely to require funding of around £20m to make it attractive to the private sector. The exact amount will depend on the solution developed during the pre-development period.

Risk management

6.9. Key project risks have been outlined in Table 2 of the Strategic Case.

6.10. The primary objective of the risk management strategy is to identify, assess, and address potential risks and opportunities across the project lifecycle which could impact on delivery and/or inform better decision making.

6.11. The Granton Waterfront programme risk strategy is directed by the risk manager who leads on the risk management activities.

6.12. The risk management strategy has been designed to promote clear ownership across the programme team and drive a 'risk aware' culture that encourages the ongoing identification and assessment of project risk.

Risk register

6.13. The risk register is a live document which captures all project risks, sets out the risk response option and actions, defines the risk mitigation plan, assesses the residual likelihood and impact, identifies any secondary risks; and assigns a risk owner and actionee.

Risk mitigation plans

6.14. The assignment of mitigation plans is directed by the risk manager to the relevant risk action owner. The risk action owner has the responsibility for developing and implementing the mitigation plan.

Financial impact

6.15. The financial impact of risks materialising is that the project would become unviable from the point of view of an investor, which could mean that the heat network could not be delivered. In order to reduce risk, financial and economic modelling of capital costs include a risk and optimism bias contingency of 40% to provide a conservative cost estimate. Sensitivity testing has also been carried out to assess viability if heat demand reduces or operational costs increase.

6.16. One benefit of the two-stage procurement process means that the private sector partner will be able to refine designs and secure heat offtake agreements prior to final contract award, providing greater certainty over cost and income.

6.17. Following contract award, under the proposed commercial structure, financial risk would be transferred to the private sector.

Risk reporting

6.18. As overall accountability of the project sits with the Edinburgh Waterfront Programme Board, risks will be reported vertically to the Programme Board on a regular basis with clear categorisation of where risks sit within the context of the project and the wider statutory/corporate environment.

Benefits realisation strategy

6.19. The key goals and resulting benefits of implementing the Granton Waterfront heat network are outlined in table one of the Strategic Case.

6.20. A core requirement of the project framework and the governance of this will be to ensure that benefits are realised. This entails defining the actives to be carried out in each stage to deliver the benefits and strategic objectives. The management arrangements will build on this by further

refining the outputs through the pre-development stage clearly showing how these align to the strategic objectives to secure required funding.

6.21. A benefits management plan with clear ownership, detailed forecasting on timing and impact, and agreed measurement criteria for each activity will be developed with clear monitoring and evaluation. The Edinburgh Waterfront Programme Board will implement a framework of ownership of the benefits management plan with clear role responsibility or accountability to deliver the anticipated benefits. Finally, the benefits management plan will include a post management evaluation strategy which puts in place a process and assurance framework.

Project governance

6.22. Set out below is the proposed structure for the delivery of the heat network which will result in a finalised business case to enable appointment of a concessionaire for the delivery phase.

6.23. Strategic oversight resides with the Programme Board and overall responsibility for the programme delivery of the procurement and pre-development stages with the Programme Director.

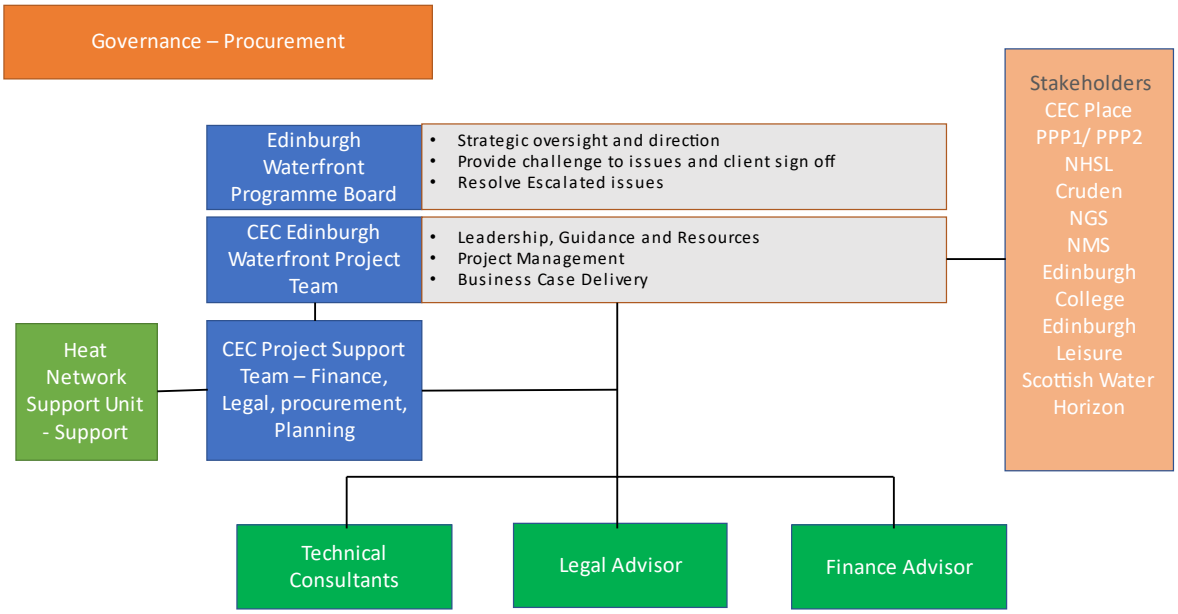

Figure 10: Governance structure during procurement stage

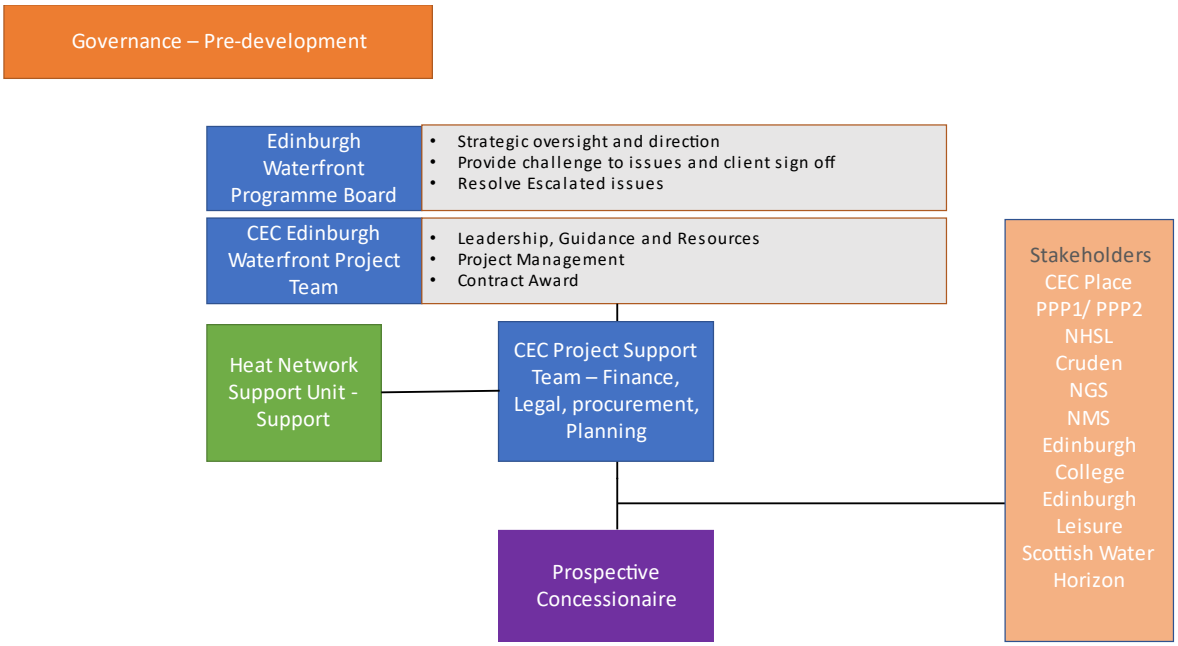

Figure 11: Governance structure during pre-development stage

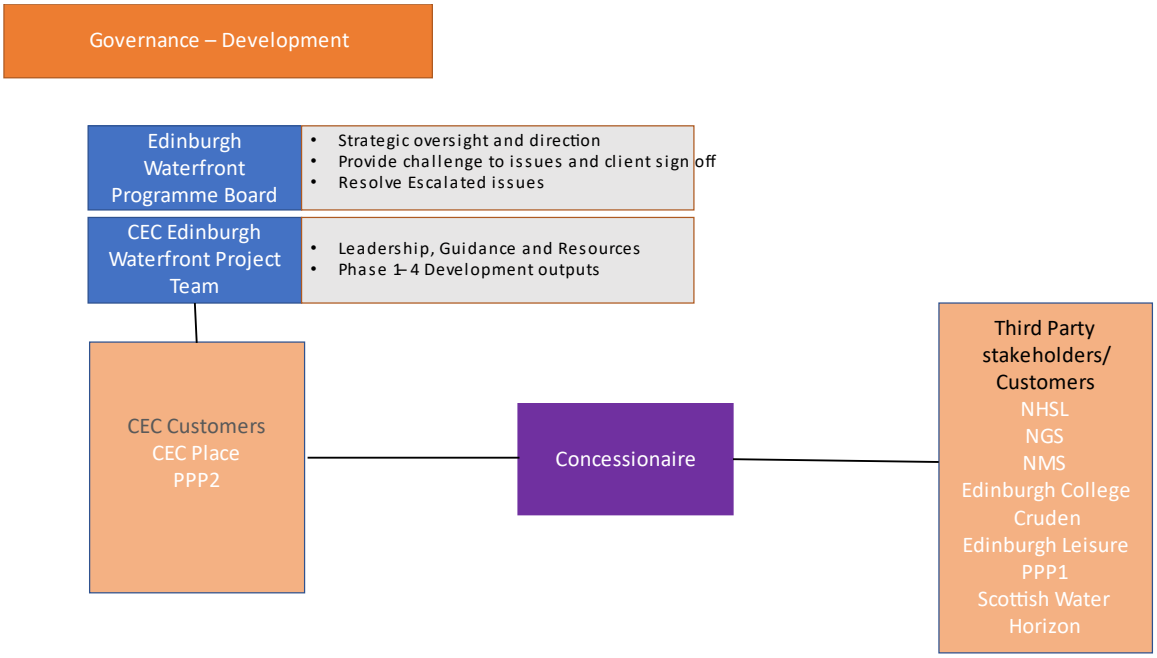

Figure 12: Governance structure during development stage

Stakeholders

6.24. Stakeholder management is a critical part of ensuring that this major intervention addresses both Council and third-party requirements to ensure that the relevant buy-in is secured to enable the concessionaire to take forward the delivery of the heat network.

6.25. Key stakeholders are set out below within Table 41. During the procurement and pre-development stages, the Council will manage the stakeholders as set out below. Those stakeholders identified as customers will be managed in partnership with the concessionaire during the pre-development phase with the concessionaire leading commercial discussions with

those customers. Once the project moves to delivery stage, the concessionaire will have direct contractual relationships with each of the stakeholders identified as customers. The concessionaire will also lead commercial discussions with Scottish Water Horizons for the abstraction of heat for the network and will work in partnership on commercial discussion with Cruden relating to the heat network.

Table 41: Key stakeholders

Stakeholder	Expectation	Communications
Council elected members	Meet strategic objectives and approve finalised business case	Regular update meetings, presentations, briefings and reports
Council Planning service	Energy centre SPEN substation	Pre-application meetings and committee
Council Roads service	Adopted Highways – all necessary approvals	Meetings as required and timeously submit for approvals
Council Development and Regeneration service (customer)	Connection and supply to Council and Edinburgh Living homes– competitive pricing; reduce fuel poverty	Work in partnership with colleagues to ensure strategic and policy outcomes achieved.
Council Communities and Families service (customer)	Connection and supply to schools – competitive pricing	Regular update meetings through procurement and pre-development period.
NHS Lothian (customer)	Connection and supply to Health Centre – competitive pricing	Regular update meetings through procurement and pre-development period.
NMS (customer)	Connection and supply to Existing and new buildings – competitive pricing	Regular update meetings through procurement and pre-development period.
NGS (customer)	Connection and supply to new facility – competitive pricing	Regular update meetings through procurement and pre-development period.
Edinburgh College (customer)	Connection and supply to College – competitive pricing	Regular update meetings through procurement and pre-development period.
Edinburgh Leisure (customer)	Connection and supply to Ainslie Park Leisure Centre – competitive pricing	Regular update meetings through procurement and pre-development period.
PPP1 (customer)	Connection and supply to Schools – competitive pricing	Regular update meetings through procurement and pre-development period.
PPP2 (customer)	Connection and supply to Schools – competitive pricing	Regular update meetings through procurement and pre-development period.
Cruden Group (customer)	Connection and supply to private homes – competitive pricing	Work in partnership through the pre-development period to ensure outcomes achieved.
RSL (customer)	Connection and supply to RSL homes – competitive pricing	Regular update meetings through procurement and pre-development period.
SPEN	Demand assessment and application to allow for electrical Infrastructure upgrade	Regular meetings through procurement and pre-development period.

Stakeholder	Expectation	Communications
Scottish Water Horizons	Agree connection to the sewer and heat offtake terms.	Regular update meetings through procurement and pre-development period.
Scottish Government	Meet strategic objectives to meet funding requirements	Regular update meetings through procurement and pre-development period to ensure strategic priorities and outcomes achieved.
Community	Consultation and engagement	Website, newsletter, meetings. Co-ordinate with comms for the wider Phase 1 development proposals.

Communications

6.26. The objective of communications and stakeholder activity is to share information, generate trust and stakeholders buy-in to the project. Key aspects include:

- Ensuring stakeholders are provided with up-to-date information about the project;
- Ensuring stakeholders are given appropriate opportunities to provide comment on the timing, phasing and scope of the programme;
- Ensuring consultation activities for inputting into programme design development are clear, open, accessible, and transparent;
- Managing and mitigating opposition to the project through open and transparent communication;
- Acknowledging and actively monitoring stakeholders' concerns and taking their views and interests into account in decision making;
- Developing a communications governance structure to define ownership and responsibility for communications across the programme; and
- Recognising interdependencies among certain stakeholders, taking into account their respective risks and exposures.

Conclusion

6.27. A robust framework has been created to ensure that that the delivery of the SSHP Heat Network is managed in a logical and planned manner. The pre-development period is critical to ensuring that key activities and interdependencies are monitored and kept on track to reduce risk.

6.28. Strong programme governance and required resources to support delivery is in place for all stages.

6.29. A stakeholder management plan has been developed so that there is continuous dialogue with all stakeholders to ensure that the project meets expectations and needs.

6.30. A benefits realisation strategy has been developed to create a framework for monitoring and evaluation to ensure the strategic objectives are achieved.

7. Way forward

Chapter summary

- There are three key stages to the delivery of the Granton Waterfront heat network.
- A two-stage procurement is proposed which will include a pre-development period and the production of a finalised business case, adding value, ensuring co-ordination with the wider regeneration programme, and helping to manage risk.
- The heat network will be operational in late-2025 to coincide with the occupation of the homes delivered as part of Phase 1 of the Granton Waterfront regeneration.

Introduction

7.1. The public sector-led regeneration of Granton Waterfront provides an opportunity for Edinburgh and Scotland to help realise key sustainability targets through the introduction of a low carbon heat network. The proposed heat network will serve new and existing homes, along with commercial premises and public sector buildings within Granton Waterfront and in the surrounding areas.

Delivery of the heat network

7.2. There are three key stages to delivering the heat network at Granton Waterfront which in total will take approximately 30 months as set out in table 42 below. Activities in each of the three stages are set out within the Management Case, section 6.5 to 6.6.

7.3. During the pre-development stage, the Council will work with the concessionaire to refine the design of the heat network and energy centre, engage, and negotiate heat supply agreements with third parties, and negotiate detailed heat off-take terms with Scottish Water Horizons for abstraction of heat from the sewer. The Council will continue to liaise with the Scottish Government to secure the funding required to deliver a heat network under a concession model and the funding required to close the viability gap on the wider Phase 1 regeneration costs. The outputs of the pre-development stage will further inform the work being undertaken to produce a finalised business case for the heat network which is targeted to be presented to the Scottish Government and a Council Committee in Autumn 2024 for approval to proceed with the project.

7.4. Following approval to proceed with the project, the Council will continue to work with the concessionaire within the pre-development period to secure all statutory agreements with the intention to proceed to award a concession agreement and enter into a heat supply agreement.

7.5. It is anticipated that construction will commence in autumn/ winter 2024 and be operational by autumn 2025 to align with the delivery and first occupation of the Phase 1 homes. The Council will manage the interface between the Concessionaire and the Council's Phase 1 development partner, Cruden Group, throughout the construction phase.

Table 42: Key stages

Stage	Duration	Dates
Procurement	8 months	April – Dec 23
Pre-development period	9 months	Jan 24 – Aug 24
Development period	13 months	Sept 24 – Oct 25

Estimated costs

7.6. Based on an analysis of the key activities set out in the management case, an estimate of the cost to complete the remaining activities associated with securing approval to proceed with the heat network is approximately £500,000. These costs will be funded by the Council's Granton Waterfront Development budget. There may also be potential to secure Scottish Government development funding towards the costs of this stage and the project team will pursue a bid for this.

Recommendation

7.7. It is recommended that that the project proceeds to seek final approval and on approval, complete all three stages as set out above to allow for delivery of an operational heat network to coincide with first occupation of the new homes forming part of Phase 1 of the Granton Waterfront regeneration.

8. Appendices

Appendix 1 – Core scenario energy costs

Table 43: Core scenario energy costs

	Domestic LHT BaU	Non-Domestic / Private LHT BaU	Public School LHT BaU	Total	
				LCOE Scenario	LHT BaU
Total heat demand **(MWh)**	419,294	263,144	120,881	803,319	803,319
BAU total discounted energy cost **(£)**	15,705,813	6,778,636	3,204,443		25,688,892
Scenario total discounted energy cost **(£)**	13,715,312	8,607,590	3,954,086	26,276,981	
Variable cost **(£/MWh)**	78.30	49.61	49.82	65.44	63.97
Connection cost **(£/MWh)**	51.55	60.20	83.93	103.92	58.62
Operation and maintenance **(£/MWh)**	179.68	64.90	77.33	32.84	125.29
Total costs **(£/MWh)**	309.52	174.72	211.08	202.20	247.88

Table 44: Core + East scenario energy costs

	Domestic LHT BaU	Non-Domestic / Private LHT BaU	Public School LHT BaU	Total	
				LCOE Scenario	LHT BaU
Total heat demand **(MWh)**	419,294	446,362	132,994	998,650	998,650
BAU total discounted energy cost **(£)**	15,705,813	8,116,594	3,525,480		29,637,558
Scenario total discounted energy cost **(£)**	12,182,032	12,968,466	3,863,968	29,014,466	
Variable cost **(£/MWh)**	78.30	49.65	49.82	68.16	62.89
Connection cost **(£/MWh)**	51.55	61.80	76.49	93.13	59.46
Operation and maintenance **(£/MWh)**	179.68	66.71	83.02	31.34	121.48
Total costs **(£/MWh)**	309.52	178.17	209.34	192.62	243.83

Table 45: Core + West scenario energy costs

	Domestic LHT BaU	Non-Domestic / Private LHT BaU	Public School LHT BaU	Total	
				LCOE Scenario	LHT BaU
Total heat demand **(MWh)**	426,128	263,144	163,553	938,198	938,198
BAU total discounted energy cost **(£)**	15,995,969	6,778,636	4,340,105		27,114,710
Scenario total discounted energy cost **(£)**	13,178,335	8,137,935	3,738,340	9,014,466	
Variable cost **(£/MWh)**	78.32	49.61	49.83	67.79	63.35
Connection cost **(£/MWh)**	51.25	60.20	79.42	99.40	59.84
Operation and maintenance **(£/MWh)**	178.83	64.90	86.20	31.45	123.61
Total costs **(£/MWh)**	308.40	174.71	215.45	198.64	246.80

Table 46: Core + Combined scenario energy costs

	Domestic LHT BaU	Non-Domestic / Private LHT BaU	Public School LHT BaU	Total	
				LCOE Scenario	LHT BaU
Total heat demand **(MWh)**	426,168	313,418	175,616	915,162	915,162
BAU total discounted energy cost **(£)**	15,995,969	8,116,594	4,661,142		28,773,705
Scenario total discounted energy cost **(£)**	15,078,514	11,089,237	6,213,579	32,379,914	
Variable cost **(£/MWh)**	78.32	49.65	49.83	70.20	62.38
Connection cost **(£/MWh)**	51.25	61.80	78.64	97.68	60.54
Operation and maintenance **(£/MWh)**	178.83	66.71	85.36	30.47	120.14
Total costs **(£/MWh)**	308.40	178.17	213.82	198.35	243.06

Table 47: New build only scenario energy costs

	Domestic LHT BaU	Non-Domestic / Private LHT BaU	Public School LHT BaU	Total	
				LCOE Scenario	LHT BaU
Total heat demand **(MWh)**	419,294	127,485	19,054	565,833	565,833
BAU total discounted energy cost **(£)**	15,705,813	3,168,258	494,462		19,368,534
Scenario total discounted energy cost **(£)**	12,078,163	3,672,340	548,869	16,299,372	
Variable cost **(£/MWh)**	78.30	49.34	49.64	59.32	70.49
Connection cost **(£/MWh)**	51.55	64.60	68.90	146.46	55.23
Operation and maintenance **(£/MWh)**	179.68	69.16	74.70	45.16	150.04
Total costs **(£/MWh)**	309.52	183.10	193.24	250.95	275.76

Appendix 2 – Glossary

Anchor load	A building with a large, dependable, long-term, demand for heat which can offer surety of demand to a heat network operator, helping make the heat network commercially viable.
Brownfield	Land that has previously been developed with a permanent structure, as opposed to “greenfield” (never developed) land.
Electric boiler	A boiler that works on the principle of heating water by passing it through an element, with carbon emissions based on the electricity grid emissions factor.
Energy centre	A building in which heat is generated.
Energy services company	(ESCO) A company providing energy services.
Capital expenditure	(CAPEX) Expenditure on goods or services with a useful life of at least one year, for example buildings and equipment, which is recorded on a company's balance sheet rather than income statement.
Fuel poverty	As defined by the Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019, circumstances in which a household spends over 10% of their net income after housing costs is spend on fuel needs and their residual income is less than 90% of the UK Minimum Income Standard.
Gigawatt	A unit of power equal to 1,000,000,000 watts.
Heat network	As defined in the Heat Networks (Scotland) Act 2021, a (district) heat network is “a network by which thermal energy is distributed from one or more sources of production to more than one building”.
Heat pump	A heating solution that works on the principle of capturing thermal energy (heat) from a source such as the air, the ground, or a body of water (such as a river, sea, or sewer) and using the refrigeration cycle can convert it to supply heat to the end user. The carbon emissions of a heat pump are based on the grid emissions factor.
Internal rate of return	(IRR) The annualised rate of growth expected from an investment – the discount rate at which the present value of annual cash inflows is equal to the initial cash outlay. A higher IRR indicates a more attractive investment proposition.
Kilowatt	A unit of power equal to 1,000 watts.
Levelized cost of energy	(LCOE) The average present cost of generating electricity over the lifetime of the generating plant in question, including the upfront capital costs, indicating the average revenue per unit of electricity generated required to cover the costs of the generating plant over its assumed operational life.
Megawatt	A unit of power equal to 1,000,000 watts.

National Development	As defined in National Planning Framework 4 (NPF4), “significant developments of national importance that will help to deliver the spatial strategy” where “their designation means that the principle of the development does not need to be agreed in later consenting processes, providing more certainty for communities, business and investors”.
Net present value	(NPV) The net value of all cashflows over the lifetime of an investment, discounted to present value to take into account risk and the time value of money. A higher net present value indicates an investment proposition is more attractive.
Net zero carbon	A scenario in which any carbon emissions are balanced by the removal of the same quantum of carbon from the atmosphere, meaning there has been no net change in carbon.
Operating expenditure	(OPEX) Expenditure on goods or services with a useful life of less than one year, for example salaries and travel costs, which is recorded on a company's income statement rather than balance sheet.
Optimism bias	The tendency of someone promoting a particular project to be overly-optimistic about the project’s likelihood of success.
Passive House	(Also Passivhaus) A building standard wherein buildings achieve high levels of energy efficiency and user comfort.
PQQ	A pre-qualification questionnaire – a questionnaire used in procurement to ascertain the suitability of a potential supplier.
Replacement expenditure	(REPEX) Expenditure on the replacement of capital assets during a project lifecycle that does not fall under repairing and maintenance.
RIBA stage	An organisational technique devised by the Royal Institute of British Architects of dividing construction projects into eight stages: (0) Strategic definition (1) - Preparation and briefing (2) Concept design (3) Spatial coordination (4) Technical design (5) Manufacturing and construction (6) Handover (7) Use.
Solar photovoltaic	(Solar PV) Technology that converts sunlight into electricity energy.
Special purpose vehicle	A company incorporated to carry out a discrete project.
Tariff	The cost to the consumer of a unit of energy, usually expressed in price per kilowatt hour (kWh).
Techno-economic model	(TEM) A model to assess the technical and economic performance of a proposed project.
Terawatt	A unit of power equal to 1,000,000,000,000 watts.
Wet well	A subterranean chamber in which raw sewage is collected.