

District heating in smarter, greener cities

A guide to commercial
structuring and financing



District heating in smarter, greener cities



Over 80% of the UK's population lives in urban areas and almost all of the UK's 64 cities continue to grow in size and population. Thinking strategically and making smart infrastructure choices can improve energy efficiency, increase energy production and strengthen resilience. District heating or a heat network, is just one of a range of well-established technologies that could support this aim¹.

The UK Green Investment Bank plc (GIB) has prepared this report to highlight the opportunity to develop low carbon heat networks in our towns and cities and to provide some insight for public sector entities on how to finance such schemes.

There is no “one size fits all” answer to commercialising heat networks but standard investment principles can be applied to inform how heat networks should be developed, structured and financed. GIB can provide financing to public and private sector heat network projects.

Nearly half the energy used in the UK is used for heating with 70% of all heat coming from natural gas²; therefore ensuring heating is affordable, secure and low carbon is important for the UK. Delivering heat through district networks can be both lower carbon and potentially cheaper for consumers than building-level heating solutions.

Heat networks are used extensively in continental Europe. Modern district heating systems involve the supply of hot water from a centralised energy centre to heat nearby homes, public buildings and businesses.

Heat networks have been operating successfully in UK cities since the 1980s to meet a need for reliable and affordable supplies of heat. GIB estimates that across the UK district heating systems offer a potential investment opportunity of over £500m to 2020 and can serve entire cities or small communities.

DECC established the Heat Network Delivery Unit (HNDU) in September 2013 to provide grant funding and expert guidance to local authorities in England and Wales looking to develop heat network schemes. In addition, the Government has also announced over £300m of funding³ for up to 200 heat networks to leverage up to £2bn of private and local capital investment over the next 10 years.

HNDU has assisted c.180 projects across 115 local authorities including £9.7m of grant funding to 2015 to support development studies. The Scottish Government (SG) Heat Policy Statement states an ambition to achieve 1.5 Twh of Scotland's heat demand to be delivered by district or communal heating and to have 40,000 homes connected by 2020. The SG Heat Network Partnership (HNP) is working with public and private sector entities to develop a pipeline of over 100 proposed heat network pipeline in Scotland. GIB works closely with HNDU and HNP to support the acceleration of investable heat network projects.

This note is aimed at local authorities who are considering taking heat network projects forward. It provides an introduction to how investors would assess schemes for potential investment and therefore provides some considerations to be factored into how business cases are developed.

- 1 GIB “Smarter, greener cities: Ten ways to modernise and improve UK urban infrastructure” April 2015
- 2 DECC “The Future of Heating: Meeting the challenge” March 2013
- 3 <https://www.gov.uk/government/news/deccs-settlement-at-the-spending-review-2015>

The district heating investment challenge

Establishing a district heating scheme involves significant upfront investment on a par with other major infrastructure projects. Given the nascent UK market, scheme development risk can be high and therefore there is a requirement for public sector organisations to work together effectively to produce robust schemes which can attract developers and investors. The public sector, in particular local authorities, has a critical role to play in promoting, convening, providing early development capital and potentially investing long term in district heating schemes.

The characteristics of heat networks can vary greatly; however all networks require an appropriate demand for heat, i.e. heat customers to generate revenues. How secure the heat demand is will be a key aspect in assessing the investment risk of the scheme and therefore the financial and commercial viability of the scheme. Heat networks are more likely to be cost-effective in urban settings, where there is a concentration of buildings, commercial buildings such as hospitals

and leisure centres that provide high and predictable heat demand and blocks of flats where individual gas boilers may be a less attractive option. A potentially viable scheme must ensure that all parties (owners, operators, offtakers, investors) achieve a financial return.

Heat network projects will progress through a typical project development cycle, from concept, to feasibility, to business case, through commercialisation and ultimately investment. At each stage of the process the economic value of the project, such as investment returns or IRR⁴, will be assessed and the cash flows that support the economics should become more certain as heat customers are secured and contracted. Any remaining uncertainty in quantum and timing, e.g. demand variance, together with the credit quality of counterparties will impact the overall investment risk of a project; a higher risk will increase the investor return expectations, and in some cases to the extent that a project may become unviable.

No investment is risk free therefore it is essential to provide sufficient information to allow developers and potential investors (including public sector) to assess schemes effectively, to assess project risk and returns in order to put in place appropriate commercial and financial structures for schemes to become investable. Unfortunately a lack of information usually results in limiting investor appetite as the risk cannot be priced.

4 Internal Rate of Return

Key investor considerations

Within the context of a potential district heating scheme as set out in Figure 1, key investor considerations will include appraisal of the following aspects:

Project income	Project expenditure	Finance
<ul style="list-style-type: none"> • long term view • secured/contract anchor heat loads • payment mechanism • heat load evolution including indexation • positive planning requirements (future demand) • credit risk of counterparties 	<ul style="list-style-type: none"> • long term view • capital cost, operation & maintenance, lifecycle • phased development • oversizing of infrastructure • technology performance • credit risk of counterparties • heat/fuel supply • other expenditure (business rates) 	<ul style="list-style-type: none"> • long term view • risk appetite • return expectations (minimum IRRs/project risk margin over cost of capital) • length of finance term • equity:debt ratios • governance and ownership structures

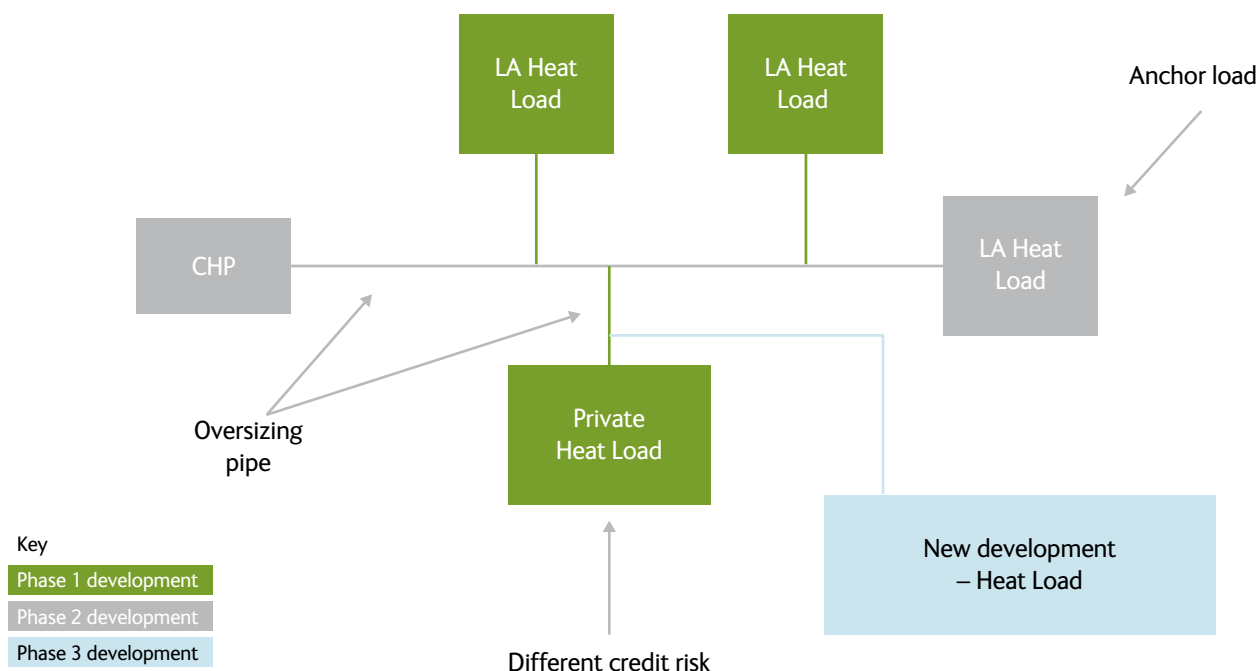
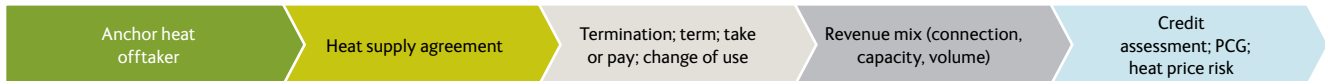


Figure 1 – District heating scheme development

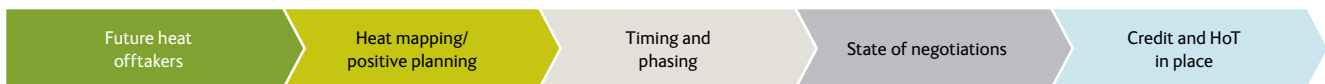
Each investor will determine the appropriate risk: return balance, with reference to their own underlying cost of capital, and what project due diligence is needed to assess and ultimately invest in the project. This applies equally to both public and private investors, although public investors may have a lower cost of capital and will also have access to ‘social’ returns and therefore assess additional aspects of a project. For example, GIB will also assess the ‘green’ credentials of a scheme and public authorities may accept lower project financial returns where social benefits are retained locally such as saving health and wellbeing budgets.

Information requirements

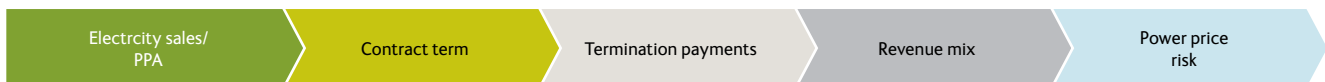
During the early stages of project development it is important for local project teams to consider what is required for commercialisation and investment. The information set out below is required to underpin good project economics, to establish an investable risk: return balance. This is not an exhaustive list, nor will each investor or partner be interested in all of the project aspects. This will depend on the project development stage and the nature of the required investment.



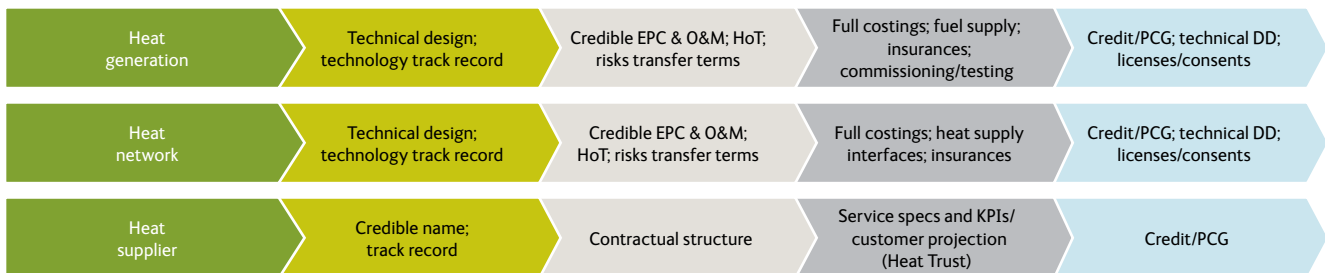
Attractive projects will have secured a material portion of the heat loads from strong credit counterparties (anchor customers early on in the development process). Longer term heat supply agreements with minimum offtake and disincentives for disconnection will reduce overall project demand risk. Price risk transfer mechanisms are also important to match with heat supply costs, such as the mix of connection fees, fixed standing charges and variable charges using appropriate uplift indices. Offtake contracts could be with end users directly or heat could be sold in bulk to an intermediary such as the local authority, housing association or property manager, who take some credit risk through on-billing end users.



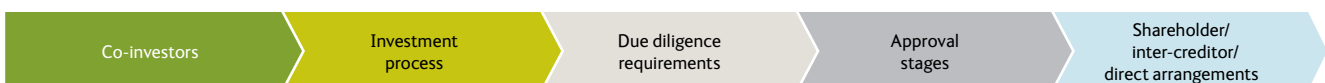
Heat mapping and phasing of future connections allows investors to assign a level of probability to heat load evolution and determine project upside; the more advanced the state of negotiations are the more likely that an equity investor can consider income as part of the base case assessment. An equity investor will also determine upside potential and put in place business development capabilities to expand the network. Over time, a larger, diverse customer base will provide a more stable and robust income base.



Many schemes include CHP plant to supply heat, realise carbon savings and secure additional revenues. As with other income streams, a project with secure electricity sales contracts will be more attractive, particularly where this contributes a significant portion of the base case project returns. These could include private wire contracts or export to grid contracts.



Attractive schemes will have been developed in line with industry standard design, appropriately licenced and consented, using proven technology, by developers with a good delivery track records. Project risk can be reduced through fixed price contracts, transfer of operational risks to subcontractors, warranties/guarantees/insurance from strong credit counterparties. Appropriate operations and maintenance regimes can reduce risk profiles and maintain returns through optimising generation and service base and peak loads. Heat network pipe infrastructure will be technology-agnostic to accommodate multiple heat sources and have flexibility to change sources over their 40 year lifetime. If heat is bought at the boundary of the heat network the security of the heat supply will be critical to assessing operational risk.



Where a scheme requires multiple investors it is important to design an appropriate fundraising plan which looks to secure strong equity counterparties initially followed by debt investors. The scheme capital structure should align incentives of key investors, funders and key customers through use of shareholder, inter-creditor and direct agreements in conjunction with well drafted scheme income and expenditure contracts.

Investors into the Project SPV will require a full suite of detailed project diligence, whilst a corporate 'debt' provider will focus more on the credit quality of the borrower, or the scheme owner.

Investment structure and finance options

There are a range of investment structures and finance options available for district heating projects although not all will be appropriate in all circumstances. Project teams need to appraise the projects from an investor’s perspective, whether public or private. We have detailed two business models, although structures can vary significantly on a spectrum.

Investment structure

Projects could be structured to sit on the scheme owner’s balance sheet, financed through *corporate finance* loans or reserves. A separate fully owned entity could be established to separate the district heating business unit – the scheme owner is in essence providing 100% project ‘equity’ with risk transfer being achieved through the contractual structure.

In a *project finance* structure the scheme owner would invest through a separate entity (an SPV). This structure could attract other equity co-investors and project senior debt with limited recourse to the scheme owner’s own balance sheet; as such risk transfer is achieved through the contractual and finance structure.

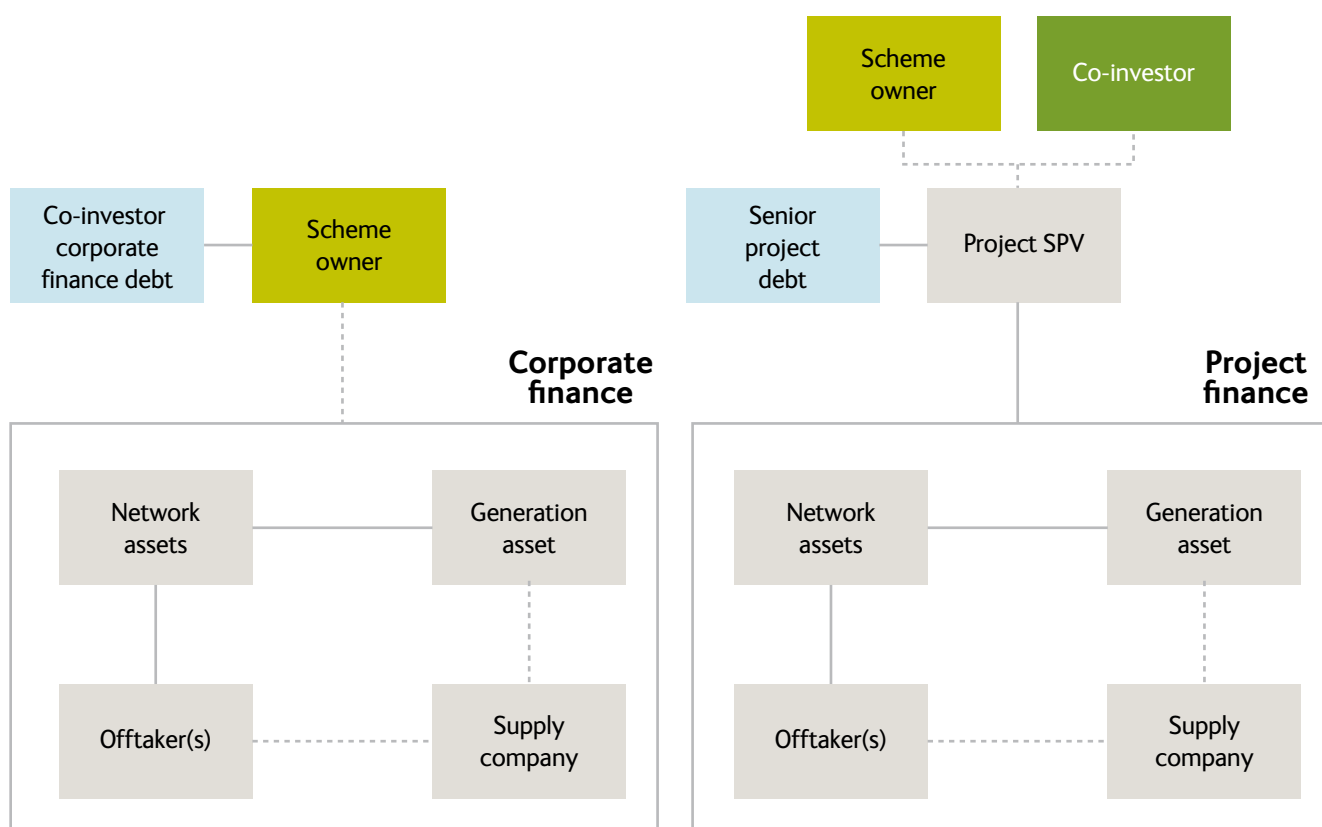


Figure 2 – Investment structures

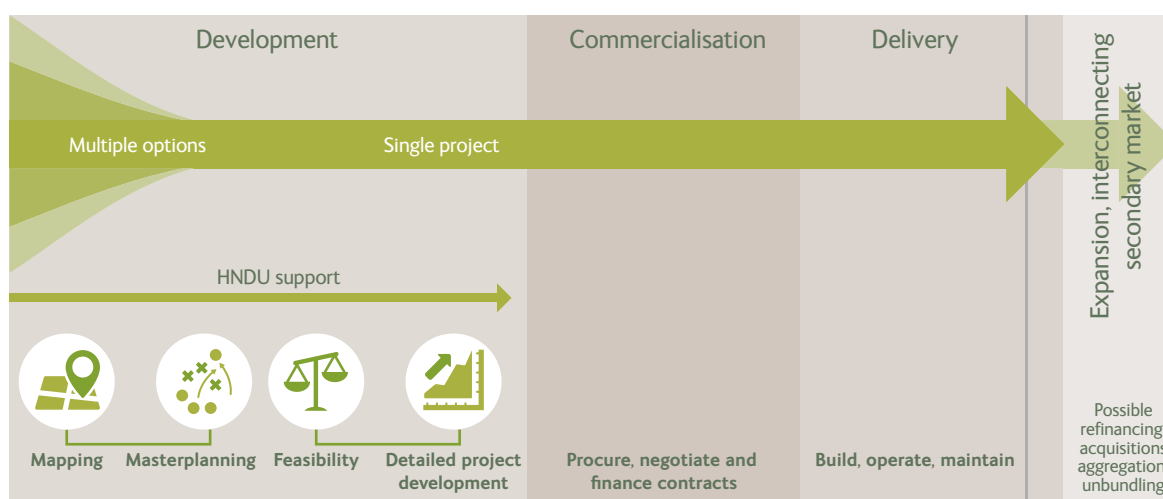
Finance options

The table below sets out some possible sources of finance and project characteristics that most suit the type of finance, together with how GIB could assist the financing.

Types of capital	Project characteristics	How GIB can assist
Corporate cash reserves <ul style="list-style-type: none"> • Cash resources used for projects with short paybacks, newer technologies, or where external funding not available or expensive • Should consider alternative uses and long term nature of assets 	<ul style="list-style-type: none"> • Small size • No/low build out risk/limited build out potential • No/low demand risk • Low returns 	Not applicable
Corporate finance (debt) <ul style="list-style-type: none"> • On-balance sheet, against the scheme owner's (borrower) credit rating • Fully owned arm's length entity to separate business unit can be established • Public sector use of Debt Management Office (DMO) finance • Banks can make term loan to private or public sector clients 	<ul style="list-style-type: none"> • Small – medium size • Low build out risk/limited build out potential • Low demand risk • 100% public or private sector owned • Low – medium returns (sufficiently above internal cost of capital) 	GIB's Green Loan offers the public sector a low, fixed-rate loan for periods of up to 30 years. It has been specifically designed to provide a flexible financing mechanism able to facilitate "spend to save" low carbon projects with repayments profiled to forecast project economics
Project finance (equity and debt) <ul style="list-style-type: none"> • Special purpose vehicle • Long term service provision with project risk transferred • Off-balance sheet, limited recourse finance • Some risk underwriting by the scheme owner could reduce cost of capital • Equity required and debt finance possible for large projects 	<ul style="list-style-type: none"> • Medium – large size • Medium build out risk/visible build out potential • Some future demand risk • 100% private or public sector owned or public/private joint venture • Risk adjusted commercial returns 	GIB's participation would be project specific. GIB could provide equity or debt, working with co-investors or could aggregate smaller projects initially
Grants/subsidised funding: <ul style="list-style-type: none"> • Support for demonstrators and new technologies, where external funding not available or expensive • Support for future proofing/oversizing network infrastructure • Central Government/European funding 	<ul style="list-style-type: none"> • Small – large size • High build out risk/visible and speculative build out potential (oversizing) • High demand risk • Public/private sector owned • Low – medium return (sub-market given project risk) 	GIB invests on a commercial basis and therefore cannot provide grants or subsidised capital. However, GIB can flexibly co-invest alongside this type of capital

Engaging potential ‘investors’

Different types of investors will be appropriate at different stages of the scheme development, market development and certainly for different types of project contractual structures. A project team must build confidence at every stage of development and be cognisant of what is required to progress to the next stage. The diagram below⁵ sets out some key activities for different stages of development.



Finance type	Development	Development	Capital	Secondary market
Finance and investor type	<ul style="list-style-type: none"> Initial scheme originator/ developer (local authority/HNDU)⁶ 	<ul style="list-style-type: none"> Initial scheme originator/ developer 3rd party developer 	<ul style="list-style-type: none"> Scheme owner equity 3rd party equity 3rd party debt finance (project or corporate) Operational re-finance 	Institutional investors
Finance activities and resources	<ul style="list-style-type: none"> Optioning (GIB's District Heating Finance note; local authority finance teams)⁷ Early market sounding: initial discussion regarding potential commercialisation structure Financial modelling Risk: reward balance & heads of terms 	<ul style="list-style-type: none"> Detailed modelling, scheme business plans, structuring of capital finance Invitation to tender/ investment memorandum Negotiations Documentation 	<ul style="list-style-type: none"> Asset management/ network growth Aggregation/building portfolio Refinancing 	

Figure 3 – Investment activities for development stages

5 DECC

6 HNDU support to local authorities in England and Wales

7 Local authorities to consider all sources of finance

Role of public authorities

Business models for district heating schemes can vary greatly but the public sector has an important role to play in all cases, from project advocate, to policy maker, to customer and potential funder.

Although the most common structure is a wholly owned public sector utility, UK authorities should consider future proofing schemes through positive policies and planning and through setting up appropriate investment structures that could be scaled and/or replicated.

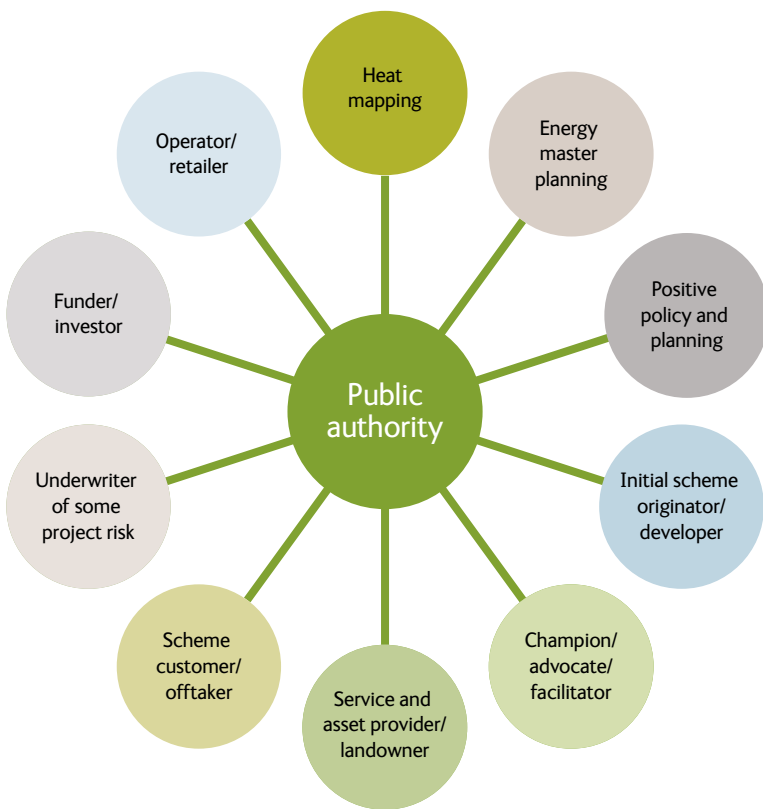


Figure 4 – Potential roles of public authorities

The next section provides an overview on how GIB can support public sector teams in commercialising district heating schemes.

UK Green Investment Bank

UK Green Investment Bank plc was launched in November 2012. With initial funding from the UK Government, it is the first bank of its kind in the world. It is a “for profit” bank, whose mission is to accelerate the UK’s transition to a greener economy, and to create an enduring institution, operating independently of Government.

We are a strategic investor with expert green and finance credentials. We can support public sector organisations by engaging early on projects and have the flexibility to provide a full range of structured financing options for energy efficiency and district heating projects. We are here to help progress the tough projects and to find innovative solutions to make sure good projects can be financed.

Our value as a partner

Sizeable & flexible capital

- Available funding to be committed to green projects
- Can invest across the capital structure
- Can invest for long periods

Knowledgeable team

- Strong finance, industry and political network
- Wide and deep contact base across public and private sector
- Understand stakeholder needs

Ability to move quickly

- Independent investment committee
- Focused mandate allows for efficient investment process
- Supportive senior management

Early engagement

- Partner with companies and get involved in projects at an early stage
 - Work through difficult situations to achieve GIB’s strategic goal of investing in green projects
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Contact details

If you would like to discuss your district heating project with GIB please contact any of our following team members:

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Glossary

CHP	Combined Heat and Power
DD	Due Diligence
EPC	Engineering, Procurement, Construction
HoT	Heads of Terms
KPI	Key Performance Indicator
O&M	Operate and Maintain
PCG	Parent Company Guarantee
PPA	Power Purchase Agreement
SPV	Special Purpose Vehicle

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