Heat Networks Delivery Models

Final Report

February 2024

Scottish Government
Riaghaltas na h-Alba

Heat Networks Delivery Models

report for the Scottish Government

prepared by

Scottish Futures Trust

Final Report — February 2024

SCOTTISH FUTURES TRUST

Foreword

This report was prepared by the Scottish Futures Trust for the Scottish Government and was completed in May 2023.

The stakeholder engagement which informed the analysis and conclusions in this report took place over the winter of 2022 / 23, ending in March 2023.

This report was made ready for publication in December 2023.

The Scottish Futures Trust and the Scottish Government are now working together to take forward a number of the recommendations made in this report, and will be undertaking further stakeholder engagement on heat network delivery models in early 2024.

Scottish Futures Trust
December 2023

Executive summary

Executive summary

1.1 Introduction

Heat networks are one of a number of low / no regret technologies for heat decarbonisation identified in Scotland's Heat in Buildings Strategy[1]. Scottish Government has set ambitious targets for their deployment, supported by a range of policy initiatives, financial incentives and regulatory measures.

These will help to build skills and capacity, facilitate the identification and development of projects, and the regulation of heat network operators. However, based on the current rate of deployment and outlook on project pipeline, it is unlikely that statutory targets will be achieved without further intervention.

This report, prepared by Scottish Futures Trust (SFT) for the Scottish Government in May 2023, assesses the potential roles that a range of delivery models (alongside a number of complementary enabling structures / mechanisms) could play in helping to accelerate the pace and scale of heat network deployment. It makes recommendations on interventions Scottish Government could make in relation to certain models.

The methodology for this report included: consideration of how delivery models should be defined and characterised in the context of heat networks; stakeholder engagement with local authorities, contractors, investors and advisers to understand the challenges to deployment at the required pace & scale within the current policy and regulatory environment[2]; identifying the features that a successful delivery model should encompass; analysis and evaluation of a broad range of established, emerging and new (for heat networks) delivery models against the agreed success criteria; and developing a set of recommendations in relation to the various models.

1 Heat In Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings (www.gov.scot)

2 This engagement took place over the winter of 2022 / 2023

1.2 Challenges to achieving pace & scale

This report identifies some significant challenges to achieving greater pace and scale of deployment of heat networks in Scotland. These were informed by SFT's own experience, together with stakeholder engagement carried out by SFT with a number of local authorities, contractors, investors and advisers. Within each stakeholder group, a variety of views were expressed, but the following broad themes emerged:

- **Multiple & competing policy objectives**
  Heat networks support multiple policy objectives: developers promote heat networks for a variety of reasons, including decarbonisation / emissions reduction; security of supply and certainty around future energy costs for the sponsor's own estate; fuel poverty alleviation; as a redevelopment / regeneration project; and as a commercial investment. Where multiple stakeholders are involved (as is usually required for a network of any scale), objectives may not be aligned.

  Increasingly, national and local planning policy is driving low carbon development. However, there remain significant uncertainties, including lack of clarity around: a backstop date by when existing buildings will need to switch away from gas; the potential role of mandatory connections within heat network zones; and the potential role of hydrogen in heating. This all creates significant risk for larger-scale heat network developments.

- **Lack of knowledge, skills & capacity**
  Whilst there is strong awareness of, and political support for, net zero initiatives, local authorities are spreading limited resource across a range of different types of projects, including fabric improvements, EV charging infrastructure, as well as heat networks.

  Local authorities have only recently been given statutory duties relating to heat networks. Many are still struggling to build and retain the required technical and commercial knowledge, skills and capacity. LHEES and Delivery Plans are still in development, and there is a recognised gap in proceeding from the output of LHEES / Delivery Plans to the identification of projects. Although development support from the Heat Network Support Unit (HNSU) is available, alongside extensive guidance, standardised contracts and capital funding, the process is still perceived as long and resource-intensive for authorities; some have little or no engagement in the process.

  Given most authorities' lack of in-house skills and capacity relating to heat networks, there is a high degree of reliance on a relatively small pool of external technical, financial and legal advisers. Although the advisory (and wider contractor) market is aware of Scottish Government ambition and supportive policy for heat networks, the lack of visibility of a clear project pipeline means it is difficult to justify recruitment to build delivery capacity in Scotland.

- **Demand assurance to encourage investment**
  The market can readily identify potential projects. For such projects to be investable, developers need certainty that sufficient customers will connect to the heat network when it is available. Most developers will not invest significantly without customer contracts to provide assurance that there will be sufficient demand to recover their investment.

  The absence of such 'demand assurance' is a key reason that developers are unwilling to invest in large-scale heat networks. This is generally true for both public and private sector developers, although their objectives, investment criteria and risk appetite tend to be different.

  Stakeholders, both public and private, are clear that policy & regulation need to provide greater demand assurance in order to de-risk potential projects and unlock investment at scale. There is no fixed view as to how this should be done.

  Demand assurance is commonly achieved by developers entering into long-term agreements with owners of anchor loads. The most attractive anchor loads are usually large public buildings, where there is confidence in a high heat demand that will be sustained over many years, combined with low counterparty risk. However, the high dependence on public sector anchor loads usually translates to a requirement for some form of public procurement exercise to allow the public sector body to procure a connection for their buildings (see further below).

- **Public procurement**
  Public procurement of heat networks is perceived by many stakeholders in the market as an unnecessarily long, complex and expensive process. Procurements can take over a year, requiring bidders to commit significant resource and cost. Contractors recognise resource and cost need to be incurred to develop designs etc., but consider that too much bid resource is required at a relatively early stage in the process, when multiple bidders can be carrying out design development and financial modelling simultaneously. There is a strong market demand for procurement to be streamlined.

  Contractors are increasingly selective when screening opportunities, and will favour projects where the procurement process is streamlined, has a clear timetable and a competent and well-resourced local authority project team. In a market with relatively few contractors and an increasing pipeline of projects, authorities need to think carefully about how to structure not just the project, but also the procurement, to ensure a good market response.

  A minority of the private sector stakeholders we spoke to questioned the need for, and benefit of, local authorities designating heat network zones, leading project development and / or procuring heat networks. Their preference was for local authorities' role to be limited to facilitation (through supportive planning policy, granting land rights for energy centres / pipes, and leveraging local stakeholder relationships) and acting as a customer by offering anchor loads. This was, however, a minority view. Most private sector stakeholders were broadly accepting of a wider role for local authorities in heat network projects.

1.3 Summary of approach & methodology

Delivery models: definition, core characteristics & desirable attributes

This report assesses the potential roles that a range of **delivery models** could play in accelerating the pace and scale of heat network deployment.

There is no generally accepted definition of the term 'delivery model'; it has different meanings in different contexts. We used the following definition in the context of heat networks, to facilitate the understanding of, and comparison between, different delivery models.

Definition: for the purpose of this report, a heat network delivery model is the set of role allocations to different parties, the commercial & financial agreements governing the relationships between the parties, and the applicable regulatory arrangements that collectively underpin the provision of services to customers via a heat network.[3]

In describing specific delivery models in this report, we use a set of **characteristics** to structure the model description, i.e. the various elements of which a delivery model is comprised. These characteristics are: **Overview**; **Project sponsor**; **Funding / income stream**; **Project structure**; **Asset ownership**; **Financing**; **Risk allocation**; **Control**; **Regulation**; **Procurement**; **Balance sheet treatment**; and **Exit strategy**. These are further explained in the main report.

In order to evaluate and compare delivery models, we also identified a set of 10 core **attributes** that we consider a delivery model would need in order to make a significant contribution to the Heat Networks (Scotland) Act 2021 deployment targets. We developed these attributes having regard to the specific challenges of the heat networks market in Scotland and agreed them with Scottish Government.

The attributes we used, which are described further in the main report are:

- Ease of deployment;
- Potential for private sector investment;
- Supports development of skills & capacity;
- Simplifies delivery;
- Contributes to policy objectives;
- Reduces demand risk;
- Supports transition to self-sustaining market;
- Supports replicability;
- Supports expansion / interconnection; and
- Facilitates installation ahead of demand.

3 This definition is derived from that used in the BEIS DPD Guidance on Strategic & Commercial Case, which defines delivery models for heat networks as "combinations of role allocations to different parties and the contracts which govern relationships between the parties.

Models were evaluated and scored against these attributes. In the evaluation of each model, we have also commented on (but not scored) the likely balance sheet treatment of the model.

Long list and categorisation of delivery models

We agreed a long-list of delivery models with Scottish Government to evaluate for this report. These delivery models were categorised as follows:

- **Existing / well-established delivery model** – models which are well-established in the UK and for which there are multiple examples of heat network projects deployed under this model (albeit with minor variations):
  - Public sector (non-Scottish Government) in-house delivery – heat network wholly owned and operated by a public body (either directly, or via a wholly owned arm's length entity), usually based on self-supply arrangements (e.g., local authority buildings, or a public sector campus) (**DM1**);
  - Service concession – heat network owned and operated by the private sector under a long-term service concession tendered by a public body, where the public sector offers anchor loads, and a concessionaire takes demand risk (**DM2**); and
  - Third party ESCo – heat network owned and operated by a private sector third-party ESCo appointed by private sector land owner / developer, generally to serve new development (**DM3**).
- **Existing delivery model / limited examples** – models which have been used in the UK on a relatively small number of heat network projects, but for which there are as yet insufficient examples to consider the model as well-established:
  - Local authority led joint venture – a local authority procures a partner and forms a JV to serve an initial project (including one or more local authority anchor loads) and potentially additional projects and / or other energy projects within the local authority area (**DM4**);
  - Community led project – a community leads heat network development and owns the network, subcontracts O&M, supplies buildings within community (**DM5**);
  - Unbundled model – a family of models involving separate ownership of generation, transmission / distribution and supply assets, e.g. where heat generators contract directly with customers and pay a use-of-system charge to the owner of heat transmission / distribution infrastructure (**DM6**); and
  - Merchant model – a private sector heat network operator contracts with off-takers to supply existing buildings, without having either being appointed by a private sector land owner / developer in connection with a particular development site, or having followed a public procurement exercise (**DM7**).
- **New delivery models for heat networks** – models for which we are not aware of any UK examples of heat networks delivered in this way, though the model in question may be established in other sectors:

- **Centrally led delivery** – In this model, Scottish Government (or an executive agency of the Scottish Government, or some other centrally controlled public body) takes the lead on development and delivery of projects, without need for local authorities to lead development. The central body could have initial ownership / part-ownership of projects (potentially alongside private sector partner(s)) but with potential for the onward sale or transfer of government stakes in projects once they are operational with established revenue streams. As with other delivery models, this model could be adjusted to perform slightly differently against a number of attributes. (**DM8**);
- **Local Authority led delivery, with Scottish Government stake** – local authorities lead the development and delivery of projects, with Scottish Government / central support and co-investment (which may be in addition to an element of grant), in a joint venture arrangement. Scottish Government would have part-ownership[4] of schemes, but with potential for sale / transfer of the government stake once a scheme is established. JVs could be bipartite – local authority & Scottish Government, or tripartite – local authority, Scottish Government and private sector (**DM9**);
- **Regional ESCo** – in this model, local authorities and other public bodies[5] (e.g., NHS, universities / colleges) come together on a regional basis and jointly procure a private sector delivery partner for each region (similar to the Hub model, which was established in Scotland to deliver community infrastructure). The local public partners then use the delivery partner to scope, design and deliver projects, according to pre-defined contracting structures, drawing on the delivery partner's supply chain. (**DM10**);
- **Public Private Partnership (PPP)** – the heat network is operated by the private sector under a long-term contract tendered by a public body, where the public sector retains the majority of demand risk, but availability risk lies with the PPP contractor (**DM11**); and
- **Regulated Asset Base** – a private sector ownership model in which heat network assets are constructed, owned and operated by a monopoly supplier on a long-term basis. Investment plans, operating performance and returns (which are capped) are subject to regulatory oversight. The model is intended to incentivise private investment in large-scale heat networks, with a cost of capital comparable to other regulated utilities (**DM12**).

The report includes a detailed description of each of these delivery models. Each model description is structured by reference to the 'characteristics' referred to above.

For existing delivery models, we have provided UK examples of heat networks using that model.

4 For the purposes of defining this model, we have assumed Scottish Government would take an equity stake in projects (e.g., by subscribing for ordinary or preference shares in a project SPV). Other forms of marketable securities could also be considered, e.g. debt securities.

5 For the purpose of this report, public bodies includes bodies which are regarded as public authorities for certain purposes (such as universities, which are often constituted as charities) and are required to comply with public procurement rules.

- **Enabling structures / mechanisms**
  In collating the long list of delivery models, we identified a number of 'enabling structures / mechanisms' that share some, but not all, of the characteristics of a delivery model, and which could complement and / or enable the implementation of one or more delivery models. These were not evaluated as delivery models, but their potential role in complementing other models was considered.

  The enabling structures considered in the report are: **Demand assurance**; **Private company with public purpose**; **Heat as a Service**; and **Procurement efficiency**.

1.4 Summary of evaluation findings & recommendations

We evaluated each of the twelve delivery models against the ten attributes described above. Each model was given a score of 0 – 3 against each attribute, to help determine a high-level ranking. The evaluation was informed by our own experience combined with stakeholder engagement. A full table of scores is provided in Appendix B.

Our conclusions and recommendations are categorised as follows:

1. a set of general, overarching recommendations and conclusions which are not specific to individual models;
2. a set of recommendations relating to implementation of the four highest-scoring models in our evaluation, should Scottish Government wish to pursue any of these models further;
3. recommendations and conclusions in respect of each of the remaining eight models considered in our evaluation; and
4. recommendations relating to 'enabling mechanisms', which could complement and / or enable the implementation of other delivery models.

The remainder of this section summarises these four sets of recommendations.

(1) Overarching conclusions & recommendations

Through our evaluation and engagement with stakeholders, we have identified general, overarching recommendations and conclusions which are not specific to individual models. These are set out in full in the main report and can be summarised follows:

a) The models can be further refined and the optimal solution (which may include attributes from a number of models), should be developed to support Scottish Government objectives.

In order to be able to evaluate, score and contrast the different delivery models, we had to make certain assumptions about existing models and how each 'new' model could be deployed. Key assumptions are included within the description of each model.

In practice, there are features of existing models which can (and do) vary, and features of the potential 'new' models that could be flexed to support

different outcomes or meet different attributes. Where this is the case, we have identified it in the evaluation text and reflected it in our summary conclusions and recommendations below. **The inherently flexible nature of the four top-performing models we are recommending for further consideration should be borne in mind when reviewing this report.**

If Scottish Government wished to promote a new model, **the top four models we identified could be refined, adjusted and adapted to develop an optimal solution** and ensure any new model appropriately balanced the most important attributes. We have framed our recommendations to reflect this flexibility and the range of choices around how new models could be deployed.

b) A long term 'Vision' for heat networks in Scotland should be developed.

There would be significant **value for Scottish Government in developing a 'vision' for how heat networks in Scotland should operate in the long term**. For example, does Scottish Government envisage significant ongoing public sector involvement, or a largely private sector owned and operated market? Understanding the 'vision', or even preferred outcomes (beyond deployment targets), would help inform decision making around the creation of any new delivery model, and would also help inform the ongoing development of forthcoming regulation under the Heat Networks (Scotland) Act 2021.

Steps should also be taken to future-proof current activity to facilitate any potential future consolidation of assets (whether into public or private (local) monopolies or unbundling of the market). This will retain future flexibility as to how Scotland's heat network market can evolve over time.

c) Existing models can be optimised in the short term, regardless of any medium or long-term intervention.

We recognise that **the existing suite of delivery models**, both those that are relatively well-established and others that are emerging, **will still have an important role to play**.

Hence, although our focus is on the four models which performed best in the evaluation against the attributes, we have also considered what, if any, recommendations should be made in respect of the other 8, lower-scoring models. Recommendations include, for example, developing case studies or the preparation of further guidance and templates.

These recommendations seek to optimise and future proof the networks delivered using more traditional routes, or prepare for new and emerging private sector models.

d) Budget implications and Government risk appetite.

Private sector investment is fundamental to achieving the necessary scale of deployment. The highest-scoring models all enable (or could allow for) private sector investment to varying degrees, but at least two of the four highest-scoring models would require some degree of **central Government investment**, either directly or indirectly, via Government owned or controlled entities.

To inform the detailed design for any potential new delivery models it wishes to take forward, Scottish Government should therefore consider and determine its

risk appetite for investment in heat networks, and **the time period over which it may wish to hold investments**, including **whether investments should be categorised as on or off Government balance sheet**.

Where investments are on balance sheet, it may be appropriate to develop an **exit strategy** such that investments would transition to off-balance sheet (through a sale / disposal of all or part of an investment in a project) after a period of time.

e) **Ongoing stakeholder engagement will be required.**

We undertook high-level, principle-based stakeholder engagement to help inform our evaluation and recommendations in this report. Based on the engagement undertaken with both public and private sector stakeholders, we think the following attributes (as described in section 5) should be a priority for any new models: **potential for private sector investment**, ability to respond to current challenges around **skills & capacity, ease of deployment** and **simplifying delivery** (in particular to promote improved procurement efficiency).

Should Scottish Government be minded to develop models further, **additional, stakeholder engagement (and involvement in development) will be important to inform the design and implementation of any new model(s)**. Engagement would need to be more detailed, and involve more refined proposals for market engagement. For major changes or interventions, public consultation may be advisable.

(2) Highest scoring models

Of the twelve models we evaluated, we identified **four delivery models** that we propose warrant further detailed development / consideration, namely:

1. Regional ESCo (DM10);
2. Local authority led joint venture (DM4);
3. Local authority led delivery, with Scottish Government stake (DM9); and
4. Centrally led (DM8).

These models scored highest in the evaluation. A full table of scores is provided at Appendix B.

Given the element of subjectivity inherent in scoring against qualitative evaluation criteria, we would not at this stage wish to prioritise these further based on scores alone. Although scores have been moderated, good arguments can be made for an increase or decrease in an individual score against an attribute by 1 mark. It is therefore important to consider the qualitative evaluation findings in section 8, alongside the scores in Appendix B. Any prioritisation of models should take into account these qualitative comments.

Note that the Regulated Asset Base (RAB) model (DM12) scored equally with Centrally led (DM8), but has not been short-listed above due to the negative assessment of the potential for the model to be deployed at the present time, given the current regulatory and policy framework.

Regional ESCo (RESCo) (DM10)

We recommend that this model is taken forward and resources are put into its further development / consideration.

This model, in which local authorities and other public bodies[6] (e.g., NHS, universities / colleges) come together on a regional basis and jointly procure a private sector delivery partner for each region to form a 'Regional ESCo' (RESCo), is analogous to the Scottish 'Hub model' for community infrastructure, in which public sector bodies came together on a regional basis to participate in joint procurements of private sector partners to deliver community infrastructure projects. In the Hub model, the successful bidders and the public bodies then formed regional "HubCos", in which the private sector partner took a majority stake, and the local public sector bodies (and SFT's investment arm) hold minority stakes.

Although further work is required to determine whether a 'Hub style' RESCo model would be as effective for heat network delivery as the existing Hub model has been for community infrastructure in Scotland, there are numerous core components of this model which perform very well against many of the evaluation attributes and have the potential to offer significant benefits to heat network delivery.

Key benefits

The RESCo structure provides a mechanism by which, on a regional basis, a single procurement unlocks multiple projects. These future projects are contemplated in the initial, regional procurement, reducing costs and delay. The structure involves a long-term relationship with a private sector delivery partner, who would establish resources and expertise within the RESCo, so that it can develop and deliver projects. The delivery partner would procure its supply chain, which can be flexed over time. Based on the Hub experience, benefits for local and regional skills and supply chains are also likely to be significant.

The 'partnering' nature of the model, where other public sector bodies have a stake in the RESCo (in addition to being named on the Contract Notice) should help to catalyse development, by bringing a larger number of public sector entities (with responsibility for potential anchor loads) to the table in a more proactive role. The benefits of this partnering approach have been very apparent in Hub.

The potential for scale through a pipeline of projects can promote both economies of scale in terms of strategic investments, purchasing power and facilitate access to a lower cost of finance.

If taken forward, the process of setting up this model could draw upon and benefit from the extensive experience and learning from the Hub programme. Similar challenges to those identified below have been overcome in the Hub model.

6 For the purpose of this report, public bodies includes bodies which are regarded as public authorities for certain purposes (such as universities, which are often constituted as charities) and are required to comply with public procurement rules.

Key risks

As this is a new model for heat networks, it would require multiple regional procurements (although a single suite of documents could be developed), preceded by a significant development period, including more detailed market testing of the concept and to test / gain the support of the relevant public bodies in each area. Scotland's HubCos took around two years to establish, although some efficiencies may be possible in delivering this model if learning from the Hub programme can be applied. Project development under existing models could continue during this development period.

The boundaries of each 'region' would need to be carefully considered to balance the need for scale and a sufficient pipeline of projects, whilst ensuring that the private sector partner had sufficient delivery capacity. The potential scale of investment for a region (as against a single local authority) may point towards the delivery partner being an investor (with ability to use multiple contractors) rather than a (single) contractor. In order to attract market interest in each region, a degree of exclusivity for the private sector partner would likely be required over certain types of projects for a minimum period. This needs to be carefully considered in the context of forthcoming regulation (although the need to consider the interface between commercial / procurement and regulatory processes is a challenge that is not unique to this model, and needs to be evaluated for all models).

The regional public bodies will require visibility of how the delivery partner provides value for money to the RESCo if it contracts services and delivery contracts through its own group companies. This can be dealt with by open book accounting or a requirement (as happens on Hub) to tender sub-contracts.

Depending on the size of Scottish Government's equity stake in a RESCo, and the degree of control conferred by its shareholder rights, there is potential for projects to appear on Scottish Government's balance sheet (until such time as its shareholding is sold to a project partner or third party) and therefore reduce funds available to be spent on other priorities. A significant amount of work and preparation went into the Hub balance sheet treatment, and those lessons could be applied here.

A full evaluation of this model against the attributes and detailed recommendations in relation to this model are set out in the main report.

Local authority led joint venture (DM4)

We recommend that this model is taken forward and resources are put into its further development / consideration.

Although there are relatively few examples of joint ventures (JVs) in the heat network sector, the JV model is based on a well-understood corporate structure that can be deployed without requiring any Scottish Government intervention.

Key benefits

All of the JV-style models we evaluated which involve a private sector partner offer significant benefits in terms of simplifying delivery, because a single procurement can unlock multiple projects: after the initial procurement for a partner (which is usually backed by a well-defined initial project), the JV partner can proactively develop business cases for additional projects, which do not need a separate procurement exercise.

In a JV, private and public sector JV partners can each 'play to their strengths'. The local authority can bring a project pipeline, land (e.g., for energy centres), anchor loads, local stakeholder relationships and supportive planning policy. The private sector brings delivery capacity and expertise to develop projects more efficiently from an early stage. Both parties bring investment, and share in risk and returns.

Ongoing public sector involvement via a JV can allow a degree of focus on policy objectives to be maintained, and will support the identification and delivery of new projects which rely on local authority anchor loads. The risk / return sharing inherent in the JV model tends to promote a collaborative rather than adversarial relationship, in which the partners' interests are suitably aligned. Some investors / developers will also accept a lower rate of return via a JV model because risks are shared, reducing the scale of grants required and supporting the transition to a self-sustaining market.

In addition to Midlothian Energy, there are examples of successful 'energy partnership' JVs in England and Wales which are focussed on, or include, the delivery of heat networks. We see significant potential in this model as a way for local authorities to procure heat networks. This approach could help with co-ordination of wider LHEES delivery across the local authority area, and should better ensure that the most optimal energy solution is identified for each building[7].

7 Note that a wider 'energy partnership' is also possible for the RESCo (DM10) model.

Key risks

In order to attract market interest, a degree of exclusivity for the private sector JV partner would be required over certain types of projects for a minimum period. The requirement for exclusivity would need to be carefully considered in the context of heat network zoning, and in particular the designation of permitted zones.

The local authority will require visibility of how the JV partner provides value for money to the JV if it contracts services and delivery through its own group companies. This can be dealt with by open book accounting or a requirement for the JV to tender sub-contracts competitively.

A full evaluation of this model against the attributes and detailed recommendations in relation to this model are set out in the main report.

Local authority led delivery, with Scottish Government stake (DM9)

We recommend that this model is taken forward and resources are put into its further development / consideration.

Feedback from local authority stakeholders indicated that an ongoing Government commitment to projects, which was more proactive than offering grants, would help support delivery and could encourage local authorities to invest in heat networks. One way of doing this would be for Scottish Government to take a stake in projects. We believe this model has significant potential and should be explored further.

Key benefits

Financial risks and returns would be shared between the parties in accordance with their respective investments. Scottish Government taking an equity stake (potentially alongside capital grant) would help to de-risk a project and allow it to proceed faster and / or at a greater scale than would otherwise happen. Scottish Government would also have the potential to share in any profits.

Scottish Government would have a greater degree of control and influence (proportionate to its equity stake) than would be achieved solely via grant funding, and would have the option to exit and recycle capital into other schemes. Centrally held stakes could be retained for the longer term or sold on when the market was more mature.

Some authorities would welcome Scottish Government being more closely involved in projects than with a ‘grant only’ structure, and see value in a Scottish Government appointee with suitable experience being involved in helping to steer the project and ensure its long-term success.

Developing a central body of skills and experience, whilst working with local authorities who can develop expertise locally, would help build skills across Scotland. Shared central knowledge of multiple projects also offers potential to identify expansion and interconnection opportunities, while sharing lessons learned.

Although a minority of investors were not in favour of sharing ownership with central Government, many were supportive.

Key risks

Scottish Government's ongoing role in projects would expose it to reputational risk in the event that the project failed to deliver the desired objectives. As a shareholder, Scottish Government would also risk losing its investment if its equity stake had no value. In this scenario, the Scottish Government investment in the project would in effect become a grant, meaning the additional risk (compared to current grant support) is more reputational than financial.

Not all potential co-investors would welcome an ongoing Scottish Government role in projects. Some do not see this as a natural government role, and would prefer intervention to be limited to policy and regulation rather than getting involved in project delivery.

An ongoing role in projects through SPV (Special Purpose Vehicle) Board appointments would provide greater insight to Scottish Government of the practical issues facing projects, and may help to guide the SPV in interpreting and applying any pre-agreed policy objectives, and add value beyond purely profit-led decision making. However, if the Scottish Government's appointee was a director, any such appointee would be bound by directors' duties, including to act in the best interests of the SPV. If the appointee was not a director (e.g., an 'observer' role), Scottish Government would not have sufficient influence and control in order to protect its investment.

A shareholding in project SPVs risks bringing the relevant project(s) onto Scottish Government balance sheet, thus reducing funds available to be spent on other spending priorities.

A full evaluation of this model against the attributes and detailed recommendations in relation to this model are set out in the main report.

Centrally led delivery (DM8)

We recommend that this model is taken forward for further consideration and resources are put into its further development / consideration.

The rationale for this model is to provide a delivery route for projects in areas for which heat networks have been identified as an appropriate decarbonisation pathway, but where local authorities are not actively taking forward development, and no other organisations are doing so at scale (e.g., on a merchant basis). The model has the potential to unlock development in such places, but could also be scaled up to deliver more commercially attractive projects as well, in order to deliver consolidation and control. This model has some positive attributes which we believe are worth considering further.

Key benefits

Consistent and significant central ownership via this model (noting that JVs with a private partner would still be possible) offers the potential for control and future consolidation and the opportunity to focus on wider policy priorities across all of Scotland. It could also remove barriers to expansion and interconnection in the future, and provide an opportunity for installation ahead of demand (provided the central body had the required investment capacity and risk appetite).

Depending on Scottish Government's investment capacity and risk appetite, a central delivery body would have the potential to invest ahead of need, for example by making strategic investments in transmission / trunk mains in anticipation of future connections in heat network zones.

A central delivery body would allow significant knowledge sharing and efficient allocation of resources, with delivery expertise building up over time.

Any investments made by Scottish Government in projects could have future value, with potential for such investments to be sold in due course (most likely when projects are operational with established revenue streams), and the proceeds of sale available for reinvestment in other projects.

Key risks

The version of this model we evaluated assumed no local authority role in developing or delivering projects (other than in offering / connecting their own anchor loads). This would be a move away from the current policy around LHEES, where local authorities are responsible for identifying appropriate heating solutions for their area. Scottish Government's role in leading project development would expose it to reputational risk in the event that projects failed to deliver the desired objectives.

A risk of creating a central body is that those local authorities who are currently active in heat network developments may step back and re-prioritise limited resources on other initiatives. It is difficult to say whether the net result would increase or decrease the overall pace and scale of delivery.

Deciding where to prioritise spending, and how to address any imbalance in areas where local authorities are pursuing their own projects, would be politically challenging – local authorities active in heat networks will need reassurance that subsidy will continue to be available to support their own developments, so they are not adversely impacted by the introduction of the delivery body.

This model would require significant capital investment (assuming that Scottish Government will need to provide capital that might otherwise have been provided by local authorities), and ongoing revenue budget. A shareholding in project SPVs risks bringing the relevant project(s) onto Scottish Government balance sheet, thus reducing funds available to be spent on other spending priorities.

As a shareholder, Scottish Government would risk losing its investment if its equity stake in a project had no value. In this scenario, the Scottish Government investment in the project would in effect become a grant, meaning the risk (compared to current grant support) is more reputational than financial.

There may be a risk of 'self-regulation' in respect of the Heat Networks (Scotland) Act 2021, where Scottish Government is developing and operating projects, whilst holding regulatory functions in respect of heat networks. This issue could be reduced if a separate statutory entity was set up to hold the heat network assets and apply for the relevant approvals, but setting up an independent entity in this manner could require further legislation.

A full evaluation of this model against the attributes and detailed recommendations in relation to this model are set out in the main report.

(3) Other models – conclusions & recommendations

Of the remaining eight models not described above, we reached varying conclusions in our evaluation findings and recommendations.

For some established models (i.e. Public Sector Led (DM1), Concession (DM2) and Private ESCo (DM3)) we have concluded that they still have a role, can be supported, and that their delivery could be optimised or improved:

- **Public Sector Led (DM1):** We recognise that this model will continue to play a useful role for those authorities with the skills & resources, investment capacity and risk appetite to develop, own & operate networks. However, given most local authorities' limited investment capacity and competing priorities for investment, this model is highly unlikely to result in the scale of investment necessary to contribute meaningfully to deployment targets. Hence we do not recommend that this model be actively promoted further by Scottish Government. Where existing local authority projects are finding it difficult to expand – e.g., due to operational challenges, competing priorities and limited resources – Scottish Government / HNSU should work with the projects to explore whether a different ownership model would be more advantageous, and how to transition.
- **Concession (DM2):** The concession model continues to offer a successful route to the procurement and delivery of heat networks for authorities which are less willing to take on any investment risk. Concessions are well-understood and offer a relatively straightforward route for bringing in private investment. Although procurement can be lengthy and costly, there is potential to improve this. Concessions offer only contractual control for the procuring authority, meaning it can be harder to manage wider policy objectives over the longer term. Developers and investors will generally seek a higher rate of return to reflect the greater amount of risk being passed on to them. At present, this tends to require higher levels of subsidy to support the investment, and also means that this model is

only really suitable for more profitable opportunities. The traditional concession model generally only delivers a single investment, rather than offering an entry-point for ongoing investment through multiple subsequent projects. It is therefore less efficient at deploying private investment than some other options. We believe that there is scope to provide guidance and support that ensures better long term outcomes for the public and procuring authority, and to ensure that concessions contribute to (and do not detract from) any longer term vision developed for heat networks in Scotland. We have made recommendations in relation to monitoring actions and development of standard forms for concessions.

- **Private ESCo (DM3):** This model (as defined) is generally limited to smaller, contained sites in order to respond to planning conditions requiring the construction of a heat network. It does not involve any substantive role for the public sector beyond regulation. While it is positive to see heat network being provided for new development, and heat networks should be encouraged for new developments, this kind of project does not generally go on to expand or serve existing buildings, and so will not deliver the pace and scale of development that is required. We do not believe this model should be actively promoted beyond promoting policies that are supportive of new heat networks. For example, we recommend that Scottish Government should continue to promote planning policy that supports or requires the installation of new heat networks (or connection into existing or planned heat networks) at all new development sites in specified areas. In practice, this will require local authorities to develop pro-heat network policies at a local level. Scottish Government may wish to consider how this can be further encouraged / supported e.g., via the sharing of experiences and best practice examples from elsewhere in the UK as part of the proposed HNSU 'strategic heat network planning' initiative.

For some other 'new models', we recommend that they should **not** be actively promoted or supported at this time, but that 'watching brief' type actions could be considered (**Merchant model (DM7)**), or consideration given as to how they might be used in the future **Unbundled (DM6)** and **Regulated Asset Base (DM12)**:

- **Merchant model (DM7):** We do not recommend that this model is promoted by Scottish Government as a means to achieving a step change in pace and scale of deployment of heat networks. Whilst we recognise the potential for private sector investment under the merchant model, we do not believe this will lead to the development of large-scale strategic heat networks aligned with intended policy outcomes. This model carries a significant risk of 'cherry picking' of anchor loads, resulting in uncoordinated and small-scale developments, misaligned with Scottish Government policy ambitions. It risks first-mover advantage in an area, potentially inhibiting future, larger-scale, development (e.g., in areas likely to be designated as permitted heat network zones). However, we recognised that this model may have a limited role for towns or suburban residential schemes (e.g., shared ground loops). We recommend that further analysis should be undertaken to identify the potential for this model in certain locations, and whether / how it should be accommodated in forthcoming wider commercial and regulatory arrangements (including LHEES, zoning and related exclusive permitting).

- **Unbundled (DM6):** In an unbundled model, generation, distribution and supply are operated as separate businesses. The development of new networks, or unbundling of existing networks into separate businesses is generally only viable and practicable where sufficient scale has already been achieved. It would therefore be premature to promote this delivery model in a relatively immature heat network market such as in Scotland. In due course, heat networks may reach a scale at which unbundling their components becomes commercially viable. With this in mind, Scottish Government should promote the future-proofing of delivery models to facilitate any potential future unbundling of networks (e.g., by holding assets in SPVs). Partially unbundled networks may develop naturally where there is an obvious industrial / third-party heat source wishing to connect to an existing network, and supply of surplus / waste heat from environment / industry into networks (e.g., Stirling Forthside, Glenrothes, Clyde Gateway, Millerhill energy-from-waste) should be encouraged and facilitated. This can be done via the HNSU. Examples would include the provision of a template supply agreement currently being developed by SFT.
- **Regulated Asset Based (DM12):** The Regulated Asset Base model offers a good long term regulatory model for large infrastructure operating in a monopoly environment. There is significant experience of this model from other sectors in the UK. It supports investment in assets by providing a guaranteed return for investors on approved investments, and mitigates demand risk by spreading costs across the entire customer base. However, it requires a large asset base to support the model, is time and cost intensive to regulate, and is not compatible with forthcoming regulation for heat networks in Scotland: current market and regulatory arrangements would not support the immediate roll out of this model. However, both existing and any new delivery models could be future-proofed to retain this option in the long term, by facilitating any future consolidation of heat network assets (whether into public or private (local) monopolies). We have recommended that Scottish Government should develop a long term 'vision' for heat networks in Scotland, including determining whether consolidation of certain types of heat network assets is desirable as a long-term structure. If long-term consolidation of ownership is deemed to be desirable, consideration can be given to how all delivery models being used could be future-proofed to facilitate this outcome.

We do not consider that the PPP model (DM11) or Community Led (DM5) would offer any delivery advantages, and recommend that they should not be pursued.

- **Community Led (DM5):** Although community led projects can have very positive policy outcomes for small communities when delivered successfully, community led projects tend to be small, challenging to deliver and often harder to fund. They can absorb skill and resource (including Government grant and advisory support) without delivering projects at scale. Whilst we recognise there may be other policy reasons for promoting community led projects and that they are likely to have some role to play, we do not recommend that this model is promoted by Scottish Government as a means to achieve scale and pace of deployment of heat

networks. However, if encouraging community involvement in projects is a priority for Scottish Government, case studies or guidance could be prepared. Scottish Government may also wish to investigate and promote alternative ways in which communities could be engaged in (and benefit from) heat networks, other than ownership (e.g., via the development of a community fund, funded by the heat network operator). HNSU could develop 'best practice' guidance for delivering community benefits, which could feed into larger procurements.

- **PPP (DM11):** The PPP model has many features similar to a concession model, and offers no additional advantages in the context of heat networks, but is more costly and complex to deliver than a concession. We therefore do not consider this model as suitable as a means for the deployment of heat networks at pace and scale. Unlike the merchant model, we are not aware of any market actors promoting or suggesting this model, and therefore no further steps are recommended.

Proposed recommendations for each of these 8 remaining models include: to consider further the interaction with forthcoming regulation; to prepare updated guidance for local authorities for delivering various models; to prepare contract templates for various models; and horizon watching / capturing lessons learned from developments / projects across the UK.

Various recommendations relate to more than one model, and can be 'packaged' accordingly.

(4) Conclusions & recommendations in relation to enabling mechanisms

There are a number of enabling structures / mechanisms which, if implemented, would also help to increase the pace and scale of delivery of heat networks. These mechanisms would, to a large extent, apply independently of the choice of delivery model for a particular project. These supportive mechanisms relate to demand assurance and procurement efficiencies.

The report describes the various ways in which **demand assurance** could be achieved, and its fundamental role in de-risking investments in heat networks from a developer perspective (both public and private sector). As part of the on-going work to develop policy and regulation, we recommend that the Scottish Government should continue to seek opportunities to provide greater demand assurance to projects. Although stakeholders we spoke to were not universal in their views on which form of demand of assurance would be most welcome (e.g. support for mandatory connections appeared to be reducing), there was clear feedback that more could be done to reduce risks around demand assurance, and that steps taken did not need to be radical. For example, some stakeholders suggested that clearer policy advising that public sector buildings should connect to heat networks would go a long way to encouraging anchor loads to connect.

The report outlines stakeholder concerns about **procurement efficiency**, including procurement procedures, time-scales and associated bid costs. We have described a range of approaches intended to increase the efficiency of procurements. **We recommend the Heat Network Support Unit should facilitate the development and implementation of procurement efficiency on a project-by-project basis**. This could include, for example, piloting a two-stage procurement process on a live project, evaluating the outcomes and disseminating lessons learnt via a case study, and / or establishing a procurement framework.

Full report

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1. Introduction

Heat networks are one of a number of low / no regret technologies for heat decarbonisation identified in Scotland's Heat in Buildings Strategy[8]. Scottish Government has set ambitious targets for their deployment, supported by a range of policy initiatives, financial incentives and regulatory measures.

These will help to build skills and capacity, facilitate the identification and development of projects, and the regulation of heat network operators. However, based on the current rate of deployment and outlook on project pipeline, it is unlikely that statutory targets will be achieved without further intervention.

This report, prepared by Scottish Futures Trust for the Scottish Government, assesses the potential roles that a range of delivery models (alongside a number of complementary enabling structures / mechanisms) could play in helping to accelerate the pace and scale of heat network deployment. It makes recommendations on interventions Scottish Government could make in relation to certain models.

The methodology for this report included: consideration of how delivery models should be defined and characterised in the context of heat networks; stakeholder engagement with local authorities, contractors, investors and advisers to understand the challenges to deployment at the required pace & scale within the current policy and regulatory environment; identifying the features that a successful delivery model should encompass; analysis and evaluation of a broad range of established, emerging and new (for heat networks) delivery models against the agreed success criteria; and developing a set of recommendations in relation to the various models.

The remainder of this report is structured as follows:

- **Section 2 – Overview of policy & regulatory landscape** – summarises the legislative, regulatory and policy environment for heat networks in Scotland and (where relevant) the UK;
- **Section 3 – Challenges to achieving pace & scale** – considers the challenges facing project developers (public and private sector) in project delivery, taking into account stakeholder feedback from local authorities, contractors and investors;
- **Section 4 – Attributes of a successful delivery model** – describes the set of attributes that models should have in order to make a meaningful contribution to policy outcomes;
- **Section 5 – Definition & features of a delivery model** – defines what is meant by a delivery model for the purposes of this report, and the main features used to characterise models;

8 Heat In Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings (www.gov.scot)

- **Section 6 – Delivery models** – describes each of the delivery models to be evaluated, categorised as: existing / well-established models; emerging models; and models that have not been deployed for heat networks in the UK to date. This section also includes a number of enabling mechanisms that could complement both existing and new delivery models;
- **Section 7 – Evaluation** – a detailed assessment of each delivery model against the agreed set of attributes, taking into account stakeholder feedback; and
- **Section 8 – Preferred delivery models & recommendations** – provides, taking into account the evaluation, a range of recommendations against each delivery model.
- **Appendix A – Stakeholder engagement** – list of organisations – local authorities, contractors, investors and advisers that participated in the stakeholder engagement exercise.
- **Appendix B – Evaluation scores** – scores for each delivery model against each attribute.

2. Overview of policy & regulatory landscape

Scotland's climate change legislation sets statutory targets for emissions reductions: 75% reduction by 2030, 90% reduction by 2040, and net zero by 2045[9]. Meeting these targets requires action across all sectors of the economy.

In relation to the built environment, the interim targets require approximately 1 million homes and the equivalent of 50,000 non-domestic buildings to be converted to zero emissions heating systems by 2030[10]. The Heat in Buildings Strategy identifies heat networks as one of a number of no / low regret strategic technologies for meeting this goal (alongside energy efficiency and individual building heat pumps).

There are an estimated 1,080 heat networks in Scotland, which account for approximately 1.4TWh of output and 1.8% of current non-electrical heat consumption by buildings[11]. Although more recent projects (supported by subsidy from Scottish Government via grant funding and / or the Non-Domestic Renewable Heat Incentive) have introduced low carbon heat sources, most heat networks in Scotland still rely on gas as their primary heat source.

Existing networks have been developed by a combination of public and private sector initiatives. In the public sector, local authorities have led on many schemes to serve their own buildings and in some cases to address local fuel poverty. Other public sector

9 Statutory targets are set out in the Climate Change (Scotland) Act 2009

10 Targets are as set out in the Scottish Government's Heat in Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings

11 Percentage of current non-electrical heat consumption is as stated in the Consultation on a 2035 heat networks target: A consultation on a proposal to introduce a 2035 target for the supply of thermal energy by heat networks in Scotland

initiatives tend to be site-specific, e.g., to serve university campuses or hospital sites. Most public sector networks are essentially self-supply arrangements, though some local authority-led schemes involve an element of supply to third-parties. Local authorities have the necessary statutory powers to develop and operate heat networks. Other public bodies are more limited in this regard, for example due to inability to borrow, or to trade. All public bodies are subject to public procurement law, which constrains how they develop their own schemes, partner with the private sector, or take supplies from third-party networks. Subsidy control and competition law are also relevant legal considerations.

Private sector development of heat networks to date has largely been driven by planning policy – for example in London where new developments are required to install heat networks or connect to existing networks – or resulting from a public procurement, for example where a private sector ESCo operates a heat network on a concession basis.

Until recently, the heat networks market has been largely unregulated, compared with other utility-type infrastructure such as electricity, gas, water and sewerage. Market growth has been slow, characterised by relatively small projects linked to ad-hoc development opportunities, and with very limited expansion of networks beyond their initial phase. Despite good examples of heat networks reducing energy costs to building owners (including in areas of fuel poverty), and carbon savings, progress has generally been ad-hoc and opportunistic, rather than based on long-term strategic planning.

Scottish Government has recently introduced a regulatory framework via the Heat Networks (Scotland) Act 2021 ("HNSA"). The HNSA includes statutory targets for deployment of heat networks: 2.6TWh of output by 2027 and 6TWh of output by 2030 – 3% and 8% respectively of current heat demand – and has recently consulted on a 2035 target (7TWh, equivalent to 9% of current heat demand). The statutory targets are informed by a range of evidence, including the UK Climate Change Committee[12], the Scottish Government's First National Assessment of Potential Heat Network Zones[13] and work to date by local authorities on the development of Local Heat and Energy Efficiency Strategies (LHEES)[14].

As well as setting statutory deployment targets, the HNSA also makes provision for a range of measures to promote market development, including:

- a licensing system for heat network operators;
- a requirement for public sector and certain other non-domestic building owners to assess the suitability of their buildings for heat network connections;
- a requirement for local authorities to review their areas and consider designating heat network zones;

12 An example of evidence that informs statutory targets is the Climate Change Committee's Research on district heating and local approaches to heat decarbonisation (Element Energy)

13 An example of evidence that informs statutory targets is the First National Assessment of Potential Heat Network Zones (www.gov.scot)

14 An example of evidence that informs statutory targets is the Local heat and energy efficiency strategies and delivery plans: guidance - gov.scot (www.gov.scot)

- a consenting process for the operation of heat networks and the construction of new ones;
- a permitting process, to allow for licensed heat network operators to have exclusive rights over certain heat network zones; and
- a process for identifying key heat network assets and to allow for an orderly transition of heat network operators if required.

These measures will be introduced by secondary legislation and are expected to be in place by 2024.

In addition to the introduction of regulation via the HNSA and LHEES, the Scottish Government has published a Heat Networks Delivery Plan, which brings together wider policy measures intended to support investment, including:

- First National Assessment of Potential Heat Network Zones;
- Heat Networks Support Unit – pre-capital development funding and support;
- Scottish Heat Networks Fund – £300m capital fund (available until May 2026);
- National Planning Framework (NPF4) – supportive policy related to new developments;
- Rates relief – 90% relief from non-domestic rates for new heat networks with renewable heat sources (until March 2024), and 50% relief for all heat networks until 2032;
- Heat in Buildings Bill – consultation in advance of the Bill to be introduced in Autumn 2023, and expected to set out timescales by which different tenures of buildings must meet minimum energy efficiency standards / install zero emissions heating systems. The consultation may propose additional measures to provide demand assurance for heat networks – we are not sighted on details; and
- Capital funding programmes – e.g., Green Public Sector Estate Decarbonisation Scheme and Social Housing Fund – which can support the cost of adapting buildings to enable connections.

In parallel to the above developments, a market framework is currently being introduced by UK legislation[15], elements of which will apply in Scotland. This will provide additional measures to protect customers of heat networks in Scotland, where the Scottish Parliament does not have the required legislative powers.

The market of heat network installers / operators active in Scotland (together with the associated supply chain) is relatively small compared to heat network markets in other countries, particularly Nordic and Scandinavian nations, and when compared with other UK infrastructure markets. Policy, regulation and funding, both within Scotland and the UK, are supporting market growth. Given the mix of devolved and reserved powers, heat networks policy and regulation in Scotland shares some features in common with the wider UK (e.g., in relation to consumer protection and energy market regulation), but is generally being developed separately. In order to

15 The UK legislation current being introduced is the Energy Bill [HL] – Parliamentary Bills – UK Parliament

support investment in Scottish heat networks, it is critically important that policy and regulation are developed to support market growth, providing an investment environment in Scotland that is at least as attractive to the market as that in the wider UK. Given the relative sizes of the Scottish and wider UK markets, this is recognised as an ongoing challenge.

3. Challenges to achieving pace & scale

The following summary of challenges to achieving greater pace and scale of deployment of heat networks has been informed by SFT's own experience, and engagement with a range of stakeholders from local authorities, contractors, investors and advisers during the preparation of this report.

Within each stakeholder group, a variety of views were expressed, so there is no single or dominant local authority perspective, contractor perspective, etc. However, the points noted below represent themes that emerged during the engagement.

3.1 Multiple & competing policy objectives

Heat networks support multiple policy objectives: developers promote heat networks for a variety of reasons, including decarbonisation / emissions reduction; security of supply and certainty around future energy costs for the sponsor's own estate; fuel poverty alleviation; as a redevelopment / regeneration project; and as a commercial investment.

Increasingly, national and local planning policy is driving low carbon development. This, when combined with sufficient scale and anchor loads, enables business cases for heat networks serving new developments to be cost competitive with a building-level low carbon counterfactual (typically, air source heat pumps). However, the lack of clarity around a backstop date by when existing buildings will need to switch away from gas (combined with continuing uncertainty around the potential future role of hydrogen for heating) impedes the ability of such heat networks to expand beyond the initial development site and connect to nearby existing buildings. By volume and type, existing buildings represent a much greater energy demand than that arising from new development. Building-level decarbonisation options for many existing buildings are limited (e.g., due to building type, space / noise constraints, planning restrictions) and can therefore provide retrofit opportunities for heat networks.

Historically, low carbon heat sources have tended to be more expensive than fossil fuel heating systems, and this trend is likely to return as gas prices fall again. This often leads to a tension between project objectives, where there is a desire to reduce energy costs as well as decarbonise heating supplies.

From a purely economic perspective, until recently the relatively low price of natural gas has favoured the installation of gas combined heat and power (CHP) fuelled networks. These are the predominant type of heat network in the UK. Whilst revenue from both electricity and heat sales can provide a return on investment and cost savings to customers, the decarbonisation of the electricity grid has significantly reduced the potential for carbon savings from CHP, such that this technology is now largely unsuitable for new heat networks with a decarbonisation objective. Moreover, there are a large number of legacy gas CHP networks that will need to switch to a low carbon heat source to meet future regulation.

3.2 Lack of knowledge, skills & capacity

Local authority stakeholders attest to the strong engagement around the Net Zero agenda. Many authorities have set carbon reduction / net zero targets in advance of Scottish Government's statutory targets. Whilst there is strong awareness of, and political support for, net zero initiatives, local authorities are spreading limited resource across a range of different types of projects, including fabric improvements, EV charging infrastructure, as well as heat networks.

Local authorities have only recently been given statutory duties relating to heat networks. Many are still struggling to build, and then retain, the required technical and commercial knowledge, skills and capacity. LHEES and Delivery Plans are still in development, and there is a recognised gap in proceeding from LHEES / Delivery Plans to project identification.

Whilst all local authorities are required to consider designating heat network zones, there is no specific duty beyond this requiring local authorities to bring forward projects within zones. Some authorities are more willing and able to do so than others.

For those authorities willing to take on a delivery role, project development is seen as a long, complex and costly process. Although HNSU development support is available, alongside extensive guidance, standardised contracts and capital funding, the process is still perceived as long and resource-intensive for authorities; some have little or no engagement in the process.

To achieve projects at scale usually requires the co-operation of multiple stakeholders – land owners, and owners of anchor loads and heat sources. Stakeholders often have different objectives, and different timelines for achieving them, resulting in long project development time frames as the lead organisation tries to gain buy-in to a joint initiative.

In addition to objectives being highly project-specific, authorities' investment capacity and risk appetite varies significantly. Some authorities are willing to invest in heat networks and own and operate them themselves, whilst others are more risk averse, have limited investment capacity and / or wish to prioritise other types of investments. From a market perspective, this results in a lack of consistency in how local authorities bring projects to market.

Given most authorities' lack of in-house skills and capacity relating to heat networks, there is a high degree of reliance on a relatively small pool of external technical, financial and legal advisers. A lack of suitable procurement frameworks available to local authorities means it can be time-consuming and inefficient to procure advisers. Some projects require several procurements in order to navigate through the different stages. Retention of key personnel within advisory firms is also an issue.

Although the advisory (and wider contractor) market is aware of Scottish Government ambition and supportive policy for heat networks, the lack of visibility of a clear project pipeline means it is difficult to justify recruitment to build delivery capacity in Scotland.

3.3 Demand assurance to encourage investment

The market can readily identify potential projects from a technical perspective, using the Scotland Heat Map / First National Assessment. For such projects to be investable, heat network developers need certainty that sufficient customers will connect to the heat network when it is available.

Most developers will not invest significantly without customer contracts to provide assurance that there will be sufficient demand to recover their investment. The absence of such 'demand assurance' is a key reason that developers can be unwilling to invest in large-scale heat networks. This is generally true for both public and private sector developers, although their objectives, investment criteria and risk appetite tend to be different.

Sufficient demand assurance can be achieved by developers entering into long-term agreements with owners of anchor loads. The most attractive anchor loads are usually large public buildings, where there is confidence in a high heat demand that will be sustained over many years, combined with low counterparty risk. However, the high dependence on public sector anchor loads usually translates to a requirement for some form of public procurement exercise (see further below).

Demand assurance can also be achieved through other means, including:

- planning policy for new development – a requirement for developments within or adjacent to heat network zones to connect to existing or planned networks;
- mandatory connections for certain types of buildings within heat network zones; and
- certainty around a timeline for banning the use of fossil fuel heating systems within existing buildings.

Stakeholders, both public and private, are clear that policy & regulation need to provide greater demand assurance in order to de-risk potential projects and unlock investment at scale. There is, however, no fixed view as to how this should be done: the end is more important than the means.

3.4 Public procurement

Public procurement of heat networks is perceived by many stakeholders in the market as an unnecessarily long, complex and expensive process. Procurements can take over a year, requiring bidders to commit significant resource and cost. Contractors recognise resource and cost need to be incurred to develop designs etc., but consider that too much bid resource is required at a relatively early stage in the process, when multiple bidders can be carrying out design development and financial modelling simultaneously.

The market stakeholders we engaged with perceived the 'standard' public-sector led project development process as time-consuming and inefficient, resulting in reference designs developed by local authorities that are expensive to produce, of limited practical value once developed, and seldom adopted by the private sector, who rely on their own designs. There is a strong market demand for procurement to be streamlined and to get the successful bidder appointed earlier in the process so that they can inform design and avoid duplication of effort.

The practical consequence of this is that contractors are becoming increasingly selective when screening opportunities, and will (everything else being equal) favour bidding for projects where the procurement process is streamlined, has a clear timetable and a competent and well-resourced local authority project team. In a market with relatively few contractors and an increasing pipeline of projects, authorities need to think carefully about how to structure not just the project, but also the procurement, to ensure a good market response.

A minority of private sector stakeholders questioned the need for, and benefit of, local authorities designating heat network zones leading project development and / or procuring heat networks. Their preference is for local authorities' role to be limited to facilitation (through supportive planning policy, granting land rights for energy centres / pipes, and leveraging local stakeholder relationships) and acting as a customer by offering anchor loads. Such contractors question the need for regulated public procurements, long-term concession contracts and / or exclusivity within heat network zones, and would prefer to compete with other heat network operators based on price and service offering.

4. Attributes of a successful delivery model

Having regard to the specific challenges of the heat networks market in Scotland, this section identifies and explores the core attributes that we consider a delivery model would need in order to make a significant contribution to the Heat Network (Scotland) Act 2021 deployment targets.

In section 6, we analyse the features of each delivery model, and in section 7 we summarise how each model performs against these attributes. The nature of the attributes means that the evaluation is primarily qualitative in nature, and hence mainly in narrative form. However, we also uses a basic scoring matrix to provide a visual indicator alongside the narrative commentary.

The scoring matrix used follows a simple 0 – 3 score or 'RAYG rating' as follows:

Evaluation score	Score description
0	Potentially negative impact in relation to this attribute; fails to meet attribute at all.
1	Is broadly neutral in relation to this attribute; neither benefit nor negative impact.
2	Performs well against this attribute.
3	Performs very well against this attribute.

An evaluation table was used to record the scores and commentary (advantages / disadvantages) for each model against each attribute. Note that for the purposes of the evaluation, the attributes were all equally weighted. Were different weightings to be attached to individual attributes (to reflect a more nuanced prioritisation of attributes), the scores, and potentially the overall ranking of models, would be affected.

The attributes of delivery models considered to be most desirable are detailed below. These were agreed with Scottish Government during the development of this paper.

4.1 Ease of deployment

This attribute asks whether the proposed model could be deployed easily and quickly, for example using existing corporate structures and broadly within the anticipated regulatory framework, or whether there are more complex steps (e.g., legislative changes) required or recommended. Where models would require a more complex authorisation route to be delivered fully, we (as far as is practicable) comment on whether the most beneficial elements or attributes of the model could be achieved in other ways, or enhanced within other existing structures.

4.2 Potential for private sector investment

This asks whether the model supports private investment in heat networks. There are a number of specific features which may be present in a model to encourage this. For example, does the model have a clear risk profile? Does it allow large scale investments to be made (by encouraging larger projects or providing a mechanism by which smaller projects can be aggregated)? Does it provide a clear exit strategy for any public sector ownership? Does it offer an opportunity for the investment to grow over time? Models which risk 'crowding out' private investment would be less favourable, for example those which propose large scale Government ownership of heat networks.

4.3 Supports development of skills and capacity

Engagement with local authorities prior to the preparation of this paper highlighted the degree to which local authorities feel that they do not have appropriate capacity or staff with the right skill sets to be delivering heat networks. We also note that, although local authorities are required under the Heat Networks (Scotland) Act 2021 to consider areas likely to be suitable for heat networks, and to consider designating heat network zones, there is no statutory obligation on local authorities to deliver (or coordinate the delivery of) heat networks in their areas. Within the private consultancy sector, there is also an increasing capacity constraint, whereby a limited number of consultants and advisors with the relevant skill sets are called upon to support a significant increase in projects. As noted above, there are also concerns about supply chain capacity.

When evaluating models we therefore consider the extent to which models could either help to address, or be less vulnerable to, these skills and capacity challenges. For example: whether the model would reduce pressure on local authority teams by outsourcing or centralising this workload; or make more effective use of private sectors skills, for example by procuring support to deliver a larger number of projects together or via one delivery vehicle.

4.4 Simplifies delivery

Engagement with local authorities prior to the preparation of the paper highlighted the challenges and delays associated with actually delivering individual heat network projects. Concerns focussed on the coordination of multiple stakeholders (often with different objectives), the lack of standardisation, and the need for, and complexity of, procurement processes. We consider, in relation to each model, whether the model helps to provide a solution to, or can circumvent or find efficiencies around some of the delivery obstacles faced in the market today.

4.5 Contributes to wider policy objectives

In most nascent or developing markets, the goal of any Government intervention is primarily to 'grow' that market sustainably. In that scenario, development may be facilitated initially (e.g., via grants), and managed via regulation, but would then take place at its own pace and in the form that the market deems most appropriate. For heat networks in Scotland, current indicators suggest that this approach will not be sufficient to catalyse the pace and scale of investment required to meet targets. This paper is therefore exploring how delivery models could help address this market failure.

Given the required pace of change around how we heat our buildings, and the wider impacts of that change, choices around delivery models for heat networks could also have a significant impact on other related policy goals. There is therefore scope for models to be evaluated against other related policy priorities, to provide insight into how the choice of model could support (or undermine) wider policy goals over the long term.

We therefore include high level commentary on the extent to which the delivery models evaluated may support delivery of other related polices and targets. We limit our commentary to the provision of insights specific to the delivery models, based on our understanding of how these models and structures work in practice, and the degree of public sector involvement. In providing our scores, we have considered 'compatibility' of each of the models with three policy areas:

- ability to address issues of fuel poverty;
- the degree of control / ability to support consumer protection via procurement processes and public ownership and control (noting that legislating on consumer protection is a matter reserved to the Westminster Parliament); and
- the degree to which a model would help support the 'Just Transition' to a zero carbon economy.

Although we have focussed on these policy areas as particularly relevant to heat networks, scoring against this attribute is likely to be similar notwithstanding the policy areas which may be a priority or focus. This is because it is primarily the nature and degree of public sector involvement that dictates whether, and the degree to which, policy priorities can be pursued through delivery.

4.6 Reduces demand risk

Demand assurance is often cited as the most important factor to making heat network projects 'investible' for the private sector. 'Demand assurance' is an umbrella term for various approaches to reducing demand risk. Some approaches take steps to guarantee customers (e.g., mandatory connections), others may instead seek to guarantee revenues (in lieu of customers, should connections not materialise as envisaged). Guaranteeing a portion of project revenues (in some form or other) reduces risk and, in turn, reduces the cost of finance.

We assess whether a model is less sensitive to, or helps provide a solution to, demand assurance challenges. For example: does the model support the commitment of public sector anchor loads to projects? Would central Government control of, or investment in, projects be more likely to be accompanied by policies or actions that promote and support connections to heat networks ? Would the model better facilitate 'guarantor' type financing where risks could be in some way underwritten by the public sector to reduce risk for third-party investors?

4.7 Supports transition to self-sustaining market

This attribute recognises the developing nature of the heat network market and supply chain in Scotland, which at present lacks capacity to deliver heat networks at the pace and scale required to meet policy targets. Transitioning to a developed market has practical and financial elements:

Practical: we consider whether the model would help develop networks and build confidence in the market, providing certainty to supply chain and consumers. For example, does the model support or make more likely the giving of specific, significant and long-term delivery commitments in relation to areas or zones for which heat networks will be the dominant technical solution.

Financial: we consider whether the model would help develop commercially self-sustaining heat networks, which represent a cost-competitive alternative for building owners and are not reliant on Government financial support in the longer term.

4.8 Supports replicability

This attribute considers whether the proposed model can be easily replicated across different geographies, which would help to drive efficiencies and promote standardisation. Some models require significant up-front investment of time and effort to establish, but which can then be repeated or expanded relatively easily, whereas others may require similar amounts of initial effort every time they are deployed. Developers and investors strongly favour models which are standardised, tried and tested, and with a well-understood risk profile.

We also consider whether the proposed model works across projects of different size, or whether is it more suited to projects of a particular or minimum size. For example, models dependent upon additional regulation (such as the Regulated Asset Base model) will involve additional regulatory costs, which would ultimately need to be recovered from customers. This tends to require a large customer base for projects to be financially viable.

4.9 Supports expansion / interconnection

This attribute considers whether the model would allow networks to expand and / or interconnect and / or unbundle in the future, and the likely degree of difficulty of doing so when compared with other options. Models which are less profit-driven, and more focussed on the best outcomes for customers, may come up against reduced friction when seeking to connect with other networks, but equally may lack the expertise or commercial skill set to achieve the best outcomes.

4.10 Facilitates installation of heat networks ahead of demand

In its review of international heat networks[16], BEIS identified that in all markets it had evaluated there was little appetite (without specific support or investment protection) for 'building ahead of demand', i.e., investing in infrastructure significantly in advance of when that infrastructure is likely to be used. This is as a result of high up-front capital costs, with uncertain revenue and return timelines. Developers face strong financial incentives to size networks strictly according to contracted demand.[17]

As a result of the pressing need to meet Net Zero targets in Scotland, and in particular to ensure that decarbonised sources of heat are available when householders begin to move away from gas boilers, building heat networks ahead of demand will be much more important than in a 'normal' market environment. It is likely to be key to ensuring that connections can be reliably made when homeowners are looking for alternative sources of heat, noting that this shift will be gradual and (unless mandatory connections are introduced) uncertain across any given area.

We therefore evaluate and comment on the ability of various models to support this kind of investment ahead of demand.

4.11 Balance sheet treatment

It is often important that a corporate or project structure is classified to the private sector under Office for National Statistics rules. The reason for this is that any private sector investment / borrowing within that structure does not then score against Scottish Government capital budgets. This process of classification is often referred to as 'balance sheet treatment'. Factors which can influence classification are summarised in section 5 below.

Classification is important, because if an investment or borrowing does score against the capital budgets, then this reduces funds available to be spent on other spending

16 The review of international heat networks carried out by BEIS is contained in the BEIS International Review of Heat Network Market Frameworks, BEIS Research Paper Number 2019/032

17 The research on sizing networks according to contracted demand is contained in the BEIS International Review of Heat Network Market Frameworks, BEIS Research Paper Number 2019/032, page 37.

priorities. Models which allow for projects to be kept 'off balance sheet', i.e., to be classified as private sector, would therefore be considered more favourable.

5. Definition and features of a delivery model

There is no generally accepted definition of the term 'delivery model'; it has different meanings in different contexts. This section explains what we mean by a delivery model for the purpose of this report, and explains the various elements of which a delivery model is comprised.

The intention is to provide clarity as to the concept of a delivery model in the context of heat networks, and therefore to facilitate the understanding of, and comparison between, different delivery models.

Definition: for the purpose of this report, a heat network delivery model is the set of role allocations to different parties, the commercial & financial agreements governing the relationships between the parties, and the applicable regulatory arrangements that collectively underpin the provision of services to customers via a heat network.[18]

The components of the definition are further explained below:

- **Role allocation** – the various roles that are adopted by parties to a heat network project, such as promoter, customer, funder, asset owner, land owner / landlord, installer, operator, supplier, etc.;
- **Commercial arrangements** – means the set of contracts between parties involved in the ownership and / or operation and / or financing of the heat network. These will include contracts relating to the provision of equipment, services to customers, etc.;
- **Financial arrangements** – means the financial instruments (e.g., equity, loans, grants) through which investors and financiers provide the initial and ongoing capital investment required to construct, operate and maintain the heat network;
- **Regulatory arrangements** – refers to the role (if any) of regulators in the construction and operation of the heat network, including the regulation of services and customer charges, the regulation of returns to investors, etc.; and
- **Services** – refers (in all cases) to the supply of heat to customers, and in some cases, to the supply of cooling and / or electricity, and the provision of ancillary services (e.g., grid balancing).

18 This definition is derived from that used in the BEIS DPD Guidance on Strategic & Commercial Case, which defines delivery models for heat networks as "combinations of role allocations to different parties and the contracts which govern relationships between the parties.

In any such delivery model, **the sources of funding**, through which the capital cost of the heat network is ultimately repaid, are assumed to be:

- **Customers** – via charges (e.g., connection charges, annual standing charges and volumetric tariffs) payable under heat supply agreements and any ancillary customer services; and
- **Taxpayers** – where an element of public subsidy is involved.

Elements of the ownership, contracting and financing arrangements, the role of the regulator, the services, and the income stream to pay for the services, will vary between delivery models. In describing these for each model, it is helpful to consider the following elements:

- **Project sponsor** – which organisation has overall responsibility for and control over the project? Under a given delivery model, does the project sponsor remain in place throughout the life of the project, or can it change over time? Does the delivery model provide a clear exit mechanism for the project sponsor (see 'exit strategy' below)?
- **Funding / income stream** – the sources of funding / income such as capital grant, connection charges and customer services that will be used to fund / repay the initial capital investment. Services will be project specific, and could include heat supply only (standing charges, volumetric charges), or heat supply combined with cooling, electricity and / or ancillary services.
- **Project structure** – distinguish between corporate structures (i.e., how the organisations involved in a project are constituted) & contractual structures (i.e., the commercial agreements between the various contracting parties). As with other types of infrastructure, the contractual arrangements will be dependent on factors such as the risk-reward profile of the project and availability of finance. Note that further information and case studies on established contracting structures, including risk allocation, is available in SFT's guidance on Delivery Structures[19].
- **Project assets** – which organisation(s) own(s) the physical assets created by the project (e.g., heat generation, distribution and supply assets)? Does this remain the same throughout the life of the project, or can it change over time? What happens to the ownership of project assets upon the expiry (or earlier termination) of a contract under which the assets are to be created?
- **Financing** – how is the project financed? Is all of the required finance provided by the project sponsor(s), or is some provided by third parties under financing arrangements?

  Accessing finance for heat networks can be challenging for a number of reasons, including: uncertain project revenues (managing demand risk over a long build-out period with an uncertain connection profile); high project development /

19 SFT's guidance on Delivery Structures is contained in their report SFT DH Delivery Structure Report (v1 - 16 Mar 20015)_0.pdf.

transaction costs; the (current) unregulated nature of the market; and marginal project returns (with frequent conflict between meeting the strategic aims of a proposed project and creating an investable proposition).

There are a number of finance options available, including:

- private sector corporate finance – provided by a private sector partner, which requires a decision by the corporate sponsor to accept the risks and potential rewards of the project in their entirety, and can only be used by organisations with a significant base of assets, debt capacity and internal cash flow;
- private project finance – generally involves the use of a special purpose vehicle to finance a specific project on a non-recourse basis;
- sources of finance provided by or on behalf of UK government – e.g., the UK Debt Management Office[20], the UK Infrastructure Bank; and
- sources of finance managed by or on behalf of the Scottish Government – e.g., the District Heating Loan Fund, the Scottish National Investment Bank.

- **Risk allocation** – key risks for heat networks include:
  - **design risk** – the risk associated with the impact on a project of deficiencies in design (e.g., of heat mains, energy centres, control systems, internal heating circuits);
  - **construction risk** – the risks associated with the building of physical assets to a specified design;
  - **operational risk** – the risk associated with operating and maintaining assets to meet specified requirements;
  - **demand / market risk** – the risk associated with variances from anticipated demand – e.g., heat loads fail to materialise, or connection of loads to the network is significantly delayed, or loads choose to disconnect from the network;
  - **performance risk** – the risk associated with being able to supply customers to an agreed performance / service standard – e.g., due to demand being greater than forecast, or heat output from generation source(s) being less than anticipated;
  - **financial risk** – various financial risks capable of producing financial loss, including credit risk, interest rate movements, exchange rate risk, etc.; and
  - **regulatory risk** – the risk associated with changes to the legal / regulatory framework adversely impacting a project (e.g., licensing, planning / consents, permitting, metering & billing, consumer protection standards, technical standards).
- **Control** – how are decisions made as to the operation of the network – e.g., expansion opportunities / new connections / service standards / tariffs – and by whom? Outsourcing delivery to the private sector is often considered the least risk option from the public sector's perspective. However, transferring all project risk to

20 Lending to local authorities on behalf of HM Treasury was carried out by the Public Works Loan Board (PWLB) until 2020, when PWLB was abolished and its functions transferred to the UK Debt Management Office.

the private sector is likely to involve significant loss of control over key elements of the project e.g., tariff setting, service standards and the potential expansion and integration of small island networks into larger schemes.

- **Regulatory role** – the heat networks sector is in the process of transition from, at present, a largely unregulated state[21], to one in which a comprehensive regulatory framework will be in place. This will be achieved by:
  - secondary legislation to give effect to the provisions of the Heat Networks (Scotland) Act 2021 (e.g., relating to Building Assessment Reports, zoning, consenting, and permitting); and
  - the enactment of the Energy Bill 2022 (and any required secondary legislations) relating to the identity of the licensing authority in Scotland, its enforcement powers, and to regulate for consumer protection for heat network customers in Scotland.
- **Public sector role** – this can vary considerably between delivery models. At one extreme, the public sector can have no role (other than, for example, where a local authority exercises planning powers relating to the development of heat networks). At the other extreme, a heat network can be entirely owned, operated and funded by a public body (usually a local authority, but also public sector campuses such as universities, colleges and NHS sites). Between these extremes the public sector can act in a variety of other capacities, such as facilitator, customer (anchor loads), guarantor (minimum heat demand), co-investor (in a joint venture), etc.;
- **Procurement route** – where the public sector has a role in a project, for example as project sponsor, co-investor (joint venture) or as a customer (anchor loads), a public procurement exercise may be required for the construction and / or operation of the heat network.
- **Balance sheet treatment** – Office for National Statistics rules determine whether a corporate or project structure is classified to the public or private sector. Depending on the role of the public sector within a proposed project structure, the full capital costs of the project may be classified to the public sector. If a private sector classification is considered desirable, the main limitations are:
  - Control – the public sector can only appoint a minority of the board and cannot have control of the organisation / project through other regulations or grant terms.
  - Ownership / underlying risk – the public sector can only provide a minority of the risk capital going into the company / project and cannot be seen to be the ultimate risk taker in the venture in other ways such as guarantor or demand off-taker of last resort.
- **Exit strategy** – the majority of heat networks in the UK to date have been established with the project sponsor retaining long-term ownership and control of most / all of the physical assets. This reflects the fact that most existing networks originated as self-supply arrangements, providing heat supply to buildings mainly under the ownership or control of a single entity (e.g., local

21 Aspects of metering and billing are regulated under the Heat Network (Metering and Billing) Regulations 2014.

authority buildings, a public sector campus, or a housing estate owned by a housing association). Long-term ownership of the assets allows the sponsor to retain full control over the network, including new connections, changes to heat sources, and customer charges.

There may be circumstances in which the project sponsor's primary interest is in establishing a heat network, but once the network is operational with stable revenue streams, the sponsor may wish to dispose of its interest in the project to a third party. The sale proceeds provide a capital receipt, which can be reinvested in other projects.

The sponsor should consider at the outset whether it wishes to retain a long-term interest in the project. If it does not, or at least wishes to retain future flexibility as to the decision, this would influence the choice of delivery model, including the commercial structuring. Some delivery models will facilitate a future exit by the initial project sponsor better than others. An example is where the project assets and associated delivery contracts are held by a special purpose vehicle (SPV), which is typically a company limited by shares, owned by the sponsor. Sale of the sponsor's interest in the project can then proceed by way of sale of the sponsor's shares in the SPV, rather than needing to transfer ownership of each asset and novate each of the delivery contracts separately.

The various delivery models considered in section 6 below refer to the above characteristics, to the extent that they are a particular feature of the model in question.

Whilst the above list captures the main elements, it is not intended to be exhaustive. For example, **tax treatment** may vary considerably between different delivery models, and between the different organisations involved in any given delivery model. However, whilst tax implications need to be understood, and can influence detailed project structuring, this should not be the primary driver when developing a delivery model for a project.

Examples of where tax treatment is relevant include:

- choice of corporate vehicle, such as a limited liability company or limited liability partnership, if an ESCo is considered necessary or desirable for the project;
- choice of contracting structures, such as whether an ESCo holds property and other assets, or takes a different interest (such as a lease or licence) from a parent organisation or third party;
- liability for non-domestic rates and appliable reliefs; and
- application and recoverability of VAT for different types of organisation.

The tax treatment of alternative delivery structures is beyond the scope of this paper, but should be considered at the development stage for a preferred option (or shortlist of options).

6. Delivery models

This section describes a 'long list' of potential delivery models for heat networks. The main features of each model are identified and (as appropriate) contrasted with other models to highlight their similarities and differences.

The delivery models are categorised as follows:

- **Existing / well-established delivery model** – models which are well-established in the UK and for which there are multiple examples of heat network projects deployed under this model (albeit with minor variations):
  - Public sector (non-Scottish Government) in-house delivery – the heat network is wholly owned and operated by a public body (either directly, or via a wholly owned arm's length entity), usually based on self-supply arrangements (e.g., local authority buildings, or a public sector campus) (**DM1**);
  - Service concession – the heat network is owned and operated by the private sector under a long-term service concession tendered by a public body, where the public sector offers anchor loads, and a concessionaire takes demand risk (**DM2**); and
  - Third party ESCo – heat network owned and operated by a private sector third-party ESCo appointed by a private sector land owner / developer, generally to serve new development (**DM3**).
- **Existing delivery model / limited examples** – models which have been used in the UK on a relatively small number of heat network projects, but for which there are as yet insufficient examples to consider the model as well-established:
  - Local authority led joint venture – a local authority procures a partner and forms a JV to serve an initial project (including one or more local authority anchor loads) and potentially additional projects and / or other energy projects within the local authority area (**DM4**);
  - Community led project – a community leads heat network development and owns the network, subcontracts O&M, supplies buildings within community (**DM5**);
  - Unbundled model – a family of models involving separate ownership of generation, transmission / distribution and supply assets, e.g. where heat generators contract directly with customers and pay a use-of-system charge to the owner of heat transmission / distribution infrastructure (**DM6**); and
  - Merchant model – a private sector heat network operator contracts with off-takers to supply existing buildings, without having either being appointed by a private sector land owner / developer in connection with a particular development site, or having followed a public procurement exercise (**DM7**).
- **New delivery models for heat networks** – models for which we are not aware of any UK examples of heat networks delivered in this way, though the model in question may be established in other sectors:

- **Centrally led delivery** – Scottish Government (Scottish Government) takes lead on development and delivery of projects (without need for local authorities to lead development). Scottish Government could have initial ownership / part-ownership of schemes (alongside private sector) but with potential for sale / transfer of government stake once scheme is established (**DM8**);
- **Local Authority led delivery, with Scottish Government stake** – local authorities lead development and delivery of projects, with Scottish Government / central support and co-investment (which may be in addition to an element of grant). Scottish Government would have part-ownership22 of schemes, but with potential for sale / transfer of government stake once scheme is established (**DM9**);
- **Regional ESCo** – local authorities and other public bodies23 (e.g., NHS, universities / colleges) come together on a regional basis and jointly procure a delivery partner for each region (similar to Hub model). The local public partner use the delivery partner to scope projects and deliver according to pre-defined contracting structures (**DM10**);
- **Public Private Partnership (PPP)** – heat network operated by private sector under a long-term contract tendered by a public body, where the public sector retains the majority of demand risk, but availability risk lies with the PPP contractor (**DM11**);
- **Regulated Asset Base** – private sector ownership model in which heat network assets are constructed, owned and operated by a monopoly supplier on a long-term basis. Investment plans, operating performance and returns (which are capped) are subject to regulatory oversight. The model is intended to incentivise private investment in large-scale heat networks, with a cost of capital comparable to other regulated utilities (**DM12**).

- **Enabling structures / mechanisms** – this section describes a number of enabling structures / mechanisms that share some, but not all, of the characteristics of a delivery model, but which could complement and / or enable the implementation of one or more delivery models outlined above:
  - **Demand assurance** – a form of guarantee to project developers to mitigate demand risk, with the intention of attracting private investment whilst reducing cost of capital and encouraging developers to invest ahead of need;
  - **Private company with public purpose** – private company established with a public purpose (and potentially charitable status), similar to the current ownership model for Welsh Water. Profits are re-invested or used to cut customer bills rather than distributed to shareholders;

22 For the purposes of defining this model, we have assume Scottish Government would take an equity stake in projects (e.g., by subscribing for ordinary or preference shares in a project SPV). Other forms of marketable securities could also be considered, e.g. debt securities.

23 For the purpose of this report, public bodies includes bodies which are regarded as public authorities for certain purposes (such as universities, which are often constituted as charities) and are required to comply with public procurement rules.

- **Heat as a Service** – a business model for heating in which consumers pay for outputs such as guaranteed room temperature / comfort levels / hot water volumes rather than inputs such as energy costs. This can involve improvements to the building fabric and controls, as well as the form in which energy is supplied to the building .
- **Procurement efficiency** – a range of approaches that could be used to reduce the time and bid costs for procurement of delivery contracts for heat networks. These include a two-stage process to appoint a delivery partner for the commercialisation stage; use of frameworks; and standardisation.

We note where these structures / mechanisms could be used in conjunction with other models.

6.1 Established delivery models

DM1: Public sector (non-Scottish Government) in-house delivery

Overview – the sponsor public body is typically looking to supply only (or primarily) a group of buildings under its direct ownership or control. In other words, this model is predominantly a self-supply arrangement, though in some cases can involve an element of third-party supply. Public bodies such as universities, colleges and NHS Boards, who tend to have buildings clustered in a purpose-built campus, may procure a heat network to supply the buildings. The model can also apply to a housing association) where it has housing stock concentrated in a relatively small area and controls the heat supply to tenants.

Project sponsor – in this model, deployed extensively across the UK, a public body acts as project sponsor, leads the development of the project and takes full financial risk, managing it through design & build contracts, and operation & maintenance contracts.

Funding / income stream – funding is provided from the sponsor public body and usually involves an element of subsidy (e.g., Scottish Government capital grant). Income is typically internal re-charging arrangements for self-supply element, but will also involve third party income (connection fees, standing charges and variable charges) if supplies are made to third parties.

Project structure – In the context of local authority-owned schemes, there are two main variations on this 'in-house' delivery model:

- the public body operates the scheme directly, with sub-contracts for design & build, operation & maintenance, & (potentially) metering & billing. Examples include the Dunfermline Community Energy Scheme, owned and operated in-house by Fife Council, and the Bunhill district heating network, owned and operated by Islington Borough Council; and

- the public body sets up a wholly-owned, arm's length vehicle, to which it transfers (or leases) the heat network assets, and which assumes responsibility for the operation of the scheme, including any sub-contracts. Examples include West Dunbartonshire Energy LLP.

There are a variety of reasons for operating a heat network through an arm's length company. These typically relate to the ability to trade; limitation of liability (by ring-fencing operations and financial risk within a separate entity); the ability for the entity to have operational independence, including dedicated resources, budget and its own business plan; and to facilitate a future sale or transfer of the network. Detailed guidance on this subject has been published by SFT, but it is important to note that Scottish local authorities, unlike their counterparts in England and Wales, are not required to set up a separate arm's length vehicle in order to trade in heat. Scottish Local authorities can sell heat directly to third parties, but do need to obtain Scottish Minister's consent prior to any trading activity.

This model offers flexibility of sub-contracting structures, with construction and operation typically outsourced to the private sector through turnkey asset delivery contracts. Generally the infrastructure contracts are split into two packages: design & build, and operation and maintenance. A separate contract for metering and billing may be issued, or this aspect could be managed in-house by the Council or its arms-length body (as appropriate).

Asset ownership – project assets are owned throughout their lifecycle by the public sector project sponsor (or, as the case may be, an arm's length body under the sponsor's ownership and control).

Control / risk – financial risk (e.g., cost overruns or lack of demand, resulting in the forecast return on investment not being realised) sits with the project sponsor throughout the lifetime of the project. Some risks, e.g. relating to design, construction, operation and maintenance, can be managed via fixed-price sub-contracts.

Financing – for public sector led self-supply schemes, financing either comes directly from or is paid for by the public sector. This may be the local authority investing its own funds, or the local authority accessing finance. The public sector can often provide cheaper finance, or access funds specific to public bodies[24].
It may have lower return thresholds than a commercial operator, with a focus on other priorities for the project e.g., providing affordable heat to social housing tenants.

Procurement – the turnkey asset delivery contracts noted above will usually fall within the scope of the public procurement regime, and are typically procured under the Public Contracts (Scotland) Regulations 2015. The restricted procedure is generally used.

Regulation – public sector led self-supply schemes will be subject to the Heat Networks (Scotland) Act 2021. Operators of existing networks will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific

24 An example of public sector providing cheaper finance or access funds is the UK Debt Management Office.

consent. New networks and expansions of existing networks will require consent. New operators will also need a licence.

Balance Sheet treatment – given the public sector sponsor's ultimate ownership and control over, and provision of the entire risk capital for, projects delivered under this model, project assets will appear on the sponsor's balance sheet. Projects led by central bodies such as colleges and NHS Boards are likely to have implications for Scottish Government capital budgets and the potential to impact spending on other priorities.

Exit strategy – if the project sponsor wishes to transfer ownership of the network to a third party in the future, this can be achieved either by an asset sale (if the assets are under direct ownership of the sponsor) or by transferring ownership of any arm's length company in which the assets are held.

Example – Athletes' Village, Glasgow[25]; Bunhill Heat & Power Network, Islington[26].

DM2: Service concession

Overview – a concession is a long-term contract under which exclusive rights are conferred on a supplier (concessionaire) to provide a service. In return for such exclusive rights, the concessionaire designs, constructs, finances and operate the assets used to provide the service, within a defined area and for a defined period of time. The concessionaire is required to take financial risk in relation to the profitability of the assets. In the context of heat networks, the project sponsor may offer its own buildings within the concession area as anchor loads, but the concessionaire takes demand risk associated with supplying these and any other buildings within the concession area. In other words, the concessionaire takes the economic risk of generating an acceptable return on investment from any heat network(s) it installs in the concession area during the agreed concession period.

Project sponsor – concessions are normally tendered by a public sector body (the procuring authority). The procuring authority can either be a single public body acting alone (usually a local authority), or several public bodies, in which one (again, usually a local authority) agrees to act as lead authority and will tender the concession for itself and on behalf of the other public bodies. The sponsor controls / regulates (through the concession agreement) the service to be provided, including performance standards, tariffs and to whom services must be provided.

Concessions can also be private sector led, for example when the owner / master developer for a large development / regeneration site wishes to appoint a long-term private sector partner to provide energy services to properties on the site as it is developed over time. In this paper, private sector-led concessions are separately noted as an important example of a 'Third party ESCo' model (DM3).

25 An example of public sector in-house delivery is Athletes' Village, Glasgow.

26 An example of public sector in-house delivery is Bunhill Heat & Power Network, Islington.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant), which may be secured by the procuring authority. Income is from customer connection charges and heat sales (annual standing charges, variable charges) during the concession period.

Project structure – the project sponsor outsources delivery and subsequent operation of the assets to the concessionaire. The concessionaire therefore assumes responsibility for the design, construction, operation and maintenance of assets throughout the concession period, and to a large extent the financing of such assets.

Asset ownership – the assets will typically be owned by the concessionaire throughout the concession period, and revert to the project sponsor at the end of the concession period. The project sponsor inherits any residual value in the assets, and can decide whether to operate them in-house, or re-tender a further contract for their continued operation.

Control / risk – the project sponsor acts as promoter / facilitator and customer (in relation to its own buildings within the concession area). It does not need to provide the majority (or in some cases any) capital, and delivery risk is substantially transferred to the concessionaire. This type of arrangement tends to suit authorities that do not have in-house delivery capacity and / or capability, investment capacity and / or appetite to take on delivery risks.

A key characteristic of such contracts is the transfer of economic risk (including significant demand risk) to the concessionaire, in return for the exclusive right to exploit the assets created under the concession. In other words, the concessionaire is granted the exclusive right to exploit the physical assets constructed under the concession, and takes the associated financial risk of doing so.

One of the key financial risks facing the concessionaire is demand risk. This can be mitigated by the procuring authority offering its own buildings for connection (with or without guaranteeing a minimum level of aggregated demand).

The concession agreement will specify the agreed outputs, including buildings to be connected, the methodology for determining heat tariffs, service standards and performance indicators. In order to manage the risks that it is required to accept under the concession agreement, the concessionaire will require substantial control over how it implements the agreement and provides the required service.

Given the long-term nature of a concession arrangement, the agreement will need to provide a mechanism to accommodate change (e.g., regulation, technology, demand, heat sources).

The concession agreement should be clear as to the procuring authority's requirements for connecting / offering connections to third parties within the concession area. Otherwise, the concessionaire may 'cherry pick' profitable customers (e.g., large, public sector anchor loads), but be reluctant to connect smaller, less profitable customers, at least without an additional financial incentive to do so.

Financing – the concessionaire finances the assets from its own balance sheet and / or commercial borrowing. In some cases, the procuring authority may offer a subsidy to increase the investability of the project (and hence attract market interest) whilst ensuring affordable tariffs for customers. However, a key characteristic of the model is that there is no guaranteed financial return to the concessionaire.

Procurement – service concessions generally fall within the scope of the public procurement regime, and require a public procurement in accordance with the Concession (Scotland) Regulations 2016. Note, however, that the degree of risk transfer actually achieved in relation to a project will affect whether the project is actually classified as a concession.

Regulation – existing projects operated under concessions will (as with all other types of projects) be subject to the Heat Networks (Scotland) Act 2021. Operators of existing concessions will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific consent. New networks and expansions of existing networks will require consent, and new operators will require licences.

The Act contemplates the tendering of permits for certain designated heat network zones. Permits will confer exclusive rights on the permit holder to develop and operate heat networks within the zone boundary for a defined period of time, and hence will operate in a similar way to concession contracts. The details of the permitting regime are still to be developed (as secondary legislation) and consulted upon.

Balance sheet treatment – this will depend on the level of risk transfer achieved, and any control that the project sponsor can exert, under the terms of concession agreement.

Exit strategy – upon expiry or earlier termination of the concession, the assets normally revert to the procuring authority, who will either continue to operate the assets itself, or by appointing a new service provider (e.g., by retendering the concession). When deciding on an appropriate concession period, the procuring authority should take into account the likely residual value of the asset at the end of the period. In some cases, the concession period is aligned with the useful economic life of the assets, so that upon expiry the asset is assumed to have no residual value.

Example – Birmingham District Energy Company[27]; Cranbrook[28]; Queen Elizabeth Olympic Park[29].

DM3: Third party ESCo

Overview – a private sector landowner / developer appoints a third-party ESCo to install and operate a heat network for a substantial new development, e.g. a regeneration site. The public sector has no role, other than through regulation / planning policy and potentially subsidy (e.g., grant funding).

27 An example of the service concession model is Birmingham District Energy Company.

28 An example of the service concession model is Cranbrook.

29 An example of the service concession model is Queen Elizabeth Olympic Park.

Project sponsor – typically a private sector land owner / developer, with ownership of a large site where there is a requirement to install a heat network under planning policy.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant), which may be secured by the landowner / developer. Income is from connection charges from plot developers and heat sales (annual standing charges, variable charges) from customers.

Project structure – the project sponsor enters into an energy services agreement with a third party ESCo, which confers on the ESCo the exclusive right and obligation to install a heat network and provide a long-term heat supply to the building owners on the site. The third-party ESCo uses its supply chain to design, install, operate and maintain the heat network. This is essentially a concession arrangement, in which the grantor is a private sector entity rather than a public sector body.

Asset ownership – projects assets are owned by the third-party ESCo throughout the project lifecycle. The project sponsor will be required to grant appropriate land rights to the ESCo for the construction of the energy centre, installation of pipes, heat substations etc.). The energy services agreement will include rights for the project sponsor to step-in and operate the assets itself or to appoint a new operator in the event that the third-party ESCo fails to fulfil its obligations to deliver the network and / or provide the required service (e.g., due to insolvency).

Control / risk – project-related risks sit with the third party ESCo. There are no public sector bodies exercising control (other than by regulation / planning policy) or taking project risk.

Financing – the project is private sector financed, usually in one of two ways:

- connection / contribution model – the heat network is financed by the third party ESCo, which then receives an agreed connection fee from plot developers and / or project sponsor as plots are built out and connected to the network; or
- adoption model – the sponsor finances and constructs the heat network to a design specified / agreed by the third party ESCo. Following commissioning of the network, the third party ESCo pays the project sponsor an agreed amount to adopt the network.

Procurement – no public procurement is required with this model. The project sponsor has freedom to appoint its preferred third party ESCo.

Regulation – there is no public sector control over tariffs or service standards. Many operators agree to sign up to the Heat Trust scheme for privately-operated schemes, but are not required to do so. Existing projects operated under concessions will (as with all other types of projects) be subject to the Heat Networks (Scotland) Act 2021. Operators of existing networks will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific consent. New networks and expansions of existing networks will require consent, and new operators will require a licence.

Balance Sheet treatment – the project assets are owned by the third party ESCo and will appear on its balance sheet . The project does not involve any public sector ownership or control – the public sector's role is limited to planning policy (which may require the installation of a heat network in certain areas), consenting (planning conditions), and potentially grant funding.

Exit strategy – the public sector has no involvement in the project. The project sponsor may or may not wish to retain a long-term interest in the site once it is fully built out. Provisions for the sale of the sponsor's interest, or the transfer of the third-party ESCo's interest, will be set out in the energy services agreement.

Example – Leicester District Energy Company (LDEC)[30].

6.2 Existing delivery model / limited examples

DM4: Local authority led joint venture

Overview – the model involves a local authority procuring a private sector partner, with whom it forms a joint venture to undertake one or more heat networks and potentially other types of energy projects. The model is not limited to a single local authority; several local authorities could jointly procure a JV partner (one of them would act as lead authority). Other public bodies could also potentially participate in a variety of ways, e.g., as a potential customer to the JV, or as a shareholder, depending on interest, investment / risk appetite, and having the necessary legal powers.

The JV model can be used to leverage private sector investment in schemes with limited financial returns that might not be sufficiently attractive to the private sector as service concessions. The sharing of risks & returns inherent in the model can result in a scheme being investible by the private sector at a slightly lower level of return than would be possible if the private sector were taking (and pricing) all delivery risk (as in a service concession).

Project sponsor – local authority. Where two or more local authorities wish to come together and jointly procure a JV partner, one of them would agree to act as lead authority.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant), which may be secured by the procuring authority. Income to the JV is from customer connection charges and heat sales (annual standing charges, variable charges).

Project structure – a joint venture is a type of legal relationship between organisations. Joint ventures (JVs) can be public-public, or public-private, or private-private. In this model, the JV is public-private.

30 An example of third party ESCo is Leicester District Energy Company.

Although a JV can simply be a contractual relationship between the parties, most JVs involve the creation of a new corporate entity (JV Co). In the latter case, both parties agree to co-invest in the entity, and its financial returns or losses are shared according to the parties' respective investments. Most corporate JVs involve the establishment of a new company (typically limited by shares), and a number of contracts (including a shareholders' agreement) documenting the governance arrangements, the partners' financing obligations towards the JV Co, services to be provided to JV Co by the individual JV partners (e.g., the day-to-day management might be carried out by the private sector partner), etc. The JV Co has its own brand and contracts directly with customers / developers for connections, heat supplies, etc.

Asset ownership – the heat network assets developed under projects carried out by JV Co would normally be under its direct ownership.

Control / risk – the public sector partner's shareholder rights in a public-private JV Co can allow it a greater degree of ongoing control and influence (proportionate to its shareholding) than under a concession arrangement. The JV Co will hold regular board meetings, at which the public and private sector partners will agree decisions around new and ongoing investments. In general, financial risks and returns are shared between the parties, with any exceptions to this principle documented in the shareholders' agreement. Hence the public sector partner has the potential to share in the JV's profits alongside the private sector partners, but also risks losing its some or all of its investment.

Financing – both parties co-invest in the JV Co, and share financial risks and returns in proportion to their respective shareholdings. Investment can take the form of capital, land rights, skills, and need not be the same for both parties. Indeed, a benefit of the model is that both parties can play to their respective strengths in what, how and when they each invest in the JV.

Procurement – the selection and appointment of a private sector JV partner by one or more local authorities would fall within the public procurement regime, and hence involve a competitive tender. Public-private JVs can facilitate the ability of the parent public sector partner (and any other public bodies involved) to procure heat supplies from the JV. This may involve the entering into of ancillary agreements (e.g., concession agreements in respect of heat supplies to buildings owned by the local authority / other public bodies by JV Co) procured at the same time and as part of the main procurement.

Regulation – existing projects operated by joint ventures will (as with all other types of projects) be subject to the Heat Networks (Scotland) Act 2021. Operators of existing networks will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific consent. New networks and expansions of existing networks will require additional consents. New operators will also require a licence.

Balance Sheet treatment – this will depend on the individual structuring of the JV Co, including the parties' respective shareholdings, rights, degree of control and approach to risk sharing. As the public sector partner is a local authority this is unlikely to score against Scottish Government capital budgets (other than any grants and potentially other financial support provided), but would sit on the local authority balance sheet.

Exit strategy – unlike a service concession, a JV need not be set up for a fixed period. However, the shareholders' agreement needs to make provision for how the JV can be brought to an end, either when it has met the objectives for which it was established, or at the instigation of one of the parties. This could include the scenario where one party wishes to dispose of its interest in the JV, with pre-emption rights for the remaining shareholder, and / or restrictions on the type of organisations to whom the interest could be transferred.

Example – Midlothian Energy Limited[31] (JV between Midlothian Council and Vattenfall); Bristol City Leap[32] (JV between Bristol City Council and Amaresco, with Vattenfall as heat networks subcontractor).

DM5: Community led project

Overview – community projects are generally of a small scale, for example set up to serve an existing village or a new development adjacent to an existing settlement[33]. A community company is set up to manage the project and act as heat supplier. The residents would be the main customers of the new company.

Project sponsor – a community body of some kind leads the development, and is central to the governance of the scheme. Whilst not acting as project sponsor in such schemes, local authorities can still play an important role, for example in facilitation, providing technical or financial support and potentially providing anchor loads.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). Income to the community company is from customer connection charges and heat sales (annual standing charges, variable charges).

Project structure – the community body would generally establish a new corporate entity to hold the project assets, and enter into turnkey asset delivery contracts for the construction, operation and maintenance of the scheme.

Various corporate structures can be used as the legal delivery vehicle, including a Community Interest Company (limited by shares or by guarantee)[34] or a Community Benefit Society (CBS). A Community CBS is a legal corporate form that benefits a wider community. It is regulated by the Financial Conduct Authority (FCA) and has

31 An example of a local authority led joint venture is Midlothian Energy Limited.

32 An example of a local authority led joint venture is Bristol City Leap.

33 More information on small scale community led projects including hypothetical contracting structure and funding flows can be found in BEIS Guidance on Strategic & Commercial Case, page 97.

34 See, for example, BIS report on Limited Companies for different ways in which community companies can be set up.

a cooperative membership structure that adheres to the principle of 'one member, one vote'.[35]

Many of the legal and structural considerations for a community led scheme are similar to a privately led and owned scheme. The scale of any scheme is likely to be small, given the challenges around funding, resourcing and managing risk.

Asset ownership – the heat network would typically be owned by the corporate entity established by the community body to deliver the project. The community body that formed the entity would hold the ultimate beneficial ownership of the assets.

Control / risk – the corporate entity established by the community body exercises control of the project. The community body would retain a high level of control over the project, with the ability to set tariffs and take on new connections. Risks that cannot be subcontracted would be retained by the entity.

Financing – the community is responsible for raising finance. Any special purpose vehicle (such as a CIC or CBS) set up would have low capitalisation, with the main assets of the company being the assets of the scheme itself. Funders of the scheme will be putting their money at risk, and contractors will require assurance as to the entity's ability to pay for works once completed[36].

Procurement – corporate entities such as CICs and CBSs are not subject to the public procurement regime. If public buildings are to be connected to a community scheme, the relevant public body / bodies will need to consider how they procure the heat supply from the network (as would be the case with any third-party network).

Regulation – existing community-led heat networks will (as with all other types of projects) be subject to the Heat Networks (Scotland) Act 2021. Operators of existing networks will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific consent. New networks and expansions of existing networks will require additional consents. New operators will require a licence.

Balance Sheet treatment – the heat network assets would appear on the balance sheet of the corporate entity established to take forward the project, which is the asset owner.

Exit strategy – the community group may wish to retain a long-term interest in the project, in order to retain control over tariffs, connections, fuel sources etc. However, if its interest is limited to establishing the network, but with a view to a future sale to a third party, this should be factored into the decision around the type of corporate entity used (some entities, such a CIC, have an in-built asset lock, which limits the type of entities to which the entity's assets can be transferred).

35 See Scottish Communities Finance page on Community Benefit Society for an example of Community CBS.

36 More information on financing community led projects see BEIS Guidance on Strategic & Commercial Case, page 96.

Example – Springbok Sustainable Wood Heat Co-Operative[37]; Swaffham Prior Heat Network[38].

DM6: Unbundled model

Overview – the 'unbundled' model is a generic term to represent any arrangement in which the ownership and / or operation of the different types of physical assets of a heat network is distributed across two or more organisations, rather than (as is currently the norm) undertaken by a single entity.

The main business operations for a heat network are:

- heat generation – including heat recovery, construction of energy centre(s);
- transmission – of thermal energy via insulated pipes from generation sites to customer sites; and
- management / retail – on-plot secondary / distribution pipework, metering, billing, general customer contract management.

This type of arrangement is similar to how large energy networks are now operated (e.g., gas and electricity networks) following their privatisation and the introduction of regulation. As heat networks are also a type of energy network, it is relevant to consider the situations in which this model can arise – for example, where a local authority owns the network and takes a heat supply from a third party heat source, or where existing networks interconnect to form a city-wide network. Scale is a key factor for the model to work: each operation needs to be big enough to support a separate business.

The BEIS International Review of Heat Network Markets[39] notes that in markets outside of the UK, nearly every heat network had integrated supply and distribution components, and the vast majority were also integrated either wholly or partly with generation. They also observed some limited Third Party Access (TPA) for generation and / or heat recovery, i.e., heat supply to the heat network from an entity that is not owned by the heat network provider. They noted that TPA access between heat networks, and heat sales between separately owned networks, was very rare and limited to very large interconnected heat networks.

The paper states that *"There seems to be agreement that vertical integration is acceptable and even necessary for all but the largest, city and regional wide schemes"*. Three separate reviews from different countries (Sweden, Germany and the Netherlands) conducted between 2012 and 2018, all came to the same conclusions.

The BEIS paper notes that there is significant expenditure associated with separating out different functions and ongoing transactional costs between the interconnected

37 See more information on an example of a community led project at Springbok Sustainable Wood Heat Co-operative.

38 See more information on an example of a community led project at Swaffham Prior Heat Network.

39 See more information on the research into international heat networks at International Review of Heat Network Market Frameworks, Rapid Evidence Assessment, Regulatory Document Review and Qualitative Interviews, BEIS Research Paper 2019/032, February 2020, page 18.

parties. It concludes that, for the UK, unbundling is unlikely to make sense at this stage because the costs of breaking up the industry will only prove worthwhile if there are significant savings from doing so.

Project sponsor – can be public or private sector, and depends on the circumstances under which the separate heat network operations arise (see further below under project structure).

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). Income will depend on the project structure, and could include 'use of system' charges and / or customer connection charges and heat sales (annual standing charges, variable charges).

Project structure – as noted above, the unbundled model is a generic term used to describe a variety of commercial arrangements. The commercial structure will be project-specific, and linked to the circumstances in which the separate operations arise. This can happen in several ways, the main ones of which are as follows:[40]

- integration of third-party heat sources into a network – for example sewage heat recovery, energy from waste facilities, other industrial heat offtake, where the supply of heat into a network is by way of a contractual arrangement rather than via a transfer of ownership of generating assets;
- interconnection of heat networks – e.g., where a number of property developers create site-specific networks, with a design intention (from the outset) for their eventual inter-connection into a wider network. The subsequent interconnection is via the construction of a transmission network. In the case of networks that were not designed with subsequent interconnection in mind, a number of issues can arise, such as compatibility of network operating temperatures, controls, etc; and
- separation of a heat network into distinct business operations – for example, an operator of a large network sells one or more assets in order to focus its business operations on one activity (e.g., generation or transmission) and / or release capital for subsequent re-investment.

Each of these scenarios can have different underlying structures. For example, a heat generator may or may not also be a heat supplier to end customers. If a generator is not also a heat supplier, it will simply be paid by the network operator for heat supplied to the network in accordance with a heat purchase agreement. If it is also a heat supplier, in addition to entering into heat supply agreements with end users, it will also pay a 'use of system' charge to the network operator.

Asset ownership – project specific, but the key distinguishing feature of this model is that ownership of the various heat network assets is, unlike most existing schemes, not held by a single organisation.

40 See more information on commercial structures relevant to the unbundled model at BEIS Guidance on Strategic & Commercial Case, page 98.

Control / risk – project specific. Unbundled networks need robust contractual frameworks between the various parties to co-ordinate the distinct operations and ensure that heat can be appropriately delivered from one part of the system to the next, and ultimately to the end consumer. BEIS Guidance notes that "contracts will need to provide adequate commercial benefits to parties and adequate recourse for failure to perform to ensure all parties are incentivised to deliver a working scheme"[41].

If smaller, independent networks become integrated into city-wide networks, the role of the system operator will be crucial. It will need to ensure that supply and demand are balanced across the network according to appropriate criteria (such as lowest carbon heat source, or lowest cost to customers), giving suitable market signals to heat generators.

Financing – project specific, depending the circumstances under which the separate operations arise.

Procurement – project specific, depending the circumstances under which the separate operations arise.

Regulation – existing heat networks will be subject to the Heat Networks (Scotland) Act 2021. Operators of existing networks will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific consent. New networks and expansions of existing networks will require additional consents. For unbundled networks, careful consideration will be required as to which operations will be subject to regulation under the Act, and therefore which organisations will need to apply for licences and / or consents. New operators will require a licence.

Balance Sheet treatment – project specific, depending on the circumstances under which the separate operations arise. The balance sheet treatment under this model will reflect that fact that different assets are owned by different organisations.

Exit strategy – project specific. If a sponsor wishes to develop a large-scale network, but wishes to recycle some of its capital by selling certain assets in a secondary market once the network is operational with established revenue streams, it may wish to ringfence the assets from the outset.

Example – Glenrothes Heat Network[42] – RWE owns the main heat source, a biomass CHP plant, which supplies a heat network owned and operated by Fife Council. The Council self-supplies in respect of its own buildings, but in respect of certain large commercial customers, RWE has the supply relationship with the customers, takes demand risk, and pays the Council an annual use-of-system charge in respect of such supplies. Other examples include Stirling Forthside[43], in which Scottish Water Horizons owns the wastewater heat source and supplies heat to a network operated by Stirling Council.

41 See BEIS Guidance on Strategic & Commercial Case, page 98

42 See more information on the Glenrothes Heat Network example.

43 See more information on the Stirling Forthside example.

DM7: Merchant model

Overview – this model is a purely 'merchant' approach, in which a private sector ESCo enters into heat supply agreements with building owners, without the ESCo being appointed either by a private sector developer / landowner to serve a large new development, or by a public body pursuant to a public procurement exercise.

The model relies on the ESCo being able to secure sufficient demand from customers such that, in conjunction with any available grant funding, and in anticipation of future regulation of building emissions, it is prepared to proceed with the investment.

Although uncommon, we understand that at least one market operator is pursuing this approach, and exploring ways of securing anchor contracts with existing building owners such as offices / other commercial buildings and bulk heat supply to residential developments, without relying on being appointed following a competitive tender under the public procurement regime.

The model could also be applied to shared ground arrays, where an investor is prepared to proceed on the basis that building owners will eventually be required by regulation to switch from gas boilers to a low carbon heating solution, and believes its solution is cost competitive with building level solutions (typically, ASHPs).

Project sponsor – a private sector ESCo.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). Income is from customer connection charges and heat sales (annual standing charges, variable charges).

Project structure – the ESCo installs the heat network and provides a heat supply using its supply chain.

Asset ownership – the ESCo owns the heat network assets.

Control / risk – the ESCo controls the project, and takes all risk. As with other models, some asset delivery contracts may be sub-contracted, but residual risk will sit with the ESCo.

Financing – the ESCo is responsible for securing finance for the project. As with other models, it will usually seek grant funding in respect of a proportion of initial capital costs.

Procurement – this model does not involve a public procurement exercise to construct the heat network, although in most cases public sector bodies will still be required to undertake a procurement exercise to purchase a heat supply from the network for their buildings.

Regulation – existing heat networks will be subject to the Heat Networks (Scotland) Act 2021. Operators of existing networks will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific consent. New networks and expansions of existing networks will require additional consents. New operators will require a licence.

Balance Sheet treatment – the project assets will be on the ESCo's balance sheet.

Exit strategy – no public sector entity is involved. The private ESCo may set up a special purpose vehicle in which to ringfence the assets and operations associated with particular projects, in order to facilitate a future disposal, if so desired.

Examples – Bradford Energy Network[44].

6.3 New heat network delivery models

DM8: Centrally led delivery

Overview – "Public sector owned and led" models are commonly deployed across the UK, including Scotland. These tend to be promoted by local authorities (see section 6.1), and hence are reliant on local authority skills, resource, investment capacity and risk appetite. Other public and quasi-public sector bodies such as universities also build, own and operate heat networks, but do so primarily to decarbonise their own estates and typically have little, if any, appetite to expand the network to incorporate buildings owned by external parties. Private sector developments are concentrated on development / regeneration sites, with little investment in networks to serve existing buildings without commitment of local authority or other public sector anchor loads. The result is development not taking place at the pace and scale required to meet policy targets.

In this model, Scottish Government (either directly, or through an agency) would take a lead role on the delivery of certain projects, focussed on areas with significant potential for heat network potential development, but in which local authorities are not acting at the pace and scale required. Scottish Government / agency could develop and hold initial ownership of schemes, or take a stake in individual projects alongside private sector partners. Scottish Government could sell its (part-) ownership in schemes at a future date, for example when first phase networks are built and have established revenues streams. This would allow Scottish Government capital to be recycled into further heat network investments, thus accelerating progress.

Project sponsor – Scottish Government, either directly, or acting through an agency. As project sponsor, Scottish Government would set up one or more wholly owned ESCos to deliver heat networks. The decision could be taken to set up one national organisation or multiple regional bodies. This decision would be informed by assessing which structure would provide optimum scale to attract the resources and investment whilst also providing sufficient focus to prioritise local opportunities.

The future Energy Agency "Heat and Energy Efficiency Scotland", if established as a central body and with this purpose, could potentially develop, own and operate heat networks. It could also be given the powers to set up ESCos to facilitate project delivery[45].

44 See more information on the Bradford Energy Network example.

45 Subject to consideration of SG devolved powers.

As sponsor, Scottish Government / agency would need to work with the relevant local authority (which would retain responsibility for LHEES, heat network zoning and planning) in relation to potential heat network developments in the area. It would need to secure the commitment of any local authority and / or other public sector bodies whose buildings could become anchor loads for a heat network.

Hence the local authority would still be involved under this model, but would not need to provide the project management resources for project development, which would be centrally led, or the funding required for investments, or take project-related risks. These would be managed centrally, at least in the short term.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). Income is from customer connection charges and heat sales (annual standing charges, variable charges).

Project structure – existing delivery structures (in particular, DM1, DM2, DM4 and DM6) could, in principle, each be adapted, with Scottish Government / agency acting as project sponsor instead of the local authority. Hence Scottish Government could, in principle, own and operate networks (DM1), let service concessions (DM2), enter into joint ventures (DM4) or own particular assets (e.g., distribution assets, to take a heat supply from a third-party heat source) (DM6). The owners of public sector anchor loads would need to agree to Scottish Government procuring heat supplies for the relevant buildings on their behalf (in addition to Scottish Government procuring the heat network)[46].

Asset ownership, Control / risk, Financing, Procurement – would all follow the relevant delivery model (adapted as noted above) – see text relevant to each model, but with Scottish Government / agency substituting for the local authority as the project sponsor.

Regulation – Scottish Government should consider whether it would be appropriate to become an investor in projects. If it decided to proceed it would need to consider putting ethical walls in place, or housing the investments in a separate vehicle (the Energy Agency for example).

The model would be deployed for new networks and potentially for expansions of existing networks. Were Scottish Government to operate heat networks (most likely through an agency), it / the agency would require a heat networks licence under the Heat Networks (Scotland) Act 2021. Similarly, in respect of any new heat network or extension to an existing network, a heat network consent would be required. Scottish Ministers would initially be the licensing and consenting authority. Issues around whether Scottish Government / agency could hold a heat networks licence and / or consent, the potential for self-regulation, and conflicts of interest, would all need to be carefully considered.

Balance Sheet treatment – this is likely to score against Scottish Government capital budgets.

46 Subject to consideration of SG devolved powers.

Exit strategy – Scottish Government could sell its (part-) ownership in schemes at a future date, for example when first phase networks are built and have established revenues streams. This would allow Scottish Government capital to be recycled into further heat network investments, thus accelerating progress.

Example – Transport Scotland provides an example of centrally led delivery by Scottish Government through its national transport agency.

DM9: Local authority led delivery, with Scottish Government stake in projects

Overview – in this model, local authorities would continue to lead project development, with Scottish Government both supporting project development and taking an equity stake in projects (either directly or via an agency, and which may be in addition to an element of grant). This model shares certain features with, and could be considered a hybrid of, DM1 (locally led project development), DM4 (formation of a joint venture vehicle) and DM8 (Centrally led delivery).

Special purpose vehicles would be established for investments into specific projects. By becoming a co-investor alongside the local authority and / or a private sector partner, the Scottish Government would have shareholder rights in proportion to its equity stake, representation on the board and the ability to transfer its stake (by sale of its shareholding) and therefore to recycle capital into other investments.

The reasons for Scottish Government taking an equity stake would primarily be to de-risk a project and allow it to proceed faster and / or at a greater scale than would otherwise happen, but with Scottish Government having a role in the project's governance and a greater degree of control and influence (proportionate to its investment)[47] than would be achieved via grant funding, Scottish Government would also have the option to exit and recycle capital into other schemes.

As noted in the commentary on DM4, financial risks and returns would be shared between the parties in accordance with their respective investments. Hence Scottish Government would have the potential to share in any profits, but also risks losing its investment. In the latter scenario, the Scottish Government investment in the project would in effect become a grant.

This model could support the roll out of heat networks at greater pace and scale, with the potential for a financial return on investments and to recycle capital. It also comes with a number of risks including financial, procurement and reputational, all of which would need to be carefully considered.

Project sponsor – a local authority (or other local public body) would lead the project and act as project sponsor, with Scottish Government providing development support and co-investment.

47 The extent of control and influence would depend on the type of equity held by Scottish Government: different types of share carry different rights, e.g., in respect of voting and dividend entitlement.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). Income is from customer connection charges and heat sales (annual standing charges, variable charges).

Project structure – Special purpose vehicles (SPVs) would be established for investments into specific projects, with Scottish Government as a minority shareholder (providing equity investment, potentially alongside an element of capital grant). The project would be structured to allow Scottish Government to sell / transfer its equity stake to a project partner or third party. The asset delivery contracts relating to design, construction, operation and maintenance, would be entered into by the SPV.

Asset ownership – assets would be owned by the SPV. Hence Scottish Government would have beneficial ownership of assets in proportion to its shareholding.

Control / risk – delivery risks would be sub-contracted, with residual risks sitting with the SPV.

Financing – the SPV would be responsible for financing the project. This would be provided by equity investments from project partners and Scottish Government.

Procurement – as the model is public sector led, delivery contracts would fall within the scope of the public procurement regime, and would initially be procured by the project sponsor. Consideration would need to be given as to whether SPVs would also be subject to the procurement regime.

Regulation – As Scottish Government set policy and are introducing regulation to the sector, there is a risk of a conflict of interest or perceived conflict (see comments on DM9). Therefore, Scottish Government should consider whether it would be appropriate to become an investor in projects. If it decided to proceed it would need to consider putting ethical walls in place, or housing the investments in a separate vehicle (the Energy Agency for example).

Balance Sheet treatment – depending on the size of Scottish Government's equity stake, and the degree of control conferred by its shareholder rights, there is potential for projects to appear on Scottish Government's balance sheet (until such time as Government's shareholding is sold to a project partner or third party) and therefore reduce funds available to be spent on other priorities.

Exit strategy – Scottish Government could build up a portfolio of investments in projects. These could be managed by a centre of expertise, which would facilitate the efficient and effective management of the investments. Returns on investments could help defray the cost of centrally-provided resources. Scottish Government could sell investments, either individually (such as when a project is operational and has reached a viable scale) or as a portfolio (to attract institutional investors).

Examples – Scottish Government holds investments in a range of projects / assets, through organisations such as Scottish Enterprise, the Scottish National Investment Bank and Scottish Futures Trust Investments.

DM10: Regional ESCo

Overview – this model is analogous to the Scottish 'Hub model' for community infrastructure, in which public sector bodies came together on a regional basis to participate in joint procurements of private sector partners to deliver infrastructure projects such as schools, libraries, health centres, etc. In the Hub model, the successful bidders and the public bodies then formed regional "HubCos", in which the private sector partner took a majority stake, and the local public sector bodies (and SFT's investment arm) hold minority stakes. There are 5 HubCos in Scotland, each operating on a regional basis. In each region, the public sector partners can choose (but are not obliged) to use the HubCo to assist with initial scoping and project development and then project delivery. Projects can be delivered under different contracting structures (design and build contract, or design, build, finance and maintain (DBFM)), depending on the public sector project sponsor's preference.

By analogy, under the regional ESCo model, local authorities and other public bodies could come together and jointly procure a private sector partner to deliver heat networks (and potentially other types of energy projects). The successful bidder and the public bodies in the area would then form a regional ESCo ("RESCo"), in which the private sector partner takes a majority stake, and the public sector bodies (and potentially Scottish Government / agency, equivalent to SFTi for HubCo) hold minority stakes. The extent to which the delivery partner is given exclusivity over certain types of projects within each area, and for how long, would be a key consideration.

In each region, the public sector RESCo partners would be able to use the RESCo to assist with initial scoping and project development and then project delivery. As with Hub, projects could potentially be delivered using different contracting structures, depending on the public sector project sponsor's preference (having regard to control, risk, funding availability, etc.). This means that heat networks could still be owned by the public sector, or jointly under a joint venture arrangement, depending on the preference for each project. We would expect that preferred approaches would emerge and could be standardised and promoted.

Project sponsor – local authorities and other public bodies represented within the RESCo would act as project sponsors in relation to identified projects within each region.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). At individual project level, income is from customer connection charges and heat sales (annual standing charges, variable charges).

Project structure, Asset ownership, Control / risk, Financing – these would be on a project-specific basis, depending on the project sponsor's preferred contracting structure. In the Hub model, ownership of project assets always rests with the relevant public sector sponsor, and financing for the project is provided either by the public sector sponsor (if the project is commissioned via a Design & Build contract), or by the private sector investors (if the project is commissioned by a DBFM contract).

Procurement – there are two stages: firstly, procurement of a private sector delivery partner for each region, and secondly, the procurement of individual projects to be delivered by RESCos on behalf of the participating public bodies.

- **Procurement of private sector partners for each RESCo**
  - Procurement could be led by one of the public bodies within the region, procuring for itself and on behalf of the other public bodies.
  - Alternatively, the procurement could be led by Scottish Government / SFT / energy agency on behalf of the public bodies in the region. (The 5 HubCos were procured by SFT on behalf of the local authorities, NHS Boards and blue-light services in each region.)
  - Each procurement would result in the appointment of a private sector partner for the region, that would take a majority stake in the RESCo, with the remaining stake held by the public bodies (and potentially Scottish Government / agency).
  - The RESCo would be a long-term delivery partner, with the ability to use a range of suppliers for design services, construction, operation & maintenance, metering and billing, etc. (Hub does this via Tier 1 contractors).
  - The delivery partner could be a heat network developer, or it may be more appropriate for the partner to be an investor partner, who would then bring one or more heat network developers into the RESCo supply chain. The latter might be more appropriate if an 'energy partnership' type model (where the partner could deliver a range of energy / heat solutions, not just heat networks) was preferred.
- **Procurement of individual projects to be delivered by RESCos**
  - A public body (or a collaboration of public bodies within each region) would be able to initiate a project with the RESCo. This would involve scoping and discussion around the preferred contracting structure for the project (e.g., D&B, DBFM).
  - Following agreement, the public sector body / bodies would appoint RESCo to deliver the project based on an agreed scope and contracting structure.
  - Depending on the contracting structure, project-specific SPVs may be established by RESCo.
  - Following any initial period of exclusivity, the public bodies within each region would not be obliged to use RESCo for any particular projects, but would have the option to do so.
  - RESCo would act as a local project development & delivery partner for heat networks (and potentially for other energy services) within each region.
  - For each project, RESCo would be obliged to demonstrate value to the commissioning public body by carrying out a mini-competition for key work packages (e.g., design services, construction, O&M). But this would not require additional public procurement exercises on a project-by-project basis, as the projects would have been contemplated in the procurement of the private sector partner for the RESCo.

  - For projects above a certain value in which the relevant public bodies were not providing all of the funding (in conjunction with Scottish Government grants / loans), RESCo could be obliged to run a funding competition.

Regulation – this model would require careful consideration of how it would integrate with the licensing, zoning and permitting regimes to be introduced under the Heat Networks (Scotland) Act 2021, including:

- which organisation(s) would require a heat networks licence?
- If RESCo were to be given exclusivity over projects of a certain type, or for a certain period of time in order to attract bidders (as was done for Hub procurements), how would this interact with the local authority's duty to consider designating heat network zones, and the potential for zones to be permitted (which would confer exclusivity on the permit holder)?

Balance Sheet treatment – depending on the size of Scottish Government's equity stake, and the degree of control conferred by its shareholder rights, there is potential for projects to appear on Scottish Government's balance sheet (until such time as Government's shareholding is sold to a project partner or third party) and therefore reduce funds available to be spent on other priorities.

Exit strategy – for the project sponsor, this will depend on the contracting structure under which individual projects are delivered by RESCo. If the sponsor contemplates a future exit, it should consider setting up a project-specific vehicle in which to ringfence project assets.

Example – The Hub programme[48].

DM11: Public Private Partnership (PPP)

Overview – PPPs have been used for a wide range of public assets, including schools, hospitals, colleges, roads, waste management facilities. We are not aware of any heat networks procured under this model.

There is no generally accepted definition of a PPP, which covers a spectrum of different types of long-term contracts, with a wide range of risk allocations and funding arrangements.

For the purpose of this paper a PPP involves:

- a long-term contract between a public body and a private sector contractor for the development and management of a public asset;
- the contractor designs, builds, finances, operates and maintains the asset and uses the asset to provide a service to the public body;
- the public body pays service payments to the contractor, based on the level of service provided, including the availability of the asset;

48 See more information on the example of The Hub.

- the service payments are used to repay the majority or all of the required finance for construction of the asset, and to provide a return for the contractor;
- the contractor bears availability risk and management responsibility through the life of the contract, but the public sector takes the majority of demand risk. This, and how the project is financed, is the main difference between a PPP and a concession: in a concession, the public sector also transfers demand risk to the contractor.

In some PPPs there is public involvement in funding (a capital contribution once the asset is operational), governance or as an anchor customer. Private user charges can also apply, although these payments tend to be relatively small in comparison to the total payments received.

A PPP is essentially an alternative means to finance the provision of new infrastructure. PPPs are intended to encourage efficient delivery and operation, deliver an appropriate quality of service and allocate risks appropriately between the parties (investors, the public sector and users of the asset).

Under a PPP the focus is on service delivery. In the case of heat networks the service would be the delivery of low carbon heat when and where the user required it.

Project sponsor – the public body acts as project sponsor for a PPP.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). Income for PPP contracts is typically based on payments by the authority from its revenue budget based on the contractor meeting strict availability and performance criteria. There can also be an element of income in respect of third-party use of PPP assets.

Project structure – the successful private sector bidder forms a special purpose vehicle (SPV), which holds the PPP contract, and through which the finance required to construct the assets is channelled. The SPV will be controlled by the private sector contractor, which will subcontract asset delivery contracts through the contractor's supply chain.

Asset ownership – the assets created under a PPP contract are usually owned by the public sector sponsor. The PPP contractor is granted access rights over the PPP assets in order to provide the services to the sponsor. The PPP assets are required to be handed back in an appropriate condition upon expiry of the contract. Following hand back, the public sector sponsor can choose either to retender or take back service provision in house.

Control / risk – the PPP contract forms a detailed risk allocation that fixes the private sector provider's revenues at the outset, based on meeting an agreed service specification and meeting a defined performance regime. This can facilitate effective competition for the contract award because it is clear what is being competed for. It can also provide strong incentives for efficient delivery after contract award because payments are typically directly linked to the level of service provision and only commence when the service starts to be provided. However, PPP contracts are relatively inflexible, which is the key reason that PPP projects can fail or be expensive

to finance where there is uncertainty over key exogenous parameters that could affect profitability.

Financing – PPP projects are typically financed from a combination of equity from the private sector contractor and debt from sponsors / third-party finance providers, on a non-recourse basis. To attract third-party / non-recourse debt requires a stable and well-understood risk profile, operating in a stable long-term policy environment.

Procurement – PPP contracts are high-value, long-term contracts, and as such fall within the scope of the public procurement regime. PPP contracts tend to involve lengthy procurements and high bid costs for both the public sector sponsor and bidders. The PPP approach focuses its primary efficiency incentives on the initial competition for the contract.

Regulation – existing heat networks will be subject to the Heat Networks (Scotland) Act 2021. Operators of existing networks will, unless granted exemptions, be required to obtain a heat networks licence, and a project-specific consent. New networks and expansions of existing networks will require additional consents. New operators will require licences. In PPP contracts, the public sector generally takes the risk of future changes in law and regulation, i.e., is required to compensate the contractor for any additional costs incurred to comply with changes in law.

Balance Sheet treatment – assets constructed under PPP contracts can be recorded on or off government balance sheet, depending on the allocation of risks and reward (factors such as construction risk, demand risk and availability risk being key). PPPs have typically been used by the Scottish Government to achieve additionality of investment where the costs of the assets are not scored to capital budget.

Exit strategy – a PPP is a long-term arrangement – typically 25 or more years – in order for service payments, through which the initial capital investment is ultimately repaid, to be affordable for the public body. The contract will include detailed termination provisions. It is costly for the public sector to terminate the arrangement voluntarily (i.e., without the contractor being in default or becoming insolvent). If the public sector voluntarily terminates, the contractor must be repaid in full, including the value of future lost profits as well as repayment of the contractor's outstanding finance. If the public sector terminates due to the contractor's default or insolvency, the private sector stands to lose some or all of its investment.

Examples – PPPs have been widely used in infrastructure projects for sectors such as education, health, transport, waste and defence.

DM12: Regulated Asset Base

Overview – Regulated Asset Base (RAB) models are commonly used in the UK as a form of economic regulation of companies operating in environments in which there are natural monopolies. Under a RAB model, one or more companies are granted a licence from an independent regulator to charge regulated prices to users in exchange for the efficient provision of services linked to an infrastructure asset or set of assets.

This regulatory framework is an arrangement that seeks to balance flexibility with commitment. The adherence by regulators to clear regulatory principles (with rights of appeal where regulatory action is considered to be in breach of such principles) has helped RAB regulated sectors in the UK to attract over £230bn in private investment since the late 1980s.

A RAB model has some similarities with a PPP model, in which a long term contract is agreed between a public entity and a private company for the development and management of an asset. However, RAB regulated models tend to cover the full life of assets, which for infrastructure assets is typically much longer than contracts agreed for PPPs.

RAB models tend to have more flexibility than PPPs, because key parameters can be periodically reset (at the end of each price control period), subject to regulatory principles, whereas in a PPP the key parameters as fixed at the outset.

Heat networks have several features that could make them a suitable asset type for a RAB model, i.e. the need to regulate service provision and charges where there is effectively a monopoly provider of infrastructure, with limited consumer choice and the potential for stranded assets. In principle, a RAB type approach would provide greater assurance to investors of a return, and drive down the cost of capital.

However, the RAB model relies on a monopoly environment / exclusive rights to achieve a low cost of capital. The grant of exclusive rights is not part of the RAB model. In the context of heat networks, the model would therefore need to be accompanied by a form of demand assurance in order to achieve a low cost of capital comparable with other utility-type RAB environments.

Funding / income stream – funding may involve an element of subsidy (e.g., Scottish Government capital grant). Income is from customer charges, which are regulated under a RAB structure.

Project structure – regulated, privately owned companies would invest in heat networks in a given geographic area, with some form of exclusive rights / monopoly position. The regulated entity would, through its supply chain, develop, finance, own and operate networks and charge customers. The role of the regulator would be to set a performance framework of economic incentives for the company to operate efficiently, and to cap (and periodically reset) customer charges / return on investment to ensure the company does not exploit its monopoly position.

Asset ownership – assets within a RAB structure are owned by the regulated entity, which is assumed to be owned by private sector investors.

Control / risk – the regulated entity has control over the delivery and operation of the assets that comprise the regulated asset base. Its return on investment (or tariff) is capped by the regulator within each price control period. It takes the risk of meeting the efficiency incentives set by the regulator. It is also subject to uncertainty around future price control periods (e.g., as to allowable capital expenditure and return on

investment). This risk is managed through the regulator being bound to follow clear regulatory principles, combined with a right of appeal. The RAB structure relies on a natural monopoly to attract low cost of finance – hence some form of demand assurance would be required in order for the RAB model to be investable.

Financing – assets within a RAB are usually financed with private capital. In general, the cost of finance for a RAB is generally low (for example, compared to PPPs). As the regulated entity's return on investment is capped by the regulator in any given price review period (though may be adjusted upwards or downwards by the regulator between such periods), the company can only generate additional revenues by growing the asset base. There is, therefore, a risk that the regulated entity will seek to over-invest in the assets, which would provide a larger base on which the capped return can be made.

Procurement – a RAB model for heat networks would require legislation to establish a new economic regulator with appropriate regulatory powers. Further work would be required to determine whether Scottish Government would have the devolved competence to enact such legislation.

Regulation – the RAB structure requires a regulator, who is responsible for ensuring that charges by regulated companies allow for the efficient costs of running the company and a reasonable return on the capital invested in the business.

The regulatory model that has traditionally applied in combination with the RAB concept includes the periodic resetting of some regulatory parameters (such as the allowed return on capital, and the determination of future cost recovery). This means that the returns to the company beyond the current regulatory period are subject to regulatory uncertainty. However, the periodic resetting of parameters is based on a fixed set of regulatory principles, such as not expropriating the investment value once it has been approved and sunk. It is also subject (in UK) to appeal to the Competition and Markets Authority. The performance framework set by the regulator operates as a proxy for the pressures associated with a competitive market, in which the entity would need to operate efficiently and not charge excessive prices in order to survive.

Whilst the legal and other barriers to adopting a RAB for heat networks are not insurmountable, the regulatory framework would need to be developed within the context of existing and planned regulatory developments in the sector. Aspects of current and planned regulation that could significantly impact the introduction of a RAB model include: the local authority development of LHEES and designation of heat network zones; development of the consenting, permitting and licensing regimes, and the forthcoming Heat in Buildings Bill.

Setting up the structures to facilitate a RAB is likely to involve the use of both devolved and reserved powers. Therefore, discussions with UK government would be required. This could have significant programme implications for implementing the Heat in Buildings Strategy.

Balance Sheet treatment – RABs structures are designed to encourage private sector investment in infrastructure, and can be designed in a way that is off balance sheet for government.

Exit strategy – the RAB model assumes ongoing investment in long-term infrastructure assets. Investment in the regulated entity is by equity, with investors being able to trade shares.

Examples – the RAB model has been used extensively as a method of financing large-scale infrastructure investment in utilities such as electricity, gas, water & sewerage (including the recent Thames Tideway Tunnel). It has also been used for airport expansion (Heathrow Terminal 5) and is being considered by UK government as an option to fund future nuclear projects.

6.4 Enabling structures / mechanisms

This section describes a number of enabling structures / mechanisms that share some, but not all, of the characteristics of a delivery model, but which could complement and / or enable the implementation of one or more delivery models analysed in sections 6.1 to 6.3 above.

We have included this section in order to comment on structures or mechanisms which are potentially relevant for heat networks, and were raised in our stakeholder engagement, but which do not warrant full review as a 'delivery model'.

The enabling structures / mechanisms we have considered are:

- **Demand assurance / guarantee to incentivise private sector activity** – a form of guarantee to project developers to mitigate demand risk, with the intention of attracting private investment whilst reducing cost of capital and encouraging developers to invest ahead of need;
- **Private company with public purpose** – private company established with a public purpose (and potentially charitable status), similar to the current ownership model for Welsh Water. Profits are re-invested or used to cut customer bills rather than distributed to shareholders;
- **Heat as a Service** – a business model for heating in which consumers pay for outputs such as guaranteed room temperature / comfort levels / hot water volumes rather than inputs such as energy costs. This can involve improvements to the building fabric and controls, as well as the form in which energy is supplied to the building; and
- **Procurement efficiency** – a range of approaches that could be used to reduce the time and bid costs for procurement of delivery contracts for heat networks. These include a two-stage process to appoint a delivery partner for the commercialisation stage; use of frameworks; and standardisation.

We note below how these structures / mechanisms could impact on aspects of delivery models described in sections 6.1 to 6.3 (e.g., how they may affect project structuring, finance options, etc.).

Demand assurance

Demand assurance is not a single mechanism, but could take several forms. The underlying aim is to reduce the risk, or to mitigate the impact, of forecast demand on a heat network not arising. This can happen due to anticipated connections being delayed or not occurring, or, following connection, actual heating demand being less than forecast.

Contractors are generally much more comfortable with the latter scenario, as they are well placed to estimate heating demand from a future connection based on building type, footprint and usage. However, they have much less control over connection risk, which is commonly cited as the single biggest risk facing developers. Mitigating this risk has the potential to improve investability and reduce the cost of capital, hence this should be the focus of any intervention in this area.

Heat networks require significant upfront capital investment. Due to the nature of the main assets (heat mains installed below ground, with high civils cost and a long asset life), they should be sized for anticipated future demand. However, the amount of demand that can be secured by the sponsor at the time of financial close is often significantly less than the potential future demand, allowing for planned new developments, and connection from additional existing buildings (where owners subsequently elect, or are eventually required, to switch to low carbon heating systems).

Demand assurance could therefore have a role to play in "future-proofing" networks to meet anticipated network growth. A form of demand assurance would particularly benefit delivery models involving private sector sponsorship and / or co-investment, but would also benefit larger, public sector led schemes, where demand risk is still present.

Connection risk could potentially be addressed by a number of mechanisms, including:

- a clear framework of trigger events and a backstop date by which building owners will be required to install zero emissions heating systems;
- mandatory connection of certain types of buildings – e.g., public buildings, large commercial buildings and buildings with communal heating systems within heat network zones;
- planning policy – requirement for new developments in heat network zones to install heat networks or connect to existing / planned third-party networks;
- financial incentives to connect – e.g., a levy on buildings within a heat network zone that do not connect within a given time period; and
- a form of guarantee available to heat network developers.

The forthcoming Heat in Buildings Bill consultation should provide clarity over trigger events / backstop dates for installation of zero emissions heating systems. Scottish Government's heat networks policy and regulation teams are already considering the potential role and scope of mandatory connections and / or financial incentives to connect. National planning policy (NPF4) makes provision for new developments (though is predicated on heat network zones being identified in Local Development Plans).

The remainder of this section therefore focuses on the potential for a form of guarantee being made available to project developers. The intended outcomes for such a guarantee would be to mitigate the impact of connection risk on developers, to increase private investment in heat networks, whilst reducing cost of capital and encouraging developers to invest ahead of need. The guarantee would be dependent on the developer agreeing to certain commitments, for example to build-out the network in accordance with an agreed programme, to meet customer service standards, etc.

A demand guarantee could be provided in different ways – alternatives would need to be considered at detailed design stage, if there was an appetite to take this forward. One mechanism would be for a guarantor to underwrite a proportion of forecast project revenues against a pre-agreed revenue growth profile. The guarantee would be called upon in the event that forecast revenues do not materialise in accordance with the pre-agreed profile (e.g., if a planned housing development is significantly delayed), due to circumstances outwith the heat network operator's control, and with the developer having demonstrated that it had taken all reasonable steps to mitigate the shortfall. The proportion guaranteed could be limited to debt repayments only, to provide assurance to investors that in a scenario where revenues are less than anticipated, debt can still be repaid. This reduction in risk should also reduce the cost of capital.

We would expect the guarantees to be offered during the commercialisation stage and agreed at financial close, potentially in conjunction with existing support mechanisms such as grants / loans. Guarantee schemes could be made generic, and available to all qualifying projects, or could be bespoke and agreed on a project-by-project basis.

Project structure – the underlying project structure would not be changed by the provision of a guarantee, other than the addition of the guarantor, the guarantee itself, and potentially the nature of the financing agreements. The potential structuring of any guarantee scheme is not covered in detailed in this paper but, for example, guarantees could be provided directly by the Scottish Government, or by another body (which would probably need to be underwritten by Scottish Government to achieve an acceptable credit rating). An example of the latter type of structure is provided by the Low Carbon Contracts Company, which is wholly owned by the Secretary of State for BEIS and which manages Contracts for Difference (CfD) and the Supplier Obligation Levy, which funds CfD payments. The Low Carbon Contracts Company is led by an independent board on which the UK Government is represented.

Control / risk – the distribution of most control and risk in a project would still be dictated primarily by the underlying delivery structure, with demand risk partially borne by the entity providing the guarantee. The amount of risk guaranteed could be adjusted to suit the project, and could change over time. The expectation would be that demand risk would be shared between the project sponsor and guarantor, so that the sponsor remains appropriately incentivised to mitigate demand risk by seeking alternative sources of revenues.

Financing – the financing options available to any individual project would broadly follow the project delivery structure being used for the project, but could be enhanced if a demand assurance guarantee is available, increasing likelihood of private investment being available, and at a lower cost of capital than would otherwise be achievable.

Regulation – the provision of demand guarantees is not incompatible with forthcoming regulation under the Heat Networks (Scotland) Act 2021. Whether existing Scottish Government procedures for providing guarantees could be used, or additional legislation / regulation would be required, would depend on the scale and complexity of any proposed guarantee scheme.

Balance Sheet treatment – whether or not the provision of a guarantee to a project would bring that individual project onto Government's balance sheet would need to be considered. This would depend on the structure of the guarantee and the nature of the conditions associated with it, and the level of control over the project (if any) the guarantee afforded to the Scottish Government. In respect of any body set up to administer guarantees, its balance sheet treatment would depend on the Scottish Government's shareholding and / or control over that body. For example, the Low Carbon Contracts Company is wholly owned by the Secretary of State for BEIS and is categorised as an arm's length governmental body.

Exit strategy – the length of any guarantee commitment would depend on the specific arrangements of the scheme, but would be expected to expire when the risk being guaranteed had fallen away, either through passage of time or by the introduction of regulation (e.g., mandatory connections or obligations being placed on homeowners to decarbonise their heat supply).

Private company with public purpose

This involves a privately owned company that is established with a public purpose. The 'public purpose' element requires that cash surpluses arising from operations are reinvested in the company and / or used to reduce customer charges. There are no distributions of profits to shareholders or officers.

This type of company may be beneficial for delivery models in which the focus is on network growth and / or minimising customer charges, with no requirement for equity investors. It principle, it could be used in the context of a variety of delivery models, including a service concession (DM2), a third party ESCo (DM3), a community led project (DM5), an unbundled model (DM6), or a merchant model (DM7)). In practice, the 'public purpose' element would be better suited to models such as a community led project, or an unbundled model in which certain assets (such as transmission pipes) were considered to be a 'public good'. Models such as a service concession, third party ESCo and merchant model are more likely to require equity investors in order to absorb project risk.

The corporate structure does not involve any shareholders, and should contain an appropriate 'asset lock', to prevent the structure being changed in the future in a way that would undermine the public purpose.

A company limited by guarantee is a suitable vehicle for this purpose. It has no shareholders, and is owned by its members, who guarantee a nominal sum of money to the company in the event of its becoming insolvent or winding up. Its corporate governance functions are the responsibility of a Board appointed by the members.

As there are no equity investors, the model is heavily reliant on debt finance. This could include commercial loans, and corporate bonds issued on the capital markets. To achieve large-scale bond finance at a low cost of capital, with no equity investors to absorb losses, the company would require a well-understood risk profile, and high degree of certainty around both the cost of providing services and of revenue streams. This would almost certainly require a form of demand assurance, which is not part of the company structure itself. The structure would therefore only be suitable as a vehicle through which to secure large-scale low-cost finance for heat network investments if it were accompanied by a form of demand assurance / exclusive rights.

Example – Glas Cymru is the primary example of this model in the infrastructure market. It was set up as a not-for-profit, single purpose company. It acquired Welsh Water in 2001, financed by a £1.9bn bond issue. Welsh Water is a licensed provider of water and sewerage services, regulated by Ofgem under a RAB structure.

Glas Cymru's corporate governance functions are the responsibility of its Board (which has a majority of independent non-executive directors), and its members, around 50 individuals appointed following a process undertaken by an independent membership selection panel. Members are not representatives of outside stakeholder groups but rather are unpaid individuals whose duty is to promote the good running of the company, in the best interests of its customers.[49]

As it has no shareholders, assets and capital investment at Glas Cymru are financed by bonds issued in the capital markets, and retained financial surpluses, which are used for the benefit of its customers. No government subsidy is involved. This model aims to reduce asset financing costs. Glas Cymru states that its strategy is to deliver a secure, long-term credit quality to investors (such as pension funds and insurance companies) so as to raise finance required at the cheapest possible cost and therefore minimise customer charges. Around a third of bill costs are used to service finance costs.

Heat as a service

Heat as a Service (HaaS) is not in itself a delivery model for heat networks, but a term used to describe a range of different business models for heat supply to (usually) individual buildings. This can include asset leasing through to alternative ways of paying for heat. Elements of these models could potentially be combined with heat network delivery models, to expand the traditional supply arrangements and combine them with the provision of other services to end consumers.

49 See more information on Glas Cymru.

There are a number of variants of HaaS. The following is a risk-based definition used by LCP Delta[50]:

"A business model where the service provider takes on all five of the following risks – all of which (other than energy price risk) have historically been borne by the customer:

1. ***Financial risk:*** *service provider takes on credit risk by providing a heating appliance for a monthly fee and little or no upfront payment.*
2. ***Technical risk:*** *the monthly fee charged by the service provider includes: routine maintenance, repairs, and appliance replacement if necessary within the contract period.*
3. ***Performance risk:*** *service provider charges per unit of output (heat) or for the outcome (warmth) provided by the heating appliance (or guarantees savings on heating costs).*
4. ***Behaviour risk:*** *service provider charges for the outcome (warmth) provided, thereby taking on the risk that customers use heating inefficiently by, for example, opening windows. This also includes the risks associated with timing of demand, which are related to energy price risks.*
5. ***Energy price risk:*** *service provider offers a fixed price per unit of heat or warmth generated for a period of time, typically a year."*

Control / risk – of the five risks identified above, heat network operators can / do take some financial risk, technical risk (for the supply of heat to the building, but generally not within it), and energy price risk (for defined periods, but subject to periodic tariff adjustments). It is rare for performance risk in terms of warmth or guaranteed savings, or behaviour risk, to be assumed by a heat network operator. Depending on the nature of the HaaS model deployed, there is potential for elements of these additional risks to be taken by a heat network operator (and its supply chain).

Comprehensive HaaS packages are yet to be tested at a commercial scale either via heat networks or other technical solutions. Some Danish heat network operators offer some degree of HaaS by providing, owning and maintaining the heating appliances within customers' homes, charging a fee for this service, which is incorporated into customer bills.

In principle, most of the models described within this paper would have the flexibility to deliver elements of HaaS (as against a 'simple' heat supply agreement). However, the additional scope associated with taking on responsibility for equipment within the building (i.e., going beyond the heat interface unit), and the measures needed to manage the risk of guaranteeing outputs (rather than supply), would represent a significant departure from current service offerings.

50 Heat as a Service: Definition and Examples; authored by Roxanne Pieterse and Gaomin Liu; reviewed by Jennifer Arran; June 2019.

Procurement efficiency

As noted in section 3, public procurement of heat networks is perceived by many in the market as unnecessarily long, complex and expensive. Procurements can take over a year, requiring bidders to commit significant resource and cost, even at an early stage in the process (prior to preferred bidder appointment).

The market perceives the 'standard' project development process as time-consuming and inefficient, resulting in reference designs developed by local authorities that are of limited value, and seldom adopted and used by the private sector, who prefer to rely on their own designs. There is a strong demand in the market for procurement to be streamlined.

One proposal for how procurement could be streamlined is a '**Joint Development Agreement**' (JDA). This is a type of two-stage procurement involving appointment of a development partner at a relatively early stage of the process. The development partner would enter into a JDA with the authority. The JDA would provide a period of exclusivity within which the development partner would produce designs / costs, engage with key customers, owners of heat sources, the DNO etc, and with its own supply chain. The intention would be to provide greater certainty at an earlier stage around both financials (and hence affordability) and deliverability. The output would be a set of delivery contracts, to be entered into if the authority confirms its intention to proceed. There is no obligation on the authority to do so, but if the authority does not proceed it is likely that the authority would be required to pay the development partner for the work done to date, which the authority would then get the benefit of.

The obvious difficulty with such an approach is determining a set of robust criteria by which a development partner can be appointed, and value for money of subsequent delivery contracts can be demonstrated.

An alternative approach would be to establish a **procurement framework** for heat networks. In England and Wales, the BHIVE Dynamic Purchasing System enables public bodies to procure funding and related services for heat network projects from a range of potential funding providers. BHIVE allows developers to raise finance for a new heat network, to finance the expansion of an existing network, and to facilitate the sale or refinancing of a heat networks. The framework acts as a marketplace for developers to access funding, and for funding providers to access projects seeking finance. The framework does not, however, include the ability for projects to award delivery contracts such as construction, operation and maintenance.

As the market matures, increasing standardisation of delivery contracts will also reduce procurement timescales and associated tender costs. A range of delivery contracts has been commissioned by BEIS. and published as the "Sales, Operation and Maintenance Set" (SOMS). The suite of templates includes land rights such as leases (for energy centres) and easements (i.e., wayleaves for pipe routes); delivery contracts such as concession agreements, DBOM, O&M; use of system agreements; connection and supply agreements, various heat supply agreements, and a metering

and billing agreement. The templates do not include templates relating to project structuring and ownership (such as a shareholders agreement for a joint venture).

A "Standardised Due Diligence Set" (SDDS) has also been developed, to provide heat network sponsors and developers with un understanding of the due diligence requirements of project finance lenders and investors.

7. Evaluation

This section provides a summary of the evaluation results, highlighting the main advantages and disadvantages of each delivery model (as described in section 6) against the attributes (as described in section 4).

Appendix B contains evaluation scores for each model, based on the following 0 – 3 / 'RAYG rating':

Evaluation score	Score description
0	Potentially negative impact in relation to this attribute; fails to meet attribute at all.
1	Is broadly neutral in relation to this attribute; neither benefit nor negative impact.
2	Performs well against this attribute.
3	Performs very well against this attribute.

Table 1 below contains the total scores for each model (against each attribute) and a provisional ranking of models according to these scores. Note that for the purpose of the evaluation exercise, each attribute was given equal weighting.

We have not provided a score against 'Balance Sheet Treatment', but instead provided commentary on which organisation's balance sheet projects delivered under the model would be classified to (e.g., private sector, central Government or local authority).

Our evaluation findings, including the scores, are the output of a series of evaluation meetings, in which commentary and scores developed separately by evaluators were moderated. The evaluation was informed by our own knowledge of the delivery models and the heat network market, and by the feedback received through the stakeholder engagement undertaken in preparing this paper.

Table 1 – Evaluation summary

Ranking	Model Description	Model type	Score
1	Regional ESCo (**DM10**) – local authorities and other public bodies (e.g., NHS, universities / colleges) would come together on a regional basis and jointly procure a delivery partner for each region (similar to Hub model). The local public partners would use the delivery partner to scope projects and deliver according to pre-defined contracting structures.	New HN delivery model	22
2	Local authority led joint venture (**DM4**) – a local authority procures a partner and forms a JV to serve an initial project (including one or more local authority anchor loads) and potentially additional projects and / or other energy projects within the local authority area.	Existing HN delivery model / limited examples	19
3	Local authority led delivery, with Scottish Government stake (**DM9**) – local authorities would lead development and delivery of projects, with Scottish Government / central support and co-investment (which may be in addition to an element of grant). Scottish Government would have part-ownership of schemes, but with potential for sale / transfer of government stake once scheme is established.	New HN delivery model	18
4	Centrally led delivery (**DM8**) – Scottish Government would take the lead on development and delivery of projects (without need for local authorities to lead development). Scottish Government would have initial ownership / part-ownership of schemes (alongside private sector) but with potential for sale / transfer of government stake once scheme is established.	New HN delivery model	17
4	Regulated Asset Base (**DM12**) – a private sector ownership model in which heat network assets are constructed, owned and operated by a monopoly supplier on a long-term basis. Investment plans, operating performance and returns (which are capped) are subject to regulatory oversight.	New HN delivery model	17

Ranking	Model Description	Model type	Score
6	Service concession (DM2) – a heat network owned and operated by the private sector under a long-term service concession tendered by a public body, where the public sector offers anchor loads, and concessionaire takes demand risk.	Existing / well-established HN delivery model	15
7	Public sector (non-Scottish Government) in-house delivery (DM1) – a heat network is wholly owned and operated by public body (either directly, or via a wholly-owned arm's length entity), usually based on self-supply arrangements (e.g., local authority buildings, or a public sector campus).	Existing / well-established HN delivery model	11
8	Merchant model (DM7) – a private sector heat network operator contracts with off-takers to supply existing buildings, without having either being appointed by a private sector landowner / developer in connection with a particular development site, or having followed a public procurement exercise.	Existing HN delivery model / limited examples	10
9	Third party ESCo (DM3) – a heat network owned and operated by a private sector third-party ESCo appointed by private sector land owner / developer, generally to serve new development.	Existing / well-established HN delivery model	9
10	Unbundled model (DM6) – a family of models involving separate ownership of generation, transmission / distribution and supply assets, e.g., where heat generators contract directly with customers and pay a use-of-system charge to the owner of heat transmission / distribution infrastructure.	Existing HN delivery model / limited examples	8
11	Community led project (DM5) – a community leads heat network development and owns the network, subcontracts O&M, supplies buildings within community.	Existing HN delivery model / limited examples	7
12	Public Private Partnership (PPP) (DM11) – a heat network is operated by private sector under a long-term contract tendered by a public body, where the public sector retains the majority of demand risk, but availability risk lies with the PPP contractor.	New HN delivery model	6

It is important to note that the 'ranking' reflects the scoring methodology in which each attribute has been equally weighted. However, we consider that the above ranking broadly reflects the most important priorities, i.e. **potential for private sector**

investment, skills & capacity, ease of deployment (alignment with forthcoming regulation; need for further legislation / new bodies) and **simplifying delivery** (procurement and dealing with stakeholders).

The following points should be kept in mind in relation to this evaluation section:

1. This section should be read in conjunction with the scores in Appendix B. Although scores have been moderated, an element of subjectivity is implicit, and in many cases good arguments can be made for an increase of decrease in an individual score against an attribute by 1 mark.
2. Some of the models (and enabling structures) contain numerous components which operate differently depending on how they are combined or layered. In particular, newer or more innovative models tend to be more complex, and incorporate within them components of other existing models. These components, and how they are deployed, could be flexed to support different outcomes. However, in order to contrast and evaluate different interventions, we have had to make assumptions about how each proposed 'new' model would operate in practice. The assumptions in relation to each model are set out in the model's detailed description, which is contained in section 6. Key assumptions which significantly influence scores but could (in practice) be adjusted are also referenced in the evaluation text below.

7.1 Evaluation of DM1: Public sector (non-Scottish Government) in-house delivery

In this model, the heat network is wholly owned and operated by a public body (either directly, or via a wholly owned arm's length entity), and is usually based on self-supply arrangements (e.g., local authority buildings, or a public sector campus). This is currently the most common model for heat networks in the UK, and these projects are generally led by local authorities. Therefore, the evaluation below assumes local authorities would be the lead body. A full description of the characteristics of this model is set out in section 6.

As an existing model using established corporate structures and generally involving only one organisation (apart from sub-contractors), this model is relatively **easy to deploy**. Should heat network regulation fall to local authorities in the future (there is scope for this under the Heat Networks (Scotland) Act 2021), then there is some risk of self-regulation.

This model scores badly for **potential for private investment** because, by its nature, it involves only public sector investment. Although local authorities may access private finance to provide capital for projects, we have only considered this to be 'private investment' if the lender has no recourse beyond the arms-length body / SPV (i.e., the local authority, as 'parent company' to the SPV, does not provide a guarantee to the lender). In practice, non-recourse debt is unusual, and projects therefore generally

remain entirely on the public sector sponsor's balance sheet. This is more of an issue for projects led by central bodies such as colleges and NHS Boards, as balance sheet treatment of those projects is likely to have implications for Scottish Government capital budgets (and the potential to impact spending on other priorities).

Although there are numerous examples of successful heat networks using this model, increasing its prevalence may not contribute much to **simplifying delivery** at pace and scale. Heat networks in general are complex to deliver, and unless there is a successful track record of delivery within an authority, deploying new projects on this basis can be difficult in practice. For a local authority establishing new networks, the process is resource intensive and can often get caught up in changing internal politics and priorities. It also requires an ongoing capacity commitment in order to for projects to be run successfully once established. As a result of all these factors, projects tend to be small scale.

Although authorities that own heat networks develop in-house **skills and capacity**, experience suggests that this is often difficult to retain. At present, under current resourcing structures, local authorities do not have the resource to dedicate to delivering these kinds of project on a large scale. Even in places where decarbonisation of heat is a priority, resourcing must compete with other (statutory) obligations. Through our engagement with stakeholders, we had consistent feedback that local authorities do not have the resources required to drive forward heat network delivery at the pace required, if they are expected to lead on delivery (or even project identification). Even those local authorities with clearer plans for in-house heat network delivery recognised that they had capacity constraints, and that the level of effort or interest they were committing was unusual, and a result of unique political support in their area.

This model scores well in terms of its ability to **contribute to wider policy goals**. Retaining public ownership allows wider policies to be promoted and potentially prioritised over profit generation, although it is essential that projects are still run on a commercial basis, to ensure they are adequately resourced and can continue to operate effectively in the longer term. The relatively small scale of 100% public sector owned projects could limit the potential for wider policy benefits.

This model is slightly less sensitive than some others to **demand risk**, because the project anchor loads are often owned and controlled by the promoting authority, who can therefore manage connection risk. However, projects remain sensitive to demand risk for buildings not within the authority's control. The appetite of public bodies to accept this risk tends to be low, with projects scaled accordingly.

Although this model is delivering projects in Scotland and therefore supporting development of the market, we do not see it making a significant contribution to the **transition to a self-sustaining market**. Experience suggests these kind of projects still require significant amounts of grant, and are not offering opportunities for private investment or innovation. As the schemes delivered are often smaller and opportunistic in nature, without clear commitments to longer term growth (or the resources to identify expansion opportunities), supply chain capacity is unlikely to be significantly boosted by a proliferation of this type of project.

As noted above, projects under this model tend to be relatively small scale, as they are challenging to resource, even where the majority of the buildings to be connected are owned by the public authority leading the project. For this reason, it is not a model which can easily be replicated across different geographies, although there is a growing amount of 'best practice' knowledge which can be captured and shared.

Expanding publicly owned projects, particularly beyond the estate of the lead organisation, is challenging for most authorities. Authorities are often unwilling or unable to resource the operation of heat networks in a way that facilitates their expansion, in part because the supply of heat to third parties is not considered 'core business'. For this reason, proliferation of this model would not be expected to support **interconnection and expansion** of networks, despite the high degree of control which is offered by single, public sector ownership, which makes interconnection and expansion feasible in theory.

Public sector lead organisations may be better placed take a longer-term view of demand and may be able to identify opportunities to **invest ahead of need** that are not purely profit driven (e.g., in order to accelerate decarbonisation of the built estate). However, such an approach requires the sponsoring authority to carry greater risk. In practice, this kind of investment is usually only achieved when supported by grant subsidy (e.g., capital grants for future proofing), and the only to a limited degree.

By definition, these projects do not have private investment and would therefore appear on the balance sheet of the sponsoring authority. Projects led by central bodies such as colleges and NHS Boards are likely to have implications for Scottish Government capital budgets (i.e., the potential to impact spending on other priorities).

7.2 Evaluation of DM2: Service concession

Under a service concession, a heat network is owned and operated by private sector under a long-term service contract tendered by a public body following a competitive procurement process. The public sector offers anchor loads, and the concessionaire takes demand risk. A full description of the characteristics of this model is set out in section 6.

As with local authority led schemes, there are numerous successful examples of service concessions for heat networks in the UK, and so the model scores well for **ease of deployment**. The concession model is broadly compatible with forthcoming regulation under the Heat Networks (Scotland) Act 2021, although consideration needs to be given as to how commercial tendering processes can best align with / feed into Heat Network Zones and the subsequent issuing of permits. There are some additional complexities when tendering for a concession compared with (say) a Design & Build contract. In particular, the long-term nature of concessions means that it very important to define and incorporate into the contract the right outcomes at the outset, as it can be complex and expensive to make changes subsequently. This can be challenging, given that unforeseen changes are inevitable over typical concession periods (25+ years). There is, however, a growing body of experience of concessions, from which best practice can be drawn.

The concession model scores well in terms of **potential for private investment** – the model is predicated upon private investment. The structure can be attractive to the private sector because of the extended concession term (generally 25-40 years for heat networks) coupled with a clear exit strategy (the heat network assets generally revert to the public authority at the end of the term, although some contractors indicated during stakeholder engagement that they would prefer to retain ownership of assets beyond that point.) A higher rate of return is generally sought for this model by investors, when compared with models where the investment is provided by, and / or greater risk is shared with, the public sector. At present, this tends to require higher levels of subsidy to support the investment, and also means that this model is only really suitable for more profitable opportunities. The traditional concession model generally only delivers a single investment, rather than offering an entry-point for ongoing investment through multiple subsequent projects. It is therefore less efficient at deploying private investment than some other options.

Greater deployment of the concession model could help to **simplify delivery**, but changes would be required to make the process more efficient. Although in theory it is possible to aggregate multiple projects and tender them under a single concession, this requires more up-front work by the authority, which will generally prefer to proceed with the project it has ready at the time. The resulting 'One Procurement, One Project' model that we see in use today for concessions is consequently slow and very costly for authorities and developers alike (particularly given that reference designs developed during by the public sector sponsor during the Feasibility and Outline Business Case (OBC) stage are often not ultimately used by the concessionaire). Bid costs and public sector development costs are ultimately paid for by customers and / or taxpayers.

Some newer procurement models, including the 'Joint Development Agreement' option discussed in section 6.4 (Enabling Mechanisms), could potentially improve the process by appointing a development partner / prospective concessionaire earlier in the process. We received consistent feedback from developer stakeholders (and, to a slightly lesser extent, investors) that current procurement practices are unworkable, and that bringing in partners earlier (before concept designs are developed) would bring significant benefits and efficiencies. A two-stage procurement process such as the Joint Development Agreement could be one way to deliver this, providing the benefits of such an approach were demonstrably greater than the risks (this has not been tested). The approach could also be applied to other models. Given that concessions are only suited to larger projects with higher potential returns, focussing on this model alone is not likely to increase delivery substantially.

As concessions generally attach to larger projects, they can bring a boost to local supply chains, supporting the development of **skills and capacity**. Once projects have been procured, the private sector partner can bring their own capacity and expertise, and may be more efficient at both drawing on experience from, and sharing knowledge across, its wider business, giving an opportunity for the skills acquired on one project to be transferred to others. The private sector concessionaire should be well placed to

recruit and retain skilled staff, with associated benefits to external advisers. Although the procuring authority will develop skills in procurement and must continue to manage the contract throughout its term, the concession model does not support significant development by local authorities of internal expertise in heat networks.

This model does little to **contribute to wider policy goals**. Although projects are often large and long term, meaning that any positive contributions the project makes will have a greater impact, securing those outcomes over the long term via an initial contract negotiation is challenging. It is difficult to draft contract conditions in such a way that allows them to be sufficiently flexible over time, without such flexibility being perceived by bidders as a risk. However, as experience grows in this area, there should be an increasing number of examples to draw on which may help authorities secure best value.

This model does not mitigate and is not less sensitive to **demand risk**. The risk moves from the authority to the concessionaire to varying degrees (depending on the detail of the contract), and is priced accordingly by the concessionaire. The procuring authority can offer anchor loads at the outset to reduce the demand risk to the concessionaire, but that approach is not unique to this model.

Proliferation of this model would help the **transition to a self-sustaining market**. Concessions support larger projects that cannot generally be delivered by public authorities in-house. Larger projects support larger scale investment, which should, in principle, drive costs down, including cost of capital. Although there are different investors interested in investing in projects of varying sizes, our stakeholder engagement indicated a preference for larger-scale opportunities, i.e., minimum investments in the range of £20–50m. This is particularly true if institutional investors are to be attracted into the market, for whom due diligence costs can only be justified for larger opportunities. The main downsides of the concession model in relation to this attribute are that a) it may not offer a 'gateway' to multiple projects, so the potential for a lasting benefit to supply chains and investment opportunity is more limited; and b) any initial capital investment is still likely to be reliant on capital grants in order to meet the private sector's investment criteria. There is no indication that concessions will be able to move away from grants in the near future, though the same is likely true for most delivery models.

The concession model does not particularly support **replicability across different geographies**, because it requires projects of significant scale in order to make the investment viable, meaning it is only really suited to larger urban areas.

The concessionaire, for whom heat networks are core business, will be naturally incentivised to identify (profitable) opportunities for **interconnection and expansion**, and can be expected to resource the project accordingly. However, the model is entirely commercially driven, so it is likely that only profitable and commercial growth opportunities would be pursued, unless the concessionaire was contractually obliged to do otherwise (which would be complex and expensive to establish within the contract). Once let, implementing change in contracts can also be complex and expensive, so may not lend itself to exploiting interconnection opportunities.

Any **investment ahead of demand** under the concession model would either need to be envisioned, required and paid for by the procuring authority at the outset (e.g., by competing the subsidy to be provided to support a fully future-proofed scheme) or be in the commercial interests of the concessionaire, who may oversize pipes if confident in being able to secure additional customers to make a return on its investment over the concession period. The private sector will generally only accept limited demand risk, and so investment ahead of need may need to be funded by the public sector (or paid for by consumers).

Balance sheet treatment will depend on the level of risk transfer achieved, and any control that the project sponsor can exert, under the terms of concession agreement.

7.3 Evaluation of DM3: Third Party ESCo

In this model, the heat network is owned and operated by a private sector ESCo appointed by a private sector landowner or developer, generally to serve new development. This model has been used predominantly in London, where strict planning conditions require heat networks for large-scale new development. We have assumed this model is limited (at least initially) to the site of any new development. This model is therefore distinct from *DM7: Merchant Model*, which assumes more of a prospecting approach, aiming to connect new and existing anchor loads across an area. A full description of the characteristics of both of these models is set out in section 6.

This model uses existing corporate structures, does not require a procurement or state involvement (other than planning and administering any regulation). Like most models, consideration will need to be given about how its proliferation would interact with exclusively permitted zones under the Heat Networks (Scotland) Act 2021. Overall, this model scores well for **ease of deployment**.

This model scores reasonably well for **potential for private investment**. Privately-owned structures are easy to transfer and exit from, without any state interest or public ownership to complicate investment, purchase or sale. However, investments are likely to be on a project by project basis, mostly likely estate or developments owned by one landowner or body, meaning schemes may not be large enough to attract certain types of capital or support significant investment (see below).

Although working well in specific circumstances, this model would not contribute significantly to **simplifying delivery** overall. Due to the lack of public sector involvement, this model avoids procurement and so can be delivered quickly. However, generally speaking it is suited for new development only, and has limited potential for retrofit or connection of existing anchor loads: there is less potential for this model in larger areas. Projects are generally delivered on a site-by-site basis, but can leverage relationships between land owners, land developers and heat network developers, replicating strategies that have worked for previous projects.

Although this kind of relationship building can foster **skills and capacity** in the private sector, a large number of relatively small schemes under this model may draw on private sector skills in an inefficient manner. This model would have little, if any, benefit in terms of building public sector skill base.

This model could negatively impact **contributions to wider policy goals**. The lack of public involvement means there is no way (other than through regulation) to control or influence provision of the service or to control pricing. Absent wider regulatory controls (e.g., through consenting or planning) there are no levers to ensure entirely privately-led schemes deliver against just transition objectives.

As these kinds of projects are scaled to meet the needs of the planned development which is generally controlled by the land owner / developer (and often required to install or connect to a heat network for planning reasons), they are less sensitive to **demand risk**. They are, however, unlikely to come forward without significant demand assurance stemming from the project itself.

This model supports the development of market-driven solutions. The development of private schemes will facilitate investment, thus supporting the **transition to a self-sustaining market**, particularly where schemes are less reliant on grant funding (for example, in areas where gas infill is not an option). The greater the number of successful heat network projects, even smaller private ones, the greater the level of market confidence. However, because schemes are generally limited to new development sites, private ESCo projects are likely to be limited in scale and to specific areas, and as such are unlikely to be sufficient to develop wider supply chains.

For the same reason, private ESCOs score badly for **replicability across different geographies**. Schemes are likely to be individual projects rather than large chain or groupings, and likely to work better on smaller scale, new developments; larger-scale projects incorporating existing public-sector anchor loads are more likely to necessitate some kind of public procurement. Private ESCo projects tend to happen primarily where the provision of (or connection to) a network is a requirement of planning policy. Such blanket, heat-network specific planning policies are not (yet) a feature of local area planning in Scotland.

This model also scores badly for **interconnection and expansion**. Delivery on a project-by-project basis, generally related to site ownership, does not encourage expansion. Generally developers are providing the network to satisfy planning requirements, not with a view to expansion. The heat network operator may or may not have the appetite or capacity to seek out future expansion or interconnection opportunities.

For similar reasons, this model is not anticipated significantly to encourage **investment ahead of need**. Projects would be expected to be scaled and designed to meet the committed demand; neither property developers nor heat network operators generally speculate on expansion.

These projects (as defined) would be classified to the private ESCO's **balance sheet**.

7.4 Evaluation of DM4: Local authority led joint venture

In this model, a local authority procures a partner and forms a joint venture (JV) to serve an initial project (including one or more local authority anchor loads) and potentially additional projects and / or other energy projects within the local authority area. A full description of the characteristics of this model is set out in section 6.

Joint ventures (JVs) are legally more complex to deploy than a concession or Design & Build contracts, because corporate governance arrangements for the JV need to be agreed alongside commercial contracts for the initial project to be delivered. However, there are a growing number of established examples across the UK of JVs being used to deliver heat networks, including Midlothian Energy (a Joint Venture between Midlothian Council and Vattenfall Heat UK. JV models rely on existing, well understood corporate structures, and are no less compatible with forthcoming regulation than other models: consideration will need to be given to how any JV interacts with zoning and exclusive permitting. This model therefore scores positively for **ease of deployment**.

This model also provides good **potential for private investment**. Investors are generally attracted to the sharing of risk with the public sector partner that is inherent in a JV structure, when compared with, e.g., a service concession (although some private sector stakeholders were less interested in investing alongside the public sector than others). As heat networks are still considered by most to be higher risk projects, sharing risk (and returns) through a JV may offer up additional opportunities for investment that would not otherwise be attractive to investors. In addition, because a JV allows a single procurement to open up multiple, future projects, it provides a structure that will support future investment more easily. How easily that additional capital can be deployed will still depend on the individual arrangements: sometimes the need for both partners to approve investments can slow things down. A JV structure also allows a public sector partner to divest of their shareholding in the future should it desire, creating an additional opportunity for private investment (assuming the JV SPV was an attractive investment at that point).

A JV model can go a long way to **simplifying delivery**. Although JVs can take significant time to procure and there is no standardised approach to doing so, the process is robust and comprehensive and, after the procurement, there is the potential to deliver projects at scale and speed. The model allows both private and public sector to play to their strengths, working together to deliver both the initial project (which generally needs to be well defined in order to attract investors) and then to identify and develop subsequent projects. The procurement efficiency of a JV, which allows the JV to take forward multiple projects within a given area following a single public procurement exercise, is highly valued. If additional public sector stakeholders are also included in the JV structure or named on the Contract Notice, this can help to facilitate future connections / phases. If the procurement is properly structured, with transparency as to which public sector stakeholders will be able to connect their assets and take a heat supply from the JV, those stakeholders should not then need to run a separate public procurement exercise in order to do so.

The JV model also allows **skills and capacity** to develop in both the public and private sectors, striking a good balance between the respective skills and capacities of each partner. If the public sector partner can help to facilitate a pipeline of projects (not requiring separate procurements), the JV partner can provide staffing and resource to develop projects, and a supply chain to deliver them. Whilst the single local authority / private partner JV structure avoids multiple procurements for projects within a given geographical area, the JV's activity and supply chain is still limited to that area, which will typically be a local authority administrative boundary.

The ongoing presence of the local authority, beyond the signing of an initial contract, may help manage and apply any policy-based outcomes or goals which have been agreed at the outset (noting that Board Member's responsibilities are always to the JV company, not external entities) in addition to using the competitive procurement to mandate or compete minimum service levels or pricing policies. This combination should help to **contribute to wider policy goals**. The potential for multiple / aggregated projects could also help to reduce the cost of finance for the private sector partner (as larger investments can absorb due diligence costs more effectively), which should be reflected in customer charges. In addition, because JVs would be expected to unlock a larger number of projects / larger-scale projects, any positive contribution has the potential to impact a wider area. The downside of the JV model, and any model with a private sector partner, is that corporate interests and the need to make a return on investment must always also be prioritised, perhaps to a greater degree than if a public body was acting alone.

This model does not reduce **demand risk** more widely, but the opportunity to name other public sector bodies as buyers of heat in the Contract Notice may help to mitigate procurement-related demand risk for future connections / projects that the JV identifies, potentially making them easier to deliver.

The opportunity to build out multiple projects within an area from a single procurement helps take a longer-term and more strategic approach to developments. This may give rise to opportunities for the JV to aggregate projects, to benefit from portfolio risk management, and potentially reduce cost of finance, all of which support the **transition to self-sustaining market** (although the JV model does not in itself change the economics of individual projects). Although there is potential to 'bundle' projects for investment via the JV, this will still be limited by the geographic boundary of the procuring local authority, which will limit the opportunity for scale and hence cost reduction (except perhaps within the cities).

This model is **replicable across various geographies**, although if every local authority wished to pursue this model individually, it would generate a significant number of resource-intensive procurements, which may not all be able to attract adequate competitive tension if launched over a similar time period (bidders will focus resources on the areas with the most potential). This could be mitigated if some local authorities decided to procure jointly, which may be possible in a multi-authority JV or in DM10: RESCo model (see below). Once in place, the JV allows delivery of different solutions

for different projects under the JV, making it more flexible than a concession model. The potential to aggregate projects or investments may create opportunities for smaller projects or extensions to existing networks that would not be commercial on their own.

The JV model is likely to support **future interconnection and expansion**. The JV private sector partner has a commercial interest in expanding schemes because it is their core business (unlike that of the public sector partner), meaning the JV should have the resources required to negotiate new connections. The public sector partner can then work to help facilitate delivery of those opportunities, through providing anchor loads or through engagement and influence with other local stakeholders (public or private). Inclusion of other public sector bodies in the Contract Notice would also support future expansions.

If the JV covered a large enough area over an extended period of time, this provides an opportunity to incentivise designs which support **investment ahead of need**. However, the JV model does not in itself achieve this. Whilst there is an opportunity to share investment risk and incentivise this kind of investment if the public sector partner is prepared to take a long-term view, both parties would need to approve individual project investments, which will always need to be commercial for the private sector partner. In practice, investment ahead of demand is usually achieved via subsidy (capital grants for future-proofing of energy centres / heat mains). This was the case for the Shawfair development, as the first project for (what became) Midlothian Energy.

Whether or not the SPV is classified to local authority **balance sheets** will depend on the individual structuring of the JV Co, including the parties' respective shareholdings, rights, degree of control and approach to risk sharing. As the public sector partner is a local authority this is unlikely to score against Scottish Government capital budgets (other than any grants and potentially other financial support provided).

7.5 Evaluation of DM5: Community led project

In this model, a community leads heat network development and owns the network. The community then subcontracts the operation and maintenance of the network. These kind of schemes generally supply buildings within a community. A full description of the characteristics of this model is set out in section 6.

Although this model uses existing corporate structures, it scores neutrally for **ease of deployment** because, in practice, arranging appropriate governance can be complex to coordinate for a community group. It often requires the creation of a new community company, which brings additional legal complexities in relation to governance and the provision of guarantees, etc.

Although this model provides potential investment opportunities for community-sourced funding and finance, or companies interested in smaller scale investments, their **potential for private investment** is limited because it is likely to be an

unattractive model for large-scale private investment, due to challenges with scale, control and transfer.

This model scores negatively for **simplifying delivery**. Although community companies do not have to run public procurements, and the community element is likely to be well received by local stakeholders, and may encourage engagement and cooperation from residential owners, these advantages do not outweigh the significant delivery and coordination challenges that small community projects often face. Projects are generally limited in size to networks serving a single, small community, which often has limited capacity to deal with interfaces and negotiations. Delivering community heat networks requires significant community organisation and commitment, which experience suggests is very hard to deliver in practice.

Although this model would develop **skills and capacity** at a community level, and may be able to support very local supply chains (local suppliers can be prioritised), these kinds of networks are unlikely to expand significantly or transfer local skills to other projects. This limits any wider benefits. These projects may also absorb scarce skills and capacity that would be better used elsewhere. For example, these projects are likely to represent an inefficient use of Government support time and resource (e.g. HNSU), because the amount of support they are likely to need would be disproportionate to the benefits delivered. We recognise however, as outlined below, that there may wider policy reasons for providing such support.

This model scores positively in respect of its potential to **contribute to wider policy** goals, because community led schemes are likely to be highly driven and focussed on wider policy objectives related to community wellbeing, fuel poverty and consumer protection. However, the lack of scale would limit any impact the project might have in any given area, and would also make it harder to support large scale training opportunities and supply chain development.

Small, community-led schemes may be slightly better able to manage **demand risk** among residential customers than other models. Community led initiatives are likely to be able to garner greater local awareness, trust and support for the heat network within the community and are therefore more likely to gain commitments to connect from households. However, any change in behaviours or attitudes is unlikely to be significant enough to reduce anxiety around demand risk to a degree which would impact the cost of finance. Schemes may end up being further reduced in scale as a result.

The nature of community led projects means they are less likely to attract significant private investment on a large scale, and are unlikely to give significant market confidence beyond a local level. As a result, they would make a minimal contribution towards a **transition to a self-sustaining market**, although they may perform well in practical terms at a local level, in giving communities confidence and engaging local suppliers.

This model is not r**eplicable across geographies**, because it will only work on small, local projects with a very engaged local community.

Although future **interconnection and expansion** would be driven primarily by the best outcome for consumers rather than a pure profit motive (which may remove some barriers to pricing / charging inefficiencies), in practice the integration of multiple community owned networks, or expansion of an existing one, is likely to be challenging in terms of the community's capacity to negotiate and ability to invest and grow networks. Any expansions would most likely be very limited in scale.

Although community led planning may be open-minded and positive about future investment and open to **investment ahead of need**, the ability of any community led project to deliver this to any significant degree would be limited by both the size of the initial project and more limited access to capital that community led schemes tend to suffer from.

Assuming there was no public sector involvement or ownership at all, then projects delivered under this model would not be classified to any public sector **balance sheets**.

7.6 Evaluation of DM6: Unbundled model

This model involves the separate ownership of generation, transmission / distribution and / or supply assets. An example is where heat generators contract directly with customers and pay a use-of-system charge to the owner of heat transmission / distribution infrastructure. This model is in fact a family of models, some of which could be delivered to varying degrees within existing or other 'new' models. For example, there are some small-scale examples of this model (e.g., privately owned heat sources feeding into networks), or as a variation of other models (e.g., centrally led development, or funding of transmission networks by Government). For the purpose of evaluation, we have focussed on the use case involving separate ownership of all components from the outset.

A full description of the characteristics of this model is set out in section 6.

This model scores neutrally for **ease of deployment**. In addition to numerous international examples (e.g., Denmark, Netherlands), this model has already been deployed on a small scale in some places in the UK (e.g., Stirling, Glenrothes), and relies purely on contractual arrangements to manage interfaces between different elements of a network. A full version of this model, where transmission and distribution are separated, is potentially sensitive to forthcoming regulation in relation to permitting, as it is not currently clear whether permitting would support a distinction between these two activities. Standardising the process of buying heat from a third party source onto a network could help to deploy this model for projects reliant on a privately-owned heat source (e.g., industrial waste heat sources) but, if separate ownership of different parts of the network became commonplace, then additional regulation to manage interfaces may be preferable.

This model could increase the **potential for private investment**. The unbundled network model is already well-known to investors familiar with UK utilities' markets

(e.g., electricity networks). Unbundling may support direct, lower cost investment into the more traditional / well understood elements of heat networks, by separating that component from parts less familiar to investors. For example, if supply and distribution were separated, then investors more used to investing in customer facing businesses may be attracted to the supply business, whereas infrastructure investors may be more focussed on the physical components. In theory, the model also allows risk to be split by offering separate investment opportunities for lower and higher risk components. The potential for all of these advantages should grow with time, once assets are established at a greater scale, and are better understood by investors.

However, starting out larger investment on an unbundled basis is likely to be challenging, as the profitability of one element of the network is always likely to be dependent on another, e.g., a generation asset only has value if heat can be distributed to contracted customers, which would be beyond the generator's control if the business was split. This interdependency risk may increase costs of investment, particularly at the outset before the supply business is established. The BEIS International Review of Heat Network Market Frameworks[51] is not supportive of pursuing the unbundled model at this stage of the sector's development. One investor stakeholder we spoke to stated that their long-term preference was only to own and operate heat network assets, and that they would prefer to transfer the supply elements (customer facing) to other entities who have more core business in this area, but accepted that this would not be possible until the market was much more mature.

The difficulty in pursuing this model from the outset (compared with the unbundling of mature networks later) means it scores badly in terms of its ability to **simplify delivery**. Complex contractual interfaces would need to be developed to manage risk across the various components. This model does not offer a clear path to large-scale delivery, unless (perhaps) Scottish Government was willing to fund and take the risk on certain transmission networks (with the option to divest in the future, once the network has been constructed and with stable revenue streams established). In some cases, for example where there is third-party waste heat available (e.g., an energy-from-waste facility or sewer source), a degree of unbundling is inevitable. The process of procuring such heat onto a network could be made easier if standardised.

This model would allow the development of some specialised skills in the different components, and could allow easier transfer of some existing **skills and capacity** from related industries (e.g., electricity supply companies could take on supply-side businesses).

This model scores neutrally in terms of its ability to **contribute to wider policy goals**. On the one hand, efficient private investment in particular types of assets could help drive down costs for consumers. If transmission networks were publicly owned, fuel-poor areas could be prioritised. On the other hand, interface risks could increase cost of capital, and the need to find profit for different businesses at each interface

51 See information on the unbundled model not being recommended at this stage in the BEIS International Review of Heat Network Market Frameworks.

could increase costs for consumers. Any state involvement in a purely supply-side business seems less likely (as opposed to owning and operating whole networks, or transmission assets), therefore the ability to control pricing and protect consumers via controlling that element of the network is low.

This model is likely to be more sensitive to **demand risk** than other models, and so scores negatively. The risk is likely to be intensified because no single entity is able to manage all aspects of the operation: the capital-intensive elements (transmission) have no visibility of income from end users (generated by the supply-side business).

Developing transmission networks under separate ownership at the outset would require significant up-front investment and carry high demand risk as income streams would be dependent on activity by others. They would require significant public subsidy, which would not (at least in the short term) support the **transition to a self-sustaining market**. One investor / developer we spoke to was interested in 'unbundling' its networks in the future (by selling the supply elements of the business), but acknowledged that this would not be possible at the outset while the market is small and immature. There may be an opportunity to bring down consumer costs by leveraging institutional investment into certain assets in the longer term, by unbundling once networks of a sizeable scale have been established. However, this advantage would not be available at the outset because of the additional costs and unmanaged risks that arise from pursuing an unbundled model for new networks.

The BEIS study concludes that separating generation vs transmission / distribution vs supply would only be worthwhile on very large projects and geographies, as a result of the additional administrative costs associated with managing the interfaces and running the various components as separate businesses. The paper noted that studies from other countries also support this conclusion. As such, this model scores negatively for **replicability**, as it would only work for large projects or networks consolidated over a larger area (even once the riskier build phase has passed).

If one or more transmission networks were to be developed (likely by the public sector), this would support expansions and could provide opportunities for smaller distribution networks to connect into the transmission networks readily, reducing up front capital and risk to supplying new customers (although interfaces would need to be negotiated each time). This would support future **expansions and interconnection**, but would be reliant on a very significant up-front (at risk) investment in a transmission network.

Again, if large transmission networks were to be delivered, this would allow pipes to be significantly oversized to support **delivery ahead of demand**, albeit at cost and risk. Without some form of demand assurance, the inability to manage the downstream connection risk (either at point of construction or in the future) would increase the risk of this activity, making it more expensive.

The **balance sheet** treatment would depend on ownership of the individual assets. If some elements were publicly owned, this would be 'on balance sheet' for the relevant public sector organisation.

7.7 Evaluation of DM7: Merchant model

In this model a private sector heat network operator contracts with off-takers to supply existing buildings, without having either being appointed by a private sector landowner / developer in connection with a particular development site, or having followed a public procurement exercise. A full description of the characteristics of this model is set out in section 6.

In relation to **ease of deployment**, this model would score well if delivered in isolation, because it uses existing corporate structures, and the lack of public sector involvement in delivery role may streamline the process. However, when taken in the wider context of forthcoming regulation and a desire for coherent area-wide heat planning (via LHEES and city-wide heat network planning), a proliferation of this model may not be consistent with the regulatory and policy 'direction of travel'. The future deployment of permits would be more challenging in areas where significant merchant networks have been established, because there would be an incumbent operator(s) in areas where local authorities would be seeking to confer exclusivity in order to benefit from a long-term, strategic approach. This will make permitting process more legally complex, as well as potentially undermining the commercial case for the permit (or the development of a strategic area-wide network by other means).

We consider this model is neutral in terms of **potential for private investment**. Privately owned structures are easy to transfer and exit from, and the lack of state involvement or public ownership would mean investments are not slowed by multiple interests. This model also offers opportunities to investors with a higher-risk appetite. On the other hand, it is hard to see how projects of this type can take place at scale (and offer larger investment opportunities) without any local authority involvement to commit anchor loads from the outset – public bodies may still have to procure the heat supply to such buildings. In addition, because a smaller number of investors are interested in projects with this kind of risk profile, these projects may only open up certain avenues of investment, with the potential to undermine others: merchant projects could undermine the commercial case for larger urban schemes by 'cherry-picking' key anchor loads, making larger schemes less likely. To create additional potential for investment, this kind of project would ideally be limited to areas where wider schemes are not being planned or prioritised at all, for example in smaller towns. There are also some micro-scale versions of this model, for example shared ground arrays, which could have a complementary role in less dense, suburban areas.

We have also scored this model neutrally in terms of its potential to **simplify delivery**. Although it does not rely on a public procurement to commence the project, legal complexities remain regarding procurement of heat supplies to public sector anchor-loads: it is unclear, in the absence of public procurement, what justification would be available to public sector bodies wishing to connect their buildings. There is therefore more potential for this model in areas where there is little or no reliance on public sector buildings. The lack of development of projects of this nature to date does suggest challenges around delivery. Challenges coordinating multiple stakeholders

will still exist, and could be harder without any local authority involvement. Anecdotal evidence appears to suggest that getting anchor loads to commit remains challenging, even when construction has commenced, although this could improve over time. A proliferation of these projects may also have a complicating impact on wider delivery, by undermining city-wide permitting and procurement (see above under 'ease of deployment'). Such merchant projects are also likely to focus on targeting key anchor loads but without being incentivised (or required) to connect other, less commercially attractive buildings as part of the process, an outcome which can be avoided with a public-sector led procurement process.

This model will foster **skills and capacity** in the private sector, and would not put any pressure on limited public sector resources. However, a larger number of smaller merchant schemes (as opposed to larger, area-wide solutions) may be less efficient and could draw on private sector skills (e.g. advisory) in a less efficient manner.

This model scores poorly in terms of its **ability to contribute to wider policy goals**. The lack of public involvement (given no public sector sponsor or procurement) means there are limited ways to control or influence how policy objectives are met through delivery. UK-wide consumer protection for heat network customers are expected to promote fair pricing, and consenting and licensing may offer some scope for promoting wider policy objectives.

This model offers opportunities to investors with a higher-risk appetite who are less sensitive to **demand risk**, but fully private schemes are unlikely to come forward without significant demand assurance stemming from the project itself, which will limit their number and size. Given the limited risk appetite of most private sector investors, and absence of public sector involvement to mitigate risk, there is nothing inherent in the model which makes it less sensitive to demand risk.

Development of private schemes will support investment and provide confidence in heat networks more generally, if they can become viable on a stand-alone basis. This remains to be demonstrated. In any event, schemes are unlikely to be sufficiently numerous or of a significant scale to support a rapid **transition to a self-sustaining market**.

This model could be **replicable** across some geographies, but is likely to be limited to smaller scale projects, as delivering on a larger scale may necessitate some kind of public procurement. Projects are more likely to come forward individually, based on a specific geography, rather than in groups.

This delivery model itself assumes a degree of future expansion in order to make it profitable, although the lack of consolidated or consistent ownership of networks may make future **interconnection and expansion** more difficult on any significant scale. Any expansion is likely to be at risk of 'cherry picking' only the most profitable routes, rather than seeking to meet any wider needs.

This model (as we understand it) is more open than other models to accepting greater risk in advance of contracted demand from customers. This could, in principle, support **investment ahead of need** such as oversizing of pipes. However, without

firm commitments from prospective customers, or firm regulation requiring or incentivising building owners to connect, it may be difficult to attract significant and sustained investment (particularly from third party investors).

By definition, these kinds of projects would be off any public sector **balance sheet**.

7.8 Evaluation of DM8: Centrally led

In this model, Scottish Government (or an executive agency of the Scottish Government, or some other centrally controlled public body) would take the lead on development and delivery of projects, without need for local authorities to lead development. The central body could have initial ownership / part-ownership of projects (potentially alongside private sector partner(s)) but with potential for the onward sale or transfer of government stakes in projects once they are operational with established revenue streams. As with other delivery models, this model could be adjusted to perform slightly differently against a number of attributes. However, for the purposes of this evaluation, we have assumed that the central body takes full control of project development and delivery in particular areas, without the relevant local authorities being actively involved in the projects.

A full description of the characteristics of this model (as assumed for the evaluation) is set out in section 6.

In terms of **ease of deployment** of the model, it is likely that a separate entity (wholly owned by the Scottish Government) would be needed to ringfence projects / assets and allow for their onward sale. While a basic corporate structure could be set up, there may be a risk of 'self-regulation' in respect of the Heat Networks (Scotland) Act 2021, where Scottish Government is developing and operating networks, whilst holding regulatory functions in respect of heat networks. This issue could be reduced if a separate statutory entity was set up to hold the heat network assets and apply for the relevant approvals, but setting up an independent entity in this manner could require further legislation. A Scottish Government Business Case would need to be developed to take forward this model, which would take time, regardless of whether a separate statutory entity was preferred. Scottish Government already has experience of setting up arms-length infrastructure companies, for example the SFTi company, which was established by SFT to invest in community infrastructure projects under the 'Hub' initiative (the model on which DM10 (**Regional ESCO**) is based).

This model could increase **potential for private investment**, provided it successfully increased the number of projects being brought forward and the pace at which they were being delivered, when compared with a scenario where Government did not intervene. Through stakeholder engagement we had some strong, and largely consistent, feedback that greater direct Government involvement in schemes (although not necessarily via this model) would project confidence that heat networks are a viable, long-term solution which Government backed. This in turn may help reduce the perception of risk to local stakeholders and investors, and provide

greater confidence, thus facilitating delivery. However, some investors (in particular those less active in or familiar with the Scottish market) were more negative about state involvement in delivery at all, with the view that 'There are some things that Government is good at, and delivery is not one of them' and *'Government should regulate and set clear rules of the game, that's all we need.'*

Whether or not centrally led delivery would **simplify delivery** and increase the total number of projects coming forward is not definitive, and is likely to depend on how central resource was deployed, and any joint working arrangements with local authorities. For the purpose of the evaluation, we have assumed that local authorities would not be involved in project development and delivery in certain areas. A central body would be able to progress projects in areas where development is not being brought forward by local authorities at all, where local authorities do not have the capacity or the willingness to develop heat networks. It would also allow significant knowledge sharing and efficient allocation of resources, with a central body of expertise building up over time. We do have concerns, however, that central control over development could have a 'shadow effect', in which uncertainty is created about who is responsible for bringing forward projects, potentially undermining development of heat network opportunities that are currently attractive to local authorities. Local authorities may stop delivering and developing projects altogether, focussing resources elsewhere. A centrally led approach would be at odds with the current message that local authorities should be progressing heat network opportunities as one of the key outputs of Local Heat and Energy Efficiency Strategies (LHEES) and associated Delivery Plans.

Any central body would need to make difficult decisions about which projects to prioritise, and therefore which projects or areas to give less priority to. This would require considerable stakeholder and communication management and would inevitably be resource intensive, with the potential of distracting from delivery. In practical terms, we also see little benefit in divorcing the development and delivery of heat networks from local authorities, even in circumstances where the authority may not be behaving proactively. Local authorities are likely to be able to provide most of the anchor loads for a scheme, and will have essential local knowledge (including from the LHEES process) and connections that will be essential to make schemes a success. Centralisation of delivery would be counterproductive if the central body did not have sufficient skills and capacity. Projects are resource intensive, hence adequate resourcing would be required to progress multiple large projects in parallel. Although there are significant delivery benefits to be gained from centralisation, we believe full centralisation could have a negative effect on delivery.

Although there would be some benefit in creating a centralised core of expertise, we note that it may be challenging for central Government to recruit and retain the **skills and capacity** required to take on this work, and building up that capacity may take some time. This risk could be managed by providing significant, ongoing revenue resource alongside capital investment, and offering competitive salaries and opportunities which matched those available in the private sector.

Of all the models, centrally led delivery is likely to have the strongest link between central policy goals and delivery, meaning it has significant potential to **contribute to wider policy goals**. The degree to which this was deliverable in practice might depend on the models chosen by the central body to deliver individual projects: significant amounts of state control over projects would allow policy goals to be prioritised, whereas if private sector models such as concessions or joint ventures were adopted, policy drivers may become diluted by corporate priorities. We note that if a new entity was created (separate from Government), there is potential for the statutory responsibilities of the new entity and central Government's policy priorities to diverge over time (e.g., keep consumer prices low instead of significant expansion).

Like most models evaluated, this option does not reduce (nor is it significantly less sensitive to) **demand risk**. It would give Scottish Government (or new entity) the opportunity to decide, at a project development stage, how much demand risk to retain. Retaining risk within the public sector may make projects cheaper and more deliverable from a private sector perspective. Local authorities may still need to be involved in committing anchor loads (though not in procuring heat networks), thus mitigating demand risk on individual projects.

If a centrally led body was able to unlock projects in otherwise stagnant areas, then it would begin to support a **transition to a self-sustaining market**. As noted above, stakeholders felt that greater Government involvement in delivery could send a strong supportive message to investors and the supply chain, but this would be sensitive to rapid delivery and demonstrating early success. Projects could be structured to provide an exit mechanism for any Government stake once projects are operational with established revenue streams, thus supporting future investment. Project and site selection would be key to avoid crowding-out private investment: central delivery would ideally be limited to areas where heat networks are deemed an appropriate solution, but development is not happening at pace and scale. This could mean a reduced likelihood of 'quick wins'.

The kinds of projects that would be delivered under this model would depend entirely on the priorities and focus of the body (and deciding this could be very politically sensitive), but it scores well for being **replicable across various geographies** because the model could work for projects of different sizes, including those not otherwise commercially viable.

Looking to the future, significant centrally led involvement could offer the strategic advantage of identifying opportunities for **interconnection and expansion**. If the central body owned or held a stake in most of the projects it delivered (which may not necessarily be the case), then that control could be used to encourage expansion / interconnection to take place where it was strategically beneficial to do so, rather than being purely profit driven. If the central body took on significant ownership and was willing to take on greater risk, it could also encourage and fund **investment ahead of need**. However, both retaining a stake in projects (in order to exercise greater influence and control) and investment ahead of need would require significant

ongoing resource and capital budget. Projects with a significant Government stake (or other form of control) would be more likely to be classified to Scottish Government's **balance sheet**, and therefore reduce funds available to be spent on other priorities.

7.9 Evaluation of DM9: Local Authority led projects; Scottish Government stake

In this model, local authorities lead the development and delivery of projects, with Scottish Government / central support and co-investment (which may be in addition to an element of grant), in a joint venture arrangement. Scottish Government would have part-ownership of schemes, but with potential for sale / transfer of government stake once scheme is established. JVs could be bipartite – local authority & Scottish Government, or tripartite – local authority, Scottish Government and private sector. Please see Figure 3 (section 8) for an illustration of this. A full description of the characteristics of this model is set out in section 6.

There are some challenges in relation to **ease of deployment** for this model. While a basic corporate structure could be set up, with Government holding investments directly in the joint venture, there may be a risk of 'self-regulation' under the Heat Networks (Scotland) Act 2021, where Scottish Government takes a stake in projects, whilst also holding regulatory functions in respect of heat networks. This would be more likely for projects where the Scottish Government held a majority stake. This issue could be reduced if a separate statutory entity was set up to hold the heat network assets and apply for the relevant approvals, but setting up an independent entity in this manner could require further legislation. A Scottish Government Business Case would need to be developed to take forward this model, which would take time, regardless of whether a separate statutory entity was preferred. Scottish Government already has experience of setting up arms-length infrastructure companies, for example the SFTi company, which was established by SFT to invest in community infrastructure projects under the 'Hub' initiative (the model on which DM10 (Regional ESCO) is base).

This model could provide additional **potential for private investment**, particularly where a private sector partner is also involved via a tripartite JV. Similarly to a local authority / private sector JV, the sharing of risk inherent in the structure can be attractive to the private sector, helping to de-risk investments compared with, e.g., a service concession. This advantage may be further increased if one of the other parties in the JV was Scottish Government. Involvement of Scottish Government may give local authorities the confidence to bring forward schemes that would otherwise not happen, creating additional investment opportunities. Through stakeholder engagement we had some strong, and largely consistent, feedback that greater direct Scottish Government involvement in schemes would project confidence that heat networks are a viable, long term solution which Scottish Government backed. This in turn may help reduce the perception of risk to stakeholders and investors,

and provide greater confidence, thus facilitating delivery. Scottish Government investments could be structured in a way that does not disincentivise other investment (e.g., making Scottish Government investment subordinate to that of other investors), although determining what an optimal structure would be requires further detailed consideration. A JV structure would also allow Scottish Government to divest its shareholding in the future should it desire, creating an additional opportunity for private investment (assuming the JV SPV was an attractive investment at that point).

The downsides of this model, in relation to the **potential for private investment**, are that governance structures for JVs can be complex, with investments generally needing to be approved by both the JV and separately by its public and private shareholders. This complexity would be multiplied by having Scottish Government as a third shareholder, with potential for approvals needed from three separate organisations. A JV would therefore require sufficient delegated authority from its shareholders to allow efficient decision making. Ensuring Scottish Government could hold and manage multiple shareholdings efficiently would be key to success of this model. As noted above under DM8, some investors (in particular those less active in or familiar with the Scottish market) were more negative than others about state involvement in delivery, and less interested in sharing risk / return with government. A minority we spoke to held the view that, *'There are some things that Government is good at, and delivery is not one of them' and 'Government should regulate and set clear rules of the game, that's all we need.'* There is also a risk that the market is seen as being "tied up" by Scottish Government stakes and therefore risks crowding out other investment. Careful selection of which projects to invest in may help overcome this.

If the joint venture was **bipartite**, that is between the local authority and Scottish Government only, then the **potential for private investment** would score the same as DM1, as it would be a fully publicly owned scheme.

In terms of **simplifying delivery**, a **tripartite** JV involving a Scottish Government stake has the same advantages and disadvantages as DM4 (Local authority led joint venture). In addition, the involvement of Scottish Government could help to facilitate delivery, by providing a more direct connection between Scottish Government's heat network policy priorities and delivery. It may also make it easier for centrally-owned anchor loads to be involved in projects. The additional resource and expertise offered by a Scottish Government shareholding could also add value over time, as experiences and best practice from other projects across the country could be shared via a single central conduit. Having Scottish Government involved in tripartite JVs may also have some delivery disadvantages: procurement may become lengthier and more complex by involving Scottish Government, unless a separate entity (or internal unit with significant autonomy) could be created. Similar 'drag' from central involvement could also carry into delivery, depending on the governance arrangements – see above under 'potential for private investment'. Work would be required to ensure that those managing central shareholdings had the resource and capacity needed to add value.

In terms of a bipartite, public-public JV, the **delivery** advantages of bringing in the private sector (as described at DM4) would be lost. However, there may still be delivery benefits in providing ongoing, central support to local authorities that want to own and operate schemes (or where schemes are not attractive to the private sector), but where the local authority (or Scottish Government, who would otherwise be providing grant only) are not satisfied that the local authority has the expertise to take the project forward. Ensuring that the support added value would be key: one stakeholder we spoke to regarded central co-investment as helpful, but only if the practical support associated with that investment provided continuity and additional commercial or technical skills, stating *"We don't need civil servants who don't understand heat networks and who change every 6 months".*

In terms of **skills and capacity**, a **tripartite** JV with a Scottish Government stake under this model has the same advantages and disadvantages as DM4 (Local authority led joint venture). In addition, an ongoing role for Scottish Government in multiple projects would help to develop skills, knowledge and best practice centrally, which can then be shared with other projects.

The ability of this model to **contribute to wider policy goals** would be similar to DM4 if the JV was tripartite (i.e., with the private sector). Having an additional public sector 'voice' involved in corporate decision making may further support policy priorities where there is appropriate discretion within the corporate framework (as explained in DM4, above), although it is possible that the two public sector voices may not agree on how best to apply those priorities. If the JV was bipartite (without the private sector), then the ability to **contribute to wider policy goals** would be more similar to DM1.

The model does not itself reduce **demand risk**. However, involving local authorities in the delivery of schemes (as opposed to proceeding without them as under DM8) can help to manage demand risk, as local authorities can commit anchor loads. In a JV model, this commitment can be ongoing and may help to deliver subsequent schemes. A bipartite, public-public JV may be able to take more demand risk, because risk is shared between the local authority and Scottish Government, and is not reliant on private sector investors. In practice, this will depend on the risk appetite of the investing authorities.

A Scottish Government stake in projects may help the **transition to self-sustaining market**, if it provided confidence of project pipeline to supply chains, as they observe greater Scottish Government commitment to heat networks. It may generate additional projects that would not come forward at pace if local authorities are asked to proceed alone, creating additional investment opportunities. Providing equity and loans, as opposed to grants only, also allows Government to 'recycle' funding into future projects, which may support additionality over the long term. The success of this intervention, and the degree of confidence it provides to the market, will be entirely dependent on early successful delivery and positive case studies.

This model scores well for being r**eplicable across geographies**. A consistent central role in multiple JVs across Scotland helps make them easier to replicate. Most of the

advantages of this model are similar to those of DM4, including that once procured, the JV allows delivery of different solutions for different projects under the JV, creating opportunities for smaller projects or extensions to existing networks that would not be commercial to bring forward on their own.

This model also scores well for supporting **interconnection and expansion**. Assuming a tripartite JV involving the private sector, the advantages are similar to DM4, but the additional involvement of a central body could provide a degree of strategic oversight, and an ability to promote interconnections. It may also help support expansions and interconnections which are not necessarily commercially attractive, but which would have wider societal or policy-based advantages, albeit this influence would always be tempered by the need to make decisions in the interests of the JV company, and by the commercial interests of the private co-investor. Involving local authorities in the JV structure, as opposed to proceeding without them as in DM8, will also ensure that local objectives can be reflected in any expansion proposals, ensuring better alignment with LHEES. In a bipartite JV (not involving a private co-investor), performance against this attribute would be poorer, because experience suggests that private sector involvement is often key to treating networks like businesses and driving expansion opportunities.

A Scottish Government stake in projects may help to support **investment ahead of need**, provided such investment was also in the interests of the JV as a corporate entity (Scottish Government's primary duty in the JV governance would be to the company). However, while Scottish Government may be prepared to take a long-term view on demand, all parties need to approve individual project investments, and the associated risks may be unattractive to the local authority or any private investor. In practice, such investment would likely need to be supported by subsidy or by Scottish Government carrying most of the risk.

There is potential for this model to be off **balance-sheet** if Scottish Government ownership and control was limited. However many of the benefits of model come from (or are significantly enhanced by) Scottish Government having control or heavy influence over decision-making within the JV.

7.10 Evaluation of DM10: Regional ESCo ("RESCo")

In this model, local authorities and other public bodies (e.g., NHS, universities / colleges) come together on a regional basis and jointly procure a private sector delivery partner for each region (similar to the Hub model, which was established in Scotland to deliver community infrastructure). The local public partners then use the delivery partner to scope, design and deliver projects, according to pre-defined contracting structures, drawing on the delivery partner's supply chain. A full description of the characteristics of this model is set out in section 6.

This model has been given a neutral score for **ease of deployment**. A similar model has been successfully deployed for Hub, and learning from the Hub initiative could

be applied to the development of a RESCo model. This model would not require new legislation, although if Scottish Government wanted to hold a stake in the RESCos (like SFT does in Hub via SFTi) then similar consideration would need to be given about how that would best be done, for the reasons described in DM8 and DM9. It would however be a new model for heat networks, and would require a number of regional procurements (for which a single suite of documents could be developed). Procurement would be preceded by a significant development period, including more detailed market testing of the concept. Hub took around two years to establish, although some efficiencies may be possible in delivering this model if learning from Hub can be applied. Consideration would need to given as to how this model could best align with the regulatory regime, in particular permitting (as each RESCo would need to offer some initial exclusivity to the private sector partner, in order to make the proposal commercially attractive).

This model provides good **potential for private investment**. The regional scale of the RESCo will provide multiple potential projects for the private sector partner to develop, using finance from its own balance sheet and third-party investors (where the public sector partners did not wish to provide funding for projects themselves). As well as being able to access finance, the RESCo partner will be incentivised to identify investment opportunities, bringing forward projects more readily than if the public sector had to generate these projects alone. The scale and duration of any exclusivity offered to the RESCo partner would influence the potential for investment at the outset.

This model scores very well against the **simplifying delivery** attribute for a number of reasons. Firstly, like a local authority led JV, a single procurement for the RESCo partner would unlock multiple projects, and would do so over a larger area, because the procurement process would involve multiple public sector bodies within a region. The 'partnering' nature of the model, where other public sector bodies have a stake in the RESCo (in addition to being named on the Contract Notice) delivers procurement efficiency but should also help to catalyse development, due to a larger number of public sector entities (with responsibility for many potential anchor loads) in a more proactive role. The RESCo could act as a 'one stop shop' for participating public bodies in the region to be able to purchase from, making it easier to develop projects using the private partner's management / design services. The heat network delivery partner (which may be the main RESCo partner, or within the RESCo partner's supply chain) would also be able to seek out wider development opportunities, including larger networks which connect buildings beyond those anchor loads offered by the public sector partners. The model could accommodate multiple contracting structures, allowing choices to be made on a project-by-project process. Selecting which structure to use may initially create complexity, but it is anticipated that best practice / preferred approaches would emerge over time. We know that the existing Hub model has significantly improved delivery of community infrastructure, but more detailed review is still required to determine whether the same degree of benefit would be achieved in the context of heat networks.

This model also scores very well against the **skills and capacity** attribute. Like all the JV models with a private partner, it strikes a good balance between the respective skills / capacities of the public and private sector partners, as described in DM4. The advantages are similar to those for DM4, with three main additional advantages: firstly, the regional nature of the proposal would allow further efficiencies in deployment of private and public sector skills, and provide easier access to heat network expertise (including to expertise accessible at an early stage in project development) for public bodies other than just local authorities. Secondly, each RESCo could have its own team with priorities focussed on the local area, developing expertise that can be deployed across the region. Thirdly, the involvement of more public sector bodies within the RESCo creates an opportunity to build local relationships and create platforms for sharing learning. The benefit of this has been very apparent in Hub, which in some regions are actively used to bring partners together on a range of topics. The regional nature of the RESCo would also have benefits for the wider supply chain, by providing a pipeline of work that does not require a public procurement to access in each case (as the supply chain is managed by the RESCo partner). There is evidence that the Hub model has had a very positive effect on supply chains.

The advantages and disadvantages to this model in respect of **contributing to wider policy goals** are similar to those identified in DM4 and DM9, except that benefits could be spread over a wider area, and there would be a larger number of public sector stakeholders involved. This could bring benefits, as greater awareness within the RESCo of how policy issues affect different public bodies may add value, but could also bring complications in setting priorities.

The proactive involvement (as distinct from the more passive step of being named on a Contract Notice) of multiple public sector bodies in the establishment of a RESCo could represent early, “in principle commitment” of anchor loads from all of the bodies. This more coordinated approach to the delivery of heat networks across a wider area to serve all participating public bodies makes this model slightly better able to cope with **demand risk** than most others.

This model would support the **transition to self-sustaining market**. The creation of a buying framework would make it easier for public authorities to develop heat networks (or facilitate the development of networks for which they provide anchor loads), generating more projects and investment opportunities more easily. The ‘partnering’ element of the model encourages the public sector partners to invest time and capacity into considering the development of heat networks in their area, which is more likely to generate projects: a number of the Hubs have fostered successful collaborative working to develop more efficient infrastructure solutions, and a RESCo could potentially deliver similar results. The regional nature of the partnership may give rise to opportunities for the RESCo to aggregate projects more easily, to benefit from portfolio risk management, and potentially to reduce the cost of finance. A larger number of public sector stakeholders making area-specific commitments to deliver (or connect their assets to) heat networks should build confidence for supply

chains, which may be more encouraged to invest in their own businesses as a result. Specification of areas to be targeted and accompanying timelines could further enhance this benefit.

This model scores well for being **replicable** across multiple geographies. RESCos could deliver across all geographies and sizes of project (where heat networks are an appropriate technical solution), supporting smaller projects that may not be deliverable as stand-alone projects. This is because procurement, supply chain, governance and access to finance via the private partner would already be established, so the cost of developing and delivering new proposals is relatively low. Projects which would ordinarily be unattractive due to prohibitive bid costs could become more viable. It also offers a simple delivery route for projects which are not investible for the private sector, but which a public sector partner wishes to fund themselves. The model would also allow greater standardisation of approach across the region, providing access to the same skill set and supply chain for all projects.

This model could also have a positive impact on **interconnection and expansion**. Like all of the models involving a private sector partner, we would expect to see the RESCo partner actively looking for opportunities to expand and interconnect schemes in their area. Regional perspective and the potential to coordinate multiple, smaller schemes may make it easier than a local-only JV to identify opportunities for expansion. The commitment of other public sector bodies in the RESCo can also provide practical support for future expansions, because expanding to additional anchor loads may not require additional procurements.

The RESCo model scores neutrally in terms of **investment ahead of need**. The model does not in itself facilitate installation ahead of demand. Like all the JV models, whilst the public sector partners may be prepared to take a long-term view on demand, the RESCo as a whole (including majority private sector voting rights) needs to approve individual project investments. However, higher levels of cross-public sector involvement may allow for greater reliance on longer-term connection opportunities without signed contractual arrangements. For example, knowledge that hospital boiler plant will need to be replaced with a zero emissions system by a certain date, together with the relevant NHS Board involved in the RESCo, should help to de-risk investment ahead of need in associated infrastructure.

Whether or not the RESCos would be classified to central Government **balance sheets** will depend on the amount of shareholding and the degree of control. A significant amount of work and preparation went into the Hub balance sheet treatment, the lessons from which could be applied here.

7.11 Evaluation of DM11: Public Private Partnership (PPP)

Under a PPP, the heat network is operated by the private sector under a long-term contract tendered by a public body. The public sector sponsor retains the majority of demand risk, but availability risk lies with the PPP contractor (in contrast to a

concession, where under our definition the private sector takes the demand risk). A full description of the characteristics of this model is set out in section 6.

We have scored PPPs neutrally in terms of **ease of deployment**. There is significant experience in deploying PPPs in Scotland for other sectors (we are not aware of any examples of heat networks), and the process is relatively robust, albeit lengthy and expensive for both public sector and bidders. There are some additional complexities when tendering for a PPP compared with a concession. In particular, a PPP involves significant technical and financial due diligence by lenders in addition to the procuring authority and private contractors, making the bidding process longer and more expensive. This model is not at odds with the Heat Networks (Scotland) Act 2021 but, like most models, consideration needs to be given to how commercial tendering processes can best align with / feed into Heat Network Zones and the subsequent issuing of permits.

In theory a PPP provides **potential for private investment**, but in practice it would be challenging and expensive to finance PPP heat networks where there is any degree of demand risk. This inflexibility means that a PPP would only have an acceptable risk profile for small heat networks with a limited number of off-takers and limited prospects (or intention) of expanding the network. However, the need to recover the significant bid costs associated with a PPP would make small-scale projects too expensive to finance.

Given it is hard to see PPP heat networks being possible at any kind of scale, we believe an attempt to encourage this model would not **simplify delivery**. They take longer to procure, require the involvement of more advisors and cost more. We see no appetite for this model for UK heat networks.

Due to the extended procurement timelines and additional input needed from advisors to deliver a PPP contact, it is likely to place an additional stress on an already thin advisory market, without delivering a greater number of projects (compared with, say, a concession). Once appointed, the PPP partner would run the project. Local authority resource would be required for contract monitoring. The PPP model offers no benefits in this regard over a standard concession. We have scored it neutrally for supporting **skills and capacity**.

This model is not likely to help **contribute to wider policy goals**. Although outcomes can be driven via the PPP contract, securing those outcomes over the long term via an initial contract negotiation is challenging. It is difficult to draft contract conditions in such a way that allows them to be sufficiently flexible and monitored over time, without such flexibility being perceived by bidders as a risk.

It is inherent in the PPP model (as defined for this paper) that the public sector would retain **demand risk** of the project. Unless the network is small (and therefore not cost effective for the PPP model), the public sector may not be well placed to manage that risk.

Greater use of this model is not likely to make a significant improvement towards the **transition to self-sustaining market**. It is predicated on third party investment, which is currently limited in heat networks in the UK today. The PPP model is likely to be a complex and slow way of attempting to encourage that, because it would take time to get banks comfortable with the nature of the asset to the degree required for a PPP, which in turn would slow down the transition. As PPPs are more expensive to procure, they are likely to result in a more expensive overall solution, as bid costs are inevitably passed on, making them more reliant on subsidy.

We do not consider this model to be **replicable across multiple geographies** or project sizes, because networks will likely have to be small and relatively self-contained in order for the risks to be manageable to an extent that allows them to be delivered via a PPP. As noted above, the expensive procurement process would not be justified for small networks.

Unlike a concession, there is limited incentive for the PPP contractor to seek out **interconnection and expansion opportunities**. PPP contracts are notoriously difficult to change, and are (by their nature) more suitable to stable assets which remain the same for the contract term. The PPP model therefore scores negatively against this attribute.

By their nature, PPPs are not well suited to projects which involve significant change over time. Hence demand would need to be secured ahead of contract signature. For this reason, this model is unlikely to support any **investment ahead of need.**

PPPs have the potential to be off the procuring authority's **balance sheet** if sufficient ownership, control and risk lies with private sector.

7.12 Evaluation of DM12: Regulated Asset Base (RAB)

The Regulated Asset Base (RAB) is a private sector ownership model in which heat network assets are constructed, owned and operated by a monopoly supplier on a long-term basis. Investment plans, operating performance and returns (which are capped) are subject to regulatory oversight. The model is intended to incentivise private investment in large-scale heat networks, with a cost of capital comparable to other regulated utilities. A full description of the characteristics of this model is set out in section 6.

Although this model is well established in the UK in other sectors and has potential long term value, it would be a new model for heat networks. The regulatory system associated with the model is not contemplated by existing or forthcoming regulation, and hence would require a significant change in approach. Its application would probably be limited to cities. Deployment of a new RAB for heat networks would require legislation. Its introduction could require a mix of devolved and reserved powers (e.g., to regulate pricing), hence the agreement of the UK government would also likely be required. We have therefore scored this model negatively for **ease of deployment**, as it is not deliverable at this time.

This model would , by definition, involve significant **private investment**. It provides for customer charges to be set periodically in order to meet a capped return approved by the regulator. There is significant potential for private investment in heat networks in cities, which is where a RAB would likely be targeted. However, the minimum efficient scale for a heat networks RAB to be cost effective (taking into account the anticipated level of returns and regulatory costs) is not known. Appetite for a new RAB has not been formally tested with the heat network market or investors, hence is unknown. However, stakeholder feedback indicated a growing acceptance that, if heat networks are to achieve their long-term potential (circa 15-20% of heat supply by 2050), then a 'long term' delivery model for heat networks would likely involve consolidation of asset ownership, underpinned by central regulation (which would be required, given the monopolistic nature of supply via heat networks).

The RAB model scores neutrally for its ability to **simplify delivery**. Once the structure was established, it would be easier to roll out projects and expansions in areas which the RAB covered when compared with taking forward individual projects However, a RAB would probably only be applicable in a very small number of geographies, primarily large cities, because a large customer base is required to spread investments. This means that other delivery models would still need to be used to deliver heat networks in other areas. It also means that there are unlikely to be enough heat network assets to support transfer to a RAB for some time (even if the RAB were to be 'national').

A RAB could result in significant investment, having a positive impact on the development of associated **skills and capacity** in the areas in which it was operating. Like other models with significant private sector involvement, the RAB operator would be able to bring resources and capacity. Even if the RAB remained in public ownership, it would be expected to operate as a business (similar to Scottish Water), and so would be resourced accordingly.

The RAB model has potential to **contribute to wider policy goals**. The intention would be that the RAB operator would have a low cost of capital, given that (regulated) returns can be achieved, which should be attractive to institutional investors (as evidenced by other RABs in operation). This low cost of capital should be reflected in customer charges. The role of an ongoing regulator should also help to support consumer protection, because the regulator would also scrutinise service delivery.

This model is the least sensitive to **demand risk**, because the customer base / stakeholders funding the RAB ultimately carry the demand risk for any investments. The model effectively socialises the risk by sharing it among an assumed large customer base, reducing risk for the RAB operator by allowing it to set and recover charges via customers / stakeholders, based on an allowed regulated return. However, the model can only manage demand risk effectively if there is a large customer base among whom to spread the risk (see simplifies delivery commentary, above).

The RAB model would support the **transition to self-sustaining market**. The opportunity to build out multiple projects within an area helps take a longer-term and more strategic approach to developments. This will create supply chain confidence

and may give rise to opportunities for the RAB operator to reduce the cost of finance via larger-scale investments, which in turn would improve project economics and hence support the transition to a self-sustaining market. However, the RAB model does not in itself change the economics of individual projects, and investments (although potentially capable of being bundled) will still be limited by the geographic boundary of the RAB's operation, which will likely be limited to large cities. There is a potential spill-over effect from a RAB's well-developed supply chains, which could increase the skills and resources available to projects outwith the RAB area(s).

The RAB model does not score well for **replicability**, because it requires a large customer base to support it. As such, unless a single, national RAB was developed, this model is likely to be of potential application only in a small number of large cities.

The RAB model scores very well for its ability to support the **interconnection and expansion** of projects. A RAB operator would have a commercial interest in developing new schemes, and expanding existing schemes within its area of operation. This is because the operator's return on capital employed is regulated, meaning it can only increase the quantum of returns by expanding its asset base. However, because the RAB model is likely to have potential application only in a small number of large cities, it would not support expansion and interconnection outside of these areas.

The model also scores relatively well in terms of **investment ahead of need**. A RAB operator is more likely to make these kinds of investments (provided they have been approved by the regulator as part of the periodic investment planning cycle), because customer charges can be set to achieve the allowed returns on investments,. However, regulators tend (over time) to be focussed on consumer protection and keeping consumer costs down, and can be reluctant to approve significant spend to deliver ahead of need, due to concerns about stranded assets. This is often symptomatic of how strategic objectives for RABs have been written, which reflect the need to balance multiple factors (e.g., the need decarbonise versus the cost to consumers).

If the RAB was privately owned, then it would not be classified to public sector **balance sheets**. If it was owned by Government, then it would have a significant impact on public sector balance sheets, given the scale of the assets under its control (similar to Scottish Water).

8. Preferred delivery models & recommendations

In light of the evaluation results and the stakeholder engagement we carried out, this section provides:

1. a set of general, overarching delivery recommendations and conclusions that are not specific to individual models;
2. for the four highest-scoring models in our evaluation, a further description of the corporate structures, benefits and risks, and a set of recommendations relating to implementation, should Scottish Government wish to pursue any of these models further;
3. recommendations and conclusions in respect of each of the remaining eight models considered in our evaluation; and
4. recommendations relating to the enabling mechanisms described in section 6.4.

8.1 General, overarching conclusions & recommendations

The models can be further refined and the optimal solution, which may include attributes from a number of models, should be developed to support the delivery of Scottish Government objectives.

We evaluated twelve models in total, as described in detail in section 6 above. Each model was then evaluated against the ten attributes described in section 4 above and given a score of 0 – 4 against each attribute, to help determine which models performed 'best'. Conclusions in relation to the four highest scoring models are set out at section 8.2 below.

In order to be able to evaluate, score and contrast different delivery models in this way, we had to make certain assumptions about existing models and how each 'new' model could be deployed. Key assumptions are included in the model descriptions / definitions in section 6.

In practice, there are features of existing models which can (and do) vary, and features of the potential 'new' models that could be flexed to support different outcomes or meet different attributes. Where this is the case, we have identified it in the evaluation text and reflected it in our summary conclusions and recommendations below. **The inherently flexible nature of the four top-performing models we are recommending for further consideration should be borne in mind when reviewing this section**.

If Scottish Government wished to promote a new model, **the top four models we identified could be refined, adjusted and adapted to develop an optimal solution** and ensure any new model appropriately balanced the most important attributes. We have framed our recommendations (sections 8.2 – 8.4 below) to reflect this flexibility and the range of choices around how new models could be deployed.

Developing a long term 'Vision' for heat networks in Scotland

We consider it prudent that the option of long-term consolidation of networks is (where practicable) preserved to retain future flexibility as to how Scotland's heat network market may evolve over time. **Steps should be taken to future-proof current activity to facilitate any potential future consolidation of assets** (whether into public or private (local) monopolies) or unbundling of projects. Hence, for example, structures involving assets owned by SPVs rather than by parent organisations, and asset reversion for concession contracts, should generally be preferred.

Whilst we can preserve flexibility in this way without knowing what the future holds, we also consider there would be significant **value for Scottish Government in going further and developing a 'vision' for how heat networks in Scotland should operate in the long term**. For example, does Scottish Government envisage significant ongoing public sector involvement, or a largely private sector owned and operated market? Understanding the 'vision', or even preferred outcomes (beyond deployment targets), would help inform decision making around the creation of any new delivery model, and would also help inform the ongoing development of forthcoming regulation under the Heat Networks (Scotland) Act 2021.

Existing models can be optimised in the short term, regardless of any medium or long-term intervention

We recognise that the **existing suite of delivery models**, both those that are relatively well-established and others that are emerging, **will still have an important role to play**. Hence, although our focus is on the four models which performed best against the various attributes, we have also considered what, if any, recommendations should be made in respect of the other eight, lower-scoring models. Recommendations include, for example, developing case studies or the preparation of further guidance and templates etc. These recommendations, set out at Table 2 below, seek to optimise and future proof the networks delivered using more traditional routes, or prepare for new and emerging private sector models.

Budget implications and Government risk appetite

Private sector investment is fundamental to achieving the necessary scale of deployment. The highest-scoring models all enable (or could allow for) private sector investment to varying degrees, but at least two would require some degree of central Government investment, either directly or indirectly, via Government owned or controlled entities.

To inform the detailed design for any potential new delivery models it wishes to take forward, **Scottish Government should consider and determine its risk appetite for investment in heat networks**, and the time period over which it may wish to hold investments. Consideration will also need to be given to balance sheet treatment and in particular whether investments should be categorised as on or off balance sheet. Where investments are on balance sheet it may be appropriate to develop an exit strategy through a sale / disposal of all or part of an investment in a project after a

period of time. Understanding these preferences will be essential to informing which models should be taken forward. For example, Centrally Led (DM8) would only be deliverable if Government had significant risk appetite and was willing to hold heat network assets on its balance sheet.

We recognise that making these kinds of decisions is challenging. We have therefore identified recommendations to inform and support this process under section 8.2 below, including a recommendation of further work to consider technical classification impacts (i.e., balance sheet treatment) of alternative investment routes (e.g., capital, equity, debt or other form of intervention) in the context of heat networks.

Ongoing stakeholder engagement will be required

We undertook high-level, principle-based stakeholder engagement to help inform our evaluation and recommendations in this report. Based on the engagement undertaken with both public and private sector stakeholders, we think the following attributes (as described in section 4) should be a priority for any new models: **potential for private sector investment**, ability to respond to current challenges around **skills & capacity**, **ease of deployment** and **simplifying delivery** (in particular to promote improved procurement efficiency).

Further, more detailed, stakeholder engagement (and involvement in development) will be important to inform the design and implementation of any new model(s). Engagement would need to be more in depth, and involve more refined proposals and market engagement. For major changes or interventions, public consultation may be advisable.

8.2 The highest scoring models

We evaluated twelve delivery models in total (each described in detail in section 6 above). Each model was evaluated against the ten attributes described in section 4 above, and given a score of 0 – 4 against each attribute.

Of these twelve, we identified four models that we propose warrant further detailed development / consideration, namely:

1. Regional ESCo (DM10);
2. Local authority led joint venture (DM4);
3. Local authority led delivery, with Scottish Government stake (DM9); and
4. Centrally led (DM8).

These models scored highest in the evaluation. Given the element of subjectivity inherent in scoring against qualitative evaluation criteria, we would not at this stage wish to prioritise these further based on scores alone. Rather, the prioritisation should take into account the evaluation comments included for each model in section 7.

Note that the RAB model (DM12) scored equally with Centrally led (DM8), but has not been short-listed above due to the negative assessment of the potential for the model to be deployed at the present time, given the current regulatory and policy framework.

We have set out an overview of each of the four models below. These include a description of the model, a schematic of the project / corporate structure, and a summary of key benefits and risks.

The next step to pursue any of these recommendations would be to agree and implement programme disciplines including governance, approach, timescales and allocation of resources.

Regional ESCo (DM10)

Overview

Under the regional ESCo model, local authorities and other public (or quasi-public) bodies (e.g., NHS, universities, colleges) would come together (entering into a 'Territory Partnering Agreement' to document the joint working arrangements) and jointly procure a private sector partner to deliver heat networks (and potentially other types of energy projects). The successful bidder and the public bodies in the area would form a regional ESCo ("RESCo"), in which the private sector partner takes a majority stake, and the public sector bodies (and potentially Scottish Government / agency) take minority stakes.

In each region, the public sector RESCo partners would be able to use the RESCo to assist with initial scoping and project development and then project delivery. Projects could potentially be delivered using different contracting structures, depending on the public sector project sponsor's preference (having regard to control, risk, funding availability, etc.). The extent to which the delivery partner is given exclusivity over certain types of projects within each area, and for how long, would be a key consideration.

Corporate structure (example)

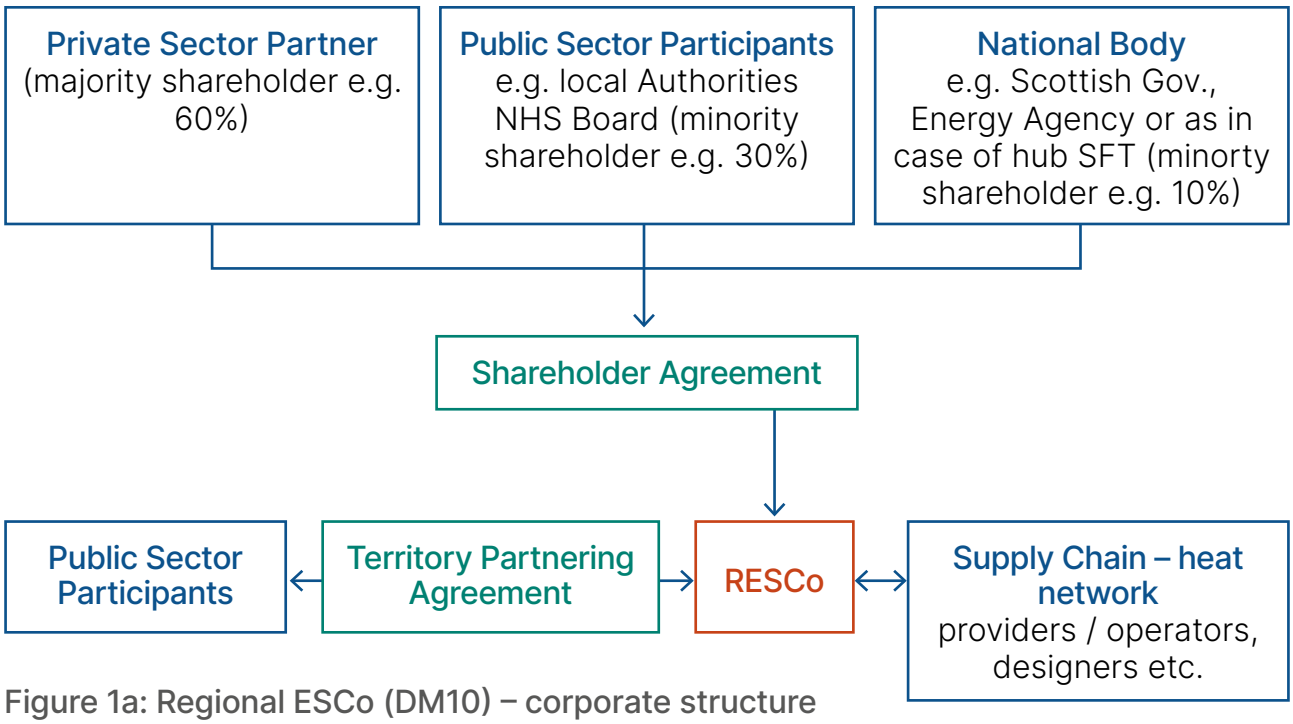

Figure 1a: Regional ESCo (DM10) – corporate structure

Project structure (example)

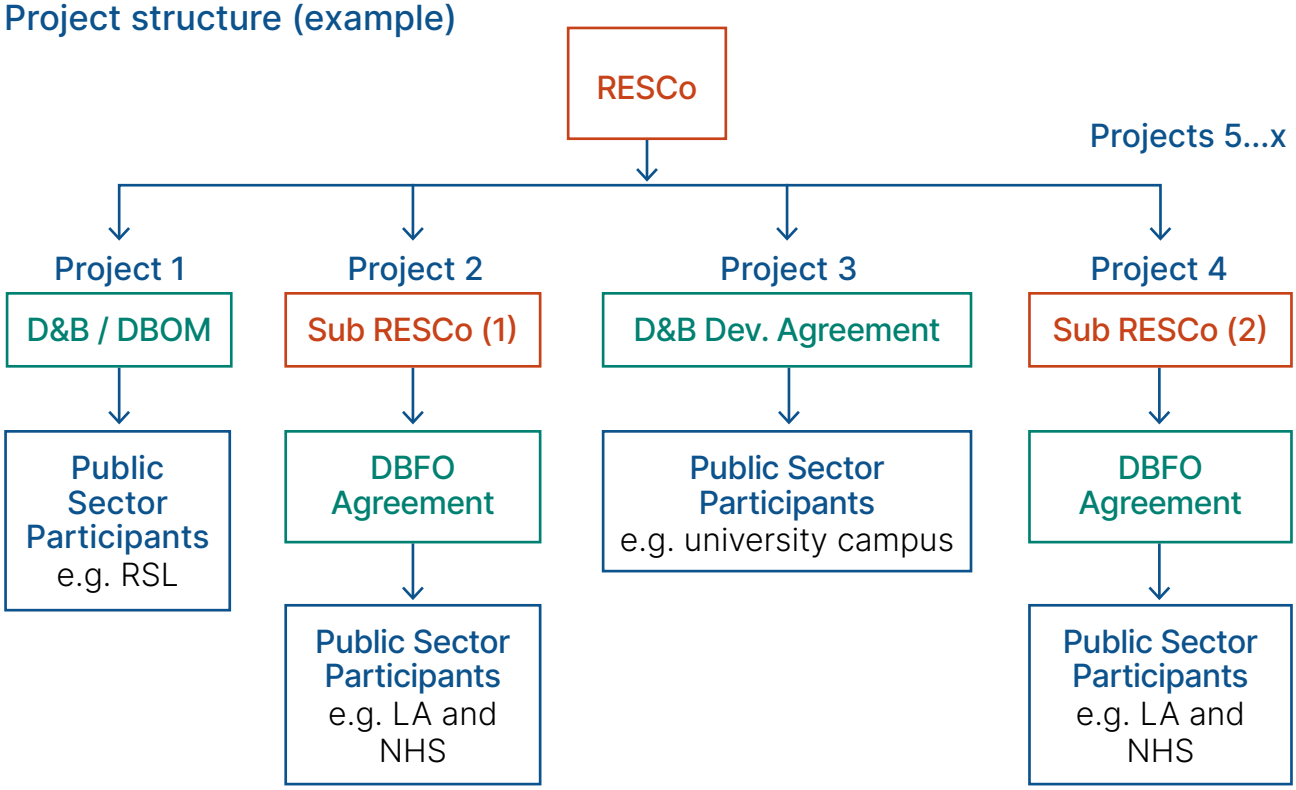

Figure 1b: Regional ESCo (DM10) – project structure

Key

Legal entities Legal agreement Participants/stakeholders

Key benefits

The RESCo model involves a long-term relationship with a private sector delivery partner. The delivery partner would procure its supply chain, which can be flexed over time. This would promote sustained private investment, supply chain development and capacity building.

The RESCo structure provides a mechanism by which, on a regional basis, a single procurement unlocks multiple projects. These future projects are contemplated in the original, regional procurement, and hence do not require a separate public procurement exercise on a project-by-project basis.

The RESCo partner could potentially support a wider range of investments beyond heat networks via the procurement of a wider "energy partner", examples of which are growing in England and Wales. This approach could help with co-ordination of wider LHEES delivery across the region, and should better ensure that the most optimal energy solution is identified for each building.

The potential for scale through a pipeline of projects can promote both economies of scale in terms of strategic investments, purchasing power and facilitate access to a lower cost of finance.

The 'partnering' nature of the model, where other public sector bodies have a stake in the RESCo (in addition to being named on the Contract Notice) delivers procurement efficiency, but should also help to catalyse development, because it brings to the table a larger number of public sector entities (with responsibility for many potential anchor loads) in a more proactive role. The benefits of this partnering approach have been very apparent in Hub.

The design process and the subsequent regional procurements could draw upon and benefit from the extensive experience and learning from the Hub programme, which has been used to deploy significant investments in community infrastructure across Scotland. Similar challenges to those identified below have been overcome in the Hub model.

Key risks

The boundaries of each 'region' would need to be carefully considered to balance the need for scale and a sufficient pipeline of projects, whilst ensuring that the private sector partner had sufficient delivery capacity. The potential pipeline and scale of investment for a region (as against a single local authority) may point towards the delivery partner being an investor (with ability to use multiple contractors) rather than a (single) contractor.

As this is a new model for heat networks, it would require multiple regional procurements (although a single suite of documents could be developed), preceded by a significant development period, including more detailed market

testing of the concept and to test / gain the support of the relevant public bodies in each area. Hub took around two years to establish, although some efficiencies may be possible in delivering this model if learning from Hub can be applied. One of the first steps would be to develop a detailed programme. Project development under existing models would continue during this development period.

In order to attract market interest in each region, a degree of exclusivity for the private sector partner would likely be required over certain types of projects for a minimum period. Exclusivity would need to be carefully considered in the context of heat network zoning, and in particular the designation of permitted zones, although this interface between commercial / procurement and regulatory processes requires consideration for all models.

The regional public bodies will require visibility of how the private sector partner provides value for money to the RESCo if it contracts services and delivery contracts through its own group companies. This can be dealt with by open book accounting or a requirement (as happens on Hub) to tender sub-contracts.

Depending on the size of Scottish Government's equity stake in a RESCo, and the degree of control conferred by its shareholder rights, there is potential for projects to appear on Scottish Government's balance sheet (until such time as its shareholding is sold to a project partner or third party) and therefore reduce funds available to be spent on other priorities. A significant amount of work and preparation went into the Hubs' balance sheet treatment, and those lessons could be applied here.

Recommendations relating to Regional ESCo (DM10)

1. Draw on Hub experience to help Scottish Government understand how existing Hub model works for community infrastructure. Facilitate meeting with SFT Hub team.
2. Consider how the Hub model could be adapted / refined for heat networks, including how to define 'regions' (for heat networks), which public bodies should be included, and what exclusivity requirement would be needed.
3. Consider whether a RESCo model should have the scope to deliver wider energy solutions (to help deliver LHEES), in addition to heat networks.
4. Consider how the regulatory framework (especially the permitting regime) would align with a requirement for exclusivity for the RESCo partner.
5. Explore with Scottish Government and other stakeholders whether there is an appetite for putting resources into the further consideration of this model.
6. Subject to confirmation of Scottish Government appetite, undertake engagement with public sector and market to inform the development of a Strategic Outline Case.

Local authority led joint venture (DM4)

Overview

This model involves a local authority procuring a private sector partner, with whom it forms a joint venture to undertake one or more heat networks and potentially other types of energy projects. The model is not limited to a single local authority; several local authorities could jointly procure a JV partner (one of them would act as lead authority). Other public bodies could also potentially participate in a variety of ways, e.g., as a potential customer to the JV, or as a shareholder, depending on interest, investment / risk appetite, and the necessary legal powers.

Corporate structure

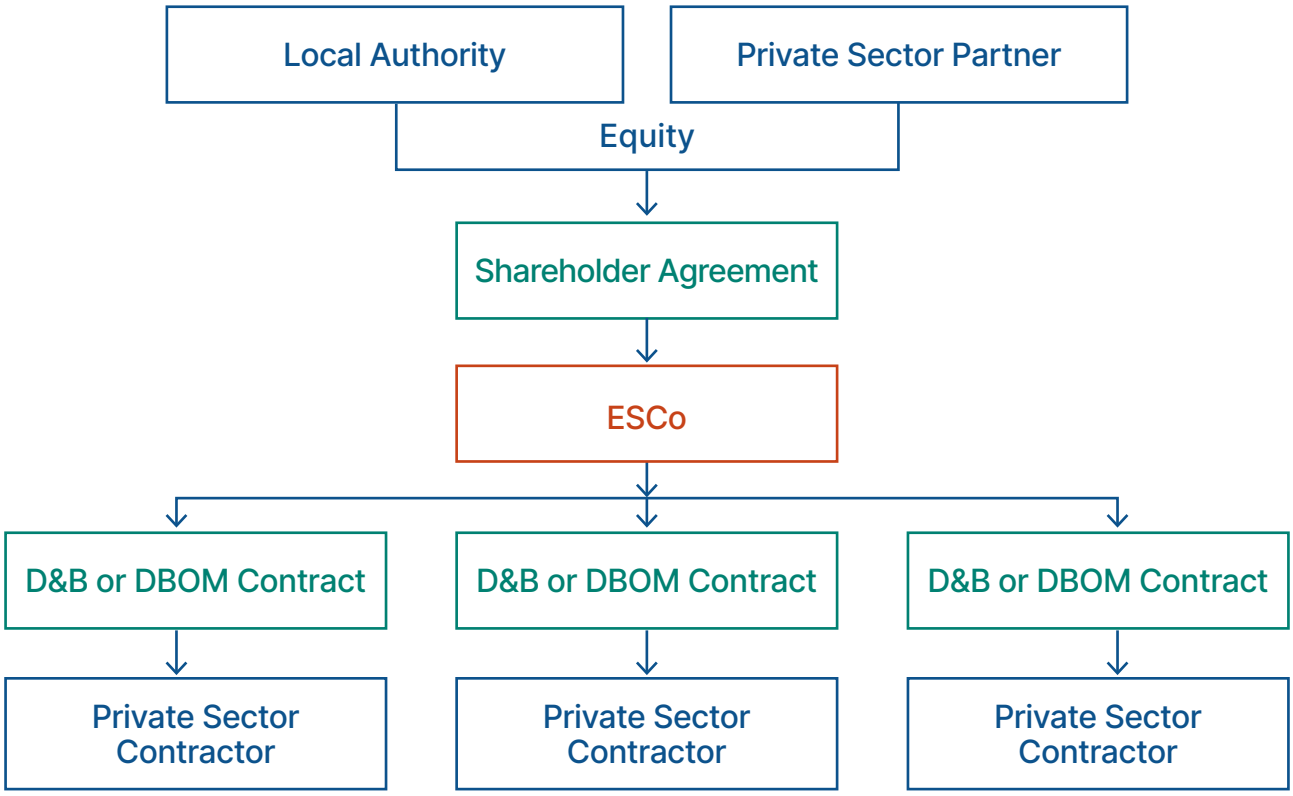

Figure 2 Local authority led joint venture (DM4)

Key

Legal entities Legal agreement Participants/stakeholders

Key benefits

Although there are relatively few examples in the heat network sector, the joint venture model is based on a well-understood corporate structure that can be deployed without requiring any Scottish Government intervention.

The JV partner could potentially support a wider range of investments beyond heat networks via the procurement of a wider "energy partner", examples of which are growing in England and Wales. This approach could help with co-ordination of wider LHEES delivery across the local authority area, and should better ensure that the most optimal energy solution is identified for each building.

After the initial procurement of a private sector JV partner (usually backed by a well-defined initial project), the JV partner can proactively develop business cases for additional projects, which do not need a separate procurement exercise. Hence a single procurement can unlock multiple projects.

Private and public sector JV partners can each 'play to their strengths'. The local authority can bring a project pipeline, land (e.g., for energy centres), anchor loads, local stakeholder relationships and supportive planning policy. The private sector brings delivery capacity and expertise. Both parties bring investment, and share in risk and returns.

The risk / return sharing inherent in the JV model tends to promote a collaborative rather than adversarial relationship, in which the partners' interests are suitably aligned.

The potential for scale through a pipeline of projects can promote both economies of scale in terms of strategic investments, purchasing power and facilitate access to a lower cost of finance.

The local authority JV structure would not impact Scottish Government's balance sheet.

Key risks

In order to attract market interest, a degree of exclusivity for the private sector JV partner would be required over certain types of projects for a minimum period. The requirement for exclusivity would need to be carefully considered in the context of heat network zoning, and in particular the designation of permitted zones.

The local authority will require visibility of how the JV partner provides value for money to the JV if it contracts services and delivery contracts through its own group companies. This can be dealt with by open book accounting or a requirement for the JV to tender sub-contracts competitively.

Recommendations relating to local authority led joint venture

7. Continue to monitor examples such as Midlothian and capture lessons learnt, including engaging with English local authorities who have procured energy partnerships (including heat networks) for their areas / cities.
8. Produce case study based on Midlothian Energy.
9. Produce guidance on procurement of JVs, and standard form documents for JVs, e.g., procurement documentation and shareholders agreement.
10. Consider how best to align the forthcoming permitting process (permitted HN Zones) with local authorities' use of JV model where JV partner benefits from exclusivity of HN developments and, once regulations finalised, produce guidance.
11. Promote awareness / use of JV model to local authorities through HNSU and make available supporting guidance / templates etc.

Local authority led delivery, with Scottish Government stake (DM9)

Overview

In this model, local authorities continue to lead project development, with Scottish Government both supporting project development and taking an equity stake in projects (either directly or via an agency, and which may be in addition to an element of capital grant). This model shares certain features with, and could be considered a hybrid of, DM1 (locally led project development), DM4 (formation of a joint venture vehicle) and DM8 (centrally led delivery).

Special purpose vehicles would be established for investments into specific projects. By becoming a co-investor alongside the local authority and / or a private sector partner, the Scottish Government would have shareholder rights in proportion to its equity stake, representation on the board and the ability to transfer its stake (by sale of its shareholding) and therefore to recycle capital into other investments.

Corporate / project structures

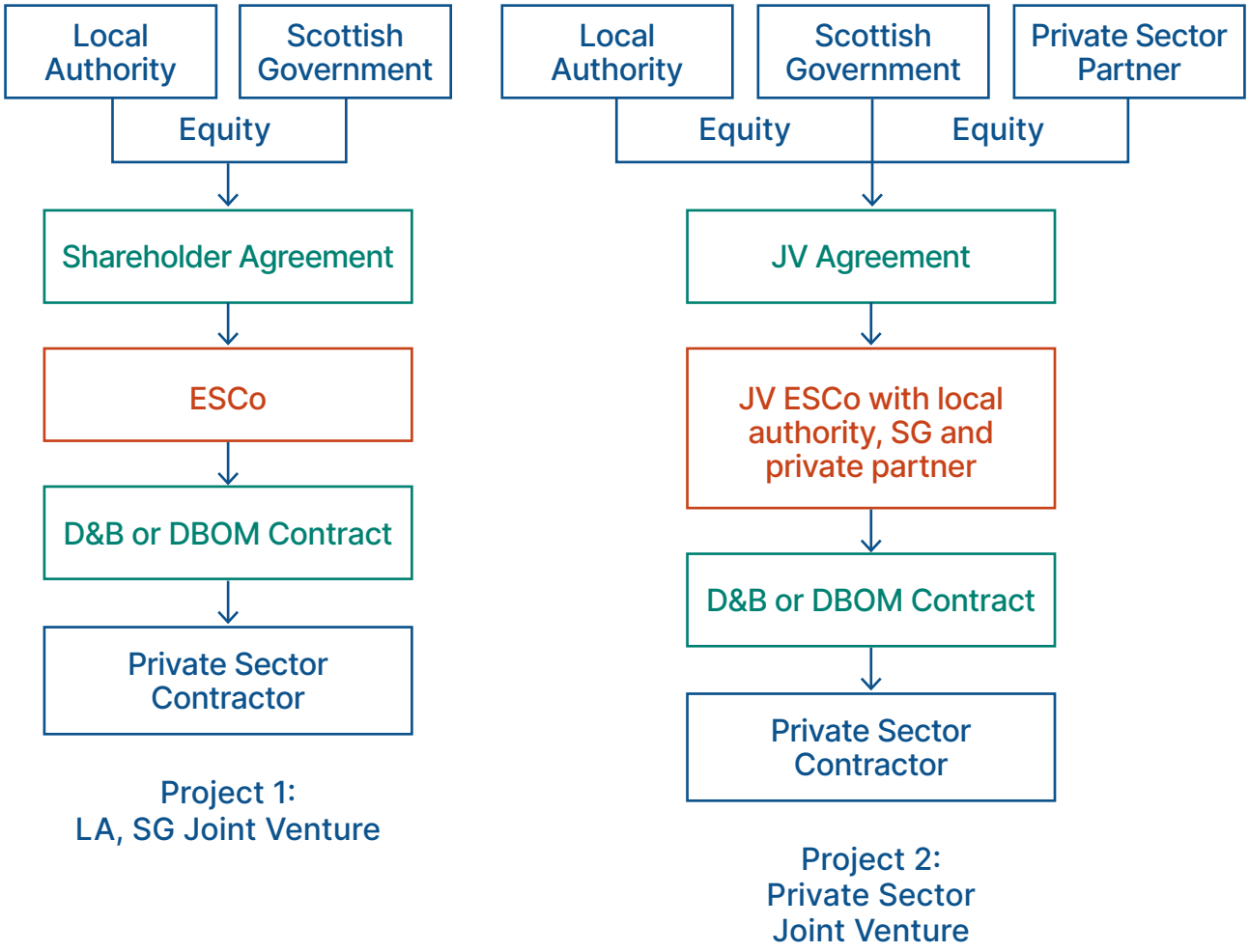

Figure 3: Local authority led delivery, with Scottish Government stake in projects

Key

Legal entities | Legal agreement | Participants/stakeholders

Key benefits

The reasons for Scottish Government taking an equity stake (potentially alongside capital grant) would be primarily to de-risk a project and allow it to proceed faster and / or at a greater scale than would otherwise happen.

Scottish Government would have a greater degree of control and influence (proportionate to its equity stake) than would be achieved solely via grant funding, and the option to exit and recycle capital into other schemes.

Financial risks and returns would be shared between the parties in accordance with their respective investments. Hence Scottish Government would have the potential to share in any profits and reinvestment them in other projects.

Some authorities would welcome Scottish Government being more closely involved in the success of projects than with a 'grant only' structure, and see value in a Scottish Government appointee with suitable experienced being involved in helping to steer the project and ensure its long-term success.

Key risks

Scottish Government's ongoing role in projects would expose it to reputational risk in the event that the project failed to deliver the desired objectives.

As a shareholder, Scottish Government would risk losing its investment if its equity stake had no value. In this scenario, the Scottish Government investment in the project would in effect become a grant, meaning the risk is more reputational than financial.

Not all local authorities (and potential private sector co-investors) would welcome an ongoing Scottish Government role in projects. Some do not see this as a natural government role, and would prefer intervention to be limited to policy and regulation rather than getting involved in project delivery.

An ongoing role in projects through SPV Board appointments would provide greater insight to Scottish Government of the practical issues facing projects, and may help to guide the company in interpreting and applying any pre-agreed policy objectives, and add value beyond purely profit led decision making. However, if that appointee was a director, any such appointee would be bound by directors' duties, including to act in the best interests of the SPV. If the appointee was not a director (e.g., an 'observer' role), Scottish Government would not have sufficient influence and control in order to protect its investment.

A shareholding in project SPVs risks bringing the relevant project(s) onto Scottish Government balance sheet, thus reducing funds available to be spent on other spending priorities.

Recommendations relating to local authority led delivery, with Scottish Government stake (DM9)

12. Test appetite for Scottish Government investment and ongoing role in projects, in which investment risks and returns are shared.
13. Consider the appropriate nature and size of any Government equity stake; what shareholder rights and duties would be suitable for equity stakes in projects; whether grant and equity could be offered together, and analyse how these elements would impact project investability (including via market engagement, if Scottish Government are minded to explore this model further).
14. Consider process and resources required to establish and manage an appropriate / suitable investment vehicle (including whether such a vehicle would be held directly by Scottish Government or not) and budgetary implications.
15. Consider how the regulatory framework would align with this model, e.g., potential for self-regulation for projects with Scottish Government part-ownership of SPVs that will need to apply to Scottish Government (Energy Consents Unit) to obtain consents / permits etc.
16. Subject to confirmation of Scottish Government appetite, undertake engagement with local authorities (and, if appropriate, COSLA), investors and developers on this model.
17. Develop a Strategic Outline Case.

Centrally led (DM8)

Overview

In this model, Scottish Government (or an executive agency of the Scottish Government, or some other centrally controlled public body) takes the lead on development and delivery of projects, without need for local authorities to lead development. The central body could have initial ownership / part-ownership of projects (potentially alongside private sector partner(s)) but with potential for the onward sale or transfer of government stakes in projects once they are operational with established revenue streams.

The rationale for the model is to provide a delivery route for projects in areas for which heat networks have been identified as an appropriate decarbonisation pathway, but where local authorities are not actively taking forward development, and no other organisations are doing so at scale (e.g., on a merchant basis). The model has the potential to unlock development in such places.

Corporate / project structure

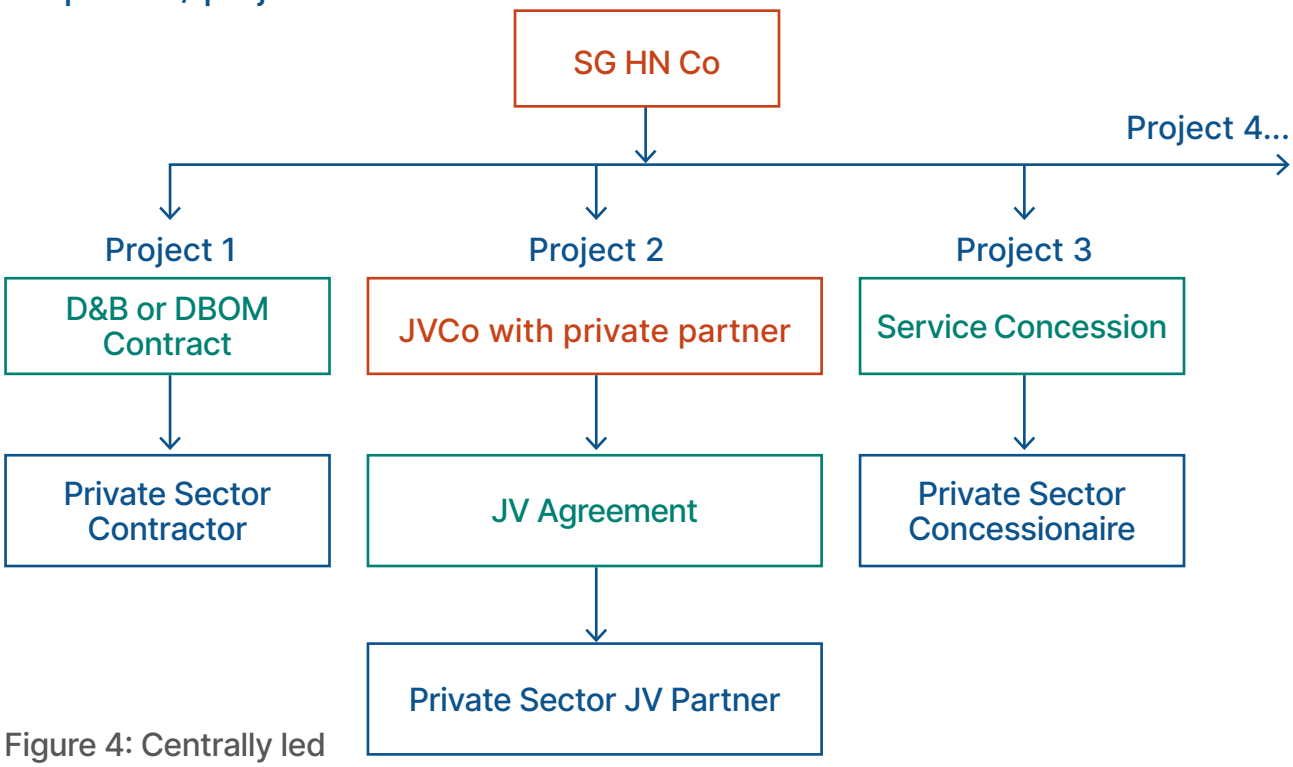

Figure 4: Centrally led

Key

Legal entities | Legal agreement | Participants/stakeholders

Key benefits

A central delivery body could unlock development in areas where a heat network is appropriate, but where local authorities are unable or unwilling to promote projects and private sector merchant models are not materialising.

Consistent and significant central ownership (noting that JVs with a private partner would still be possible) offers the potential for control and future consolidation and the opportunity to focus on wider policy priorities across all of Scotland. It could also remove barriers to expansion and interconnection in the future.

Depending on Scottish Government's investment capacity and risk appetite, a central delivery body would have the potential to invest ahead of need, for example by making strategic investments in transmission / trunk mains in anticipation of future connections in heat network zones.

A central delivery body would allow significant knowledge sharing and efficient allocation of resources, with a central body of delivery expertise building up over time.

Any investments made by the Scottish Government in projects could have future value, with potential for such investments to be sold in due course (most likely, when projects are operational with established revenue streams), and the proceeds of sale available for reinvestment in other projects.

Key risks

Scottish Government's role in leading project development would expose it to reputational risk in the event that projects failed to deliver the desired objectives.

An important risk in creating a centrally led delivery body is that those local authorities who are currently active in heat network developments may step back and re-prioritise limited resources on other initiatives. It is therefore difficult to say whether the net effect of a new body would be to increase or decrease the overall pace and scale of delivery.

As a shareholder, Scottish Government would risk losing its investment if its equity stake in a project had no value. In this scenario, the Scottish Government investment in the project would in effect become a grant, meaning the risk is more reputational than financial.

There may be a risk of 'self-regulation' in respect of the Heat Networks (Scotland) Act 2021, where Scottish Government is developing and operating networks, whilst also holding regulatory functions in respect of heat networks. This issue could be reduced if a separate statutory entity was set up to hold the heat network assets and apply for the relevant approvals, but setting up an independent entity in this manner could require further legislation.

The model assumes local authorities do not have a role in developing or delivering projects – only in offering / connecting their own anchor loads. This would be a move away from the current policy around LHEES, where local authorities are responsible for identifying appropriate heating solutions for their area.

This model would require significant capital investment (assuming that Scottish Government will need to provide capital that might otherwise have been provided by local authorities), and ongoing revenue budget.

A centrally led delivery body would (by definition) look to increase investment in areas where local authorities are not actively developing heat networks. Local authorities that are active in heat networks will be keen to see equivalent Scottish Government investment being made in their areas. Hence such local authorities will need reassurance that subsidy will be available to support their own developments, so they are not adversely impacted by the introduction of the delivery body.

A shareholding in project SPVs risks bringing the relevant project(s) onto Scottish Government balance sheet, thus reducing funds available to be spent on other spending priorities.

Recommendations relating to Centrally led (DM8)

18. Test Scottish Government's appetite to lead development and delivery of heat networks.
19. Consider how this model might interact with any other models still continuing, including how capital investment is spread equitably between areas in which Government is leading and areas in which others are content to lead.
20. Consider the appropriate nature and size of any Government equity stake; what shareholder rights and duties would be suitable for equity stakes in projects; whether grant and equity could be offered together, and analyse how these elements would impact project investability (including via market engagement, if Scottish Government are minded exploring this model further).
21. Consider process and resources required to establish and manage an appropriate / suitable investment vehicle, (including whether such a fund would be held directly by Scottish Government or by a dedicated investment vehicle) and budgetary implications.
22. Consider how the regulatory framework would align with this model, e.g., potential for self-regulation for projects with Scottish Government ownership (or part-ownership) of SPVs that will need to apply to Scottish Government (Energy Consents Unit) for consents / permits etc.
23. Subject to confirmation of Scottish Government appetite for this model, undertake engagement with local authorities (and, if appropriate, COSLA), investors and developers on model.
24. Develop a Strategic Outline Case.

8.3 Conclusions & recommendations in relation to the other delivery models

Of the remaining eight models not described above, we reached varying conclusions.

For some established models (i.e., Public Sector Led (DM1), Concession (DM2) and Private ESCo (DM3)) we have concluded that they still have a role, can be supported, and that their delivery could be optimised or improved.

For some other 'new models', we recommend that they should not be actively promoted or supported at this time, but that 'watching brief' type actions could be considered (Merchant model (DM7)), or consideration given as to how they might be used in the future (Unbundled (DM6) and Regulated Asset Base (DM12).

We do not consider that the PPP model (DM11) or Community Led (DM5) would offer any delivery advantages, and recommend that they should not be pursued.

The following pages summarise our evaluation conclusions in relation to these 8 remaining models, and sets out any proposed recommendations for each of them.

The following sections are ordered to reflect the remaining models' evaluation ranking (out of 12) based on scoring against the attributes, noting that the top four scoring models are already described above. The section on each model includes:

- the ranking of the model (full scores are provided in Appendix B);
- a summary of the model description;
- whether the model is considered 'new' (or not) in relation to heat networks;
- a summary of our evaluation conclusions in relation to the model; and
- proposed recommendations in relation to the model.

There are recommendations relating to the need to consider further the interaction with forthcoming regulation; updated guidance for local authorities for delivering various models; contract templates for various models; and horizon watching / capturing lessons learned from developments / projects across the UK. Various recommendations relate to more than one model, hence could be 'packaged' accordingly.

Regulated Asset Base (DM12)

Model description

A private sector ownership model in which heat network assets are constructed, owned and operated by a monopoly supplier on a long-term basis. Investment plans, operating performance and returns (which are capped) are subject to regulatory oversight.

Ranking 4 (joint)
Model type New Heat Network Delivery Model

Conclusions and potential next steps

Current market and regulatory arrangements would not support the immediate roll out of this model. However, we recommend that both existing and any new delivery models should be future proofed to retain this option and to facilitate any future consolidation (whether into public or private (local) monopolies).

The Regulated Asset Base model offers a good long term regulatory model for large infrastructure that operates in a monopoly environment. There is significant experience of this model from other sectors. It supports investment in assets by providing a guaranteed return for investors on approved investments, and mitigates demand risk by spreading costs across the entire customer base. However, it requires a large asset base to support the model, is time and cost intensive to regulate, and is not compatible with forthcoming regulation.

Recommendations

- Develop a long term 'vision' for heat networks in Scotland, including determining whether consolidation of certain types of heat network assets (such as distribution pipes) into (local) monopolies under common ownership (whether public or private) is desirable as a long-term structure.
- If long-term consolidation of ownership is deemed to be desirable, consider how both existing and any new delivery models could be future proofed to facilitate this outcome. For example, use of SPVs to hold projects assets, and asset reversion on expiry / termination of long-term concession contracts.

Service concession (DM2)

Model description

The heat network is owned and operated by the private sector under a long-term service concession tendered by a public body, where the public sector offers anchor loads, and the concessionaire takes demand risk.

Ranking 6
Model type Existing / well-established HN delivery model

Conclusions and potential next steps

Promote awareness of the concession model and, where there is an appetite to use it, provide support to deliver a better outcome for the procuring authority.

The concession model continues to offer a successful route to the procurement and delivery of heat networks for authorities which are less wiling to take on any investment risk. They are well-understood and offer a relatively straightforward route for bringing in private investment. Although procurement can be lengthy and costly, there is potential to improve this.

Concessions offer only contractual control for the procuring authority, meaning it can be harder to manage wider policy objectives over the longer term.

Developers and investors will generally seek a higher rate of return to reflect the greater amount of risk being passed on to them. This tends to require higher levels of grant.

We believe that there is scope to provide guidance and support that ensures better long-term outcomes for the public and procuring authority, and to ensure that concessions contribute to (and do not detract from) any longer-term vision developed for heat networks in Scotland.

Recommendations

- Monitor examples of concessions from across the UK and, where relevant, internationally. Capture lessons learnt
- Where local authorities are minded to use a concession, encourage long-term / strategic approach to ensure to ensure that the procurement unlocks significant investment (e.g., multiple projects / zones / sites from one procurement).
- Consider how best to align permitting process (permitted HN Zones) with local authorities' use of the concession model.
- Produce standard form documents for concessions, e.g., procurement documentation and shareholders agreement.
- Promote awareness of the concession model to local authorities and make available supporting guidance / templates etc.

Public sector (non-Scottish Government) in-house delivery (DM1)

Model description

The heat network is wholly owned and operated by a public body (either directly, or via a wholly-owned arm's length entity), usually based on self-supply arrangements (e.g., local authority buildings, or a public sector campus).

Ranking 7
Model type Existing / well-established HN delivery model

Conclusions and potential next steps

Do not actively promote but provide support where there is an appetite to explore a transition into different ownership models.

We recognise that this model will continue to play a useful role for those authorities with the skills & resources, investment capacity and risk appetite to develop, own & operate networks.

Given local authorities' limited investment capacity and competing priorities for investment, this model is highly unlikely to result in the scale of investment necessary to contribute meaningfully to deployment targets. Hence, we do not recommend that this model be actively promoted further by Scottish Government.

Recommendations

- Where local authority projects are finding it difficult to expand – e.g., due to operational challenges, competing priorities and limited resources – Scottish Government / HNSU should work with the projects to explore whether a different ownership model would be more advantageous, and how to transition.

Merchant model (DM7)

Model description

A private sector heat network operator contracts with off-takers to supply existing buildings, without having either being appointed by a private sector landowner / developer in connection with a particular development site, or having followed a public procurement exercise.

Ranking 8
Model type Existing HN delivery model / limited examples

Conclusions and potential next steps

Do not actively promote the Merchant model.

We do not recommend that this model is promoted by Scottish Government as a means to achieving a step change in pace and scale of deployment of heat networks.

Whilst we recognise the potential for private sector investment under the merchant model, we do not believe this will lead to the development of large-scale strategic heat networks aligned with intended policy outcomes.

This model carries a significant risk of 'cherry picking' of anchor loads, resulting in uncoordinated and small-scale developments, misaligned with Scottish Government policy ambitions. It risks first-mover advantage in an area, potentially inhibiting future, larger-scale, development (e.g., in areas likely to be designated as permitted heat network zones).

This model may have a limited role for towns or suburban residential schemes (e.g., shared ground loops).

Recommendations

- Further analysis should be undertaken to identify the potential for this model in certain locations, and whether / how it should be accommodated in forthcoming wider commercial and regulatory arrangements (including LHEES, zoning and related exclusive permitting).

Third party ESCo (DM3)

Model description

The heat network is owned and operated by a private sector third-party ESCo appointed by private sector landowner / developer, generally to serve new development.

Ranking 9
Model type Existing / well-established HN delivery model

Conclusions and potential next steps

Do not actively promote this model beyond promoting policies that are supportive of new heat networks.

This model (as defined) does not involve any substantive role for the public sector beyond regulation. It is generally limited to smaller, contained sites in order to respond to planning conditions requiring the construction of a heat network.

While it is positive to see this kind of network being developed for new development, and it should be encouraged for new developments, this kind of project does not generally expand or serve existing buildings and so will not deliver the pace and scale of development that is required.

Recommendations

- We recommend that the Scottish Government continues to promote planning policy that supports the installation of new heat networks or connection to existing or planned heat networks for new development.
- In practice, this will require local authorities to develop pro-heat network policies at a local level and Scottish Government may wish to consider how this can be further encouraged / supported e.g., sharing of experiences and best practice examples from elsewhere in the UK via the proposed HNSU 'strategic heat network planning' initiative. Third party ESCo (DM3)

Unbundled model (DM6)

Model description

A family of models involving separate ownership of generation, transmission / distribution and supply assets, e.g., where heat generators contract directly with customers and pay a use-of-system charge to the owner of heat transmission / distribution infrastructure.

Ranking 10
Model type Existing HN delivery model / limited examples

Conclusions and potential next steps

Promote the futureproofing of delivery models to facilitate any potential future unbundling of networks.

Other than in cases where there is an obvious industrial / third-party heat source, the development of new networks, or unbundling of existing networks, (in which generation, distribution and supply are operated as separate businesses) is generally only practicable where sufficient scale has already been achieved. It would therefore be premature to promote this delivery model in a relatively immature HN market such as in Scotland.

Recommendations

- Supply of surplus / waste heat from environment / industry into networks (e.g., Stirling Forthside, Glenrothes, Clyde Gateway, Millerhill energy-from-waste) should be encouraged and facilitated (e.g., by use of the template supply agreement we are currently developing). This can be done via the HNSU.
- In due course, heat networks may reach a scale at which unbundling becomes commercially viable. With this in mind, Scottish Government should promote the futureproofing of delivery models to facilitate any potential future unbundling of networks (e.g., by holding assets in SPVs). Unbundled model (DM6).

Community led project (DM5)

Model description

A community leads heat network development and owns the network, subcontracts O&M, supplies buildings within community.

Ranking 11
Model type Existing HN delivery model / limited examples

Conclusions and potential next steps

Do not promote Community led model as a means to achieve scale.

Although community led projects can have very positive policy outcomes for local communities when delivered successfully, community led projects tend to be small, challenging to deliver and often harder to fund. They can absorb skill and resource (including Government grant and advisory support) without delivering projects at scale.

Whilst we recognise there may be other policy reasons for promoting community led projects and that they are likely to have some role to play, we do not recommend that this model is promoted by Scottish Government as a means to achieve scale and pace of deployment of heat networks.

Recommendations

- If encouraging community involvement in projects is a priority for Scottish Government, case studies / guidance could be prepared.
- Scottish Government may wish to investigate and promote alternative ways in which communities could be engaged in heat networks, other than ownership (e.g., via the development of a community fund, funded by the heat network operator). This could take the form of 'best practice' guidance for delivering community benefit, which could feed into larger procurements. This guidance could be developed via the HNSU.Public Private Partnership (PPP) (DM11).

Public Private Partnership (PPP) (DM11)

Model description

The heat network is operated by the private sector under a long-term contract tendered by a public body, where the public sector retains the majority of demand risk, but availability risk lies with the PPP contractor.

Ranking 12
Model type New HN delivery model

Conclusions and potential next steps

Do not promote PPP as a model for the delivery of heat networks.

The PPP model has many features similar to a concession model, and no additional advantages in the context of heat networks, but is more costly and complex to deliver than a concession.

We therefore do not consider this model as suitable as a means for the deployment of heat networks at pace and scale.

Unlike the merchant model, we are not aware of any market actors promoting or suggesting this model, and therefore no further steps are recommended.

8.4 Conclusions & recommendations in relation to enabling mechanisms

In section 6.4, we described a number of **enabling structures / mechanisms** that share some, but not all, of the characteristics of a delivery model, but which could complement and / or enable the implementation of one or more delivery models described in sections 6.1 to 6.3 above. We included section 6.4 in order to comment on structures or mechanisms which are potentially relevant for heat networks, and were raised in our stakeholder engagement, but which do not warrant full review as a 'delivery model'.

We have concluded that there are a number of enabling structures / mechanisms which, if implemented, would also help to increase the pace and scale of delivery of heat networks. These mechanisms would, to a large extent, apply independently of the choice of delivery model for a particular project. These supportive mechanisms relate to demand assurance and procurement efficiencies.

In section 6.4 we described the various ways in which **demand assurance** could be achieved, and its fundamental role in de-risking investments in heat networks from a developer perspective (both public and private sector). As part of the on-going work to develop policy and regulation, **we recommend that the Scottish Government should continue to seek opportunities to provide greater demand assurance to projects**. Although stakeholders we spoke to were not universal in their views on which form of demand of assurance would be most welcome (e.g. support for mandatory connections appeared to be reducing), there was clear feedback that more could be done to reduce risks around demand assurance, and that steps taken did not need to be radical. For example, some stakeholders suggested that clearer policy advising that public sector buildings should connect to heat networks would go a long way to encouraging anchor loads to connect.

In section 3 we outlined stakeholder concerns about **procurement efficiency**, including procurement procedures, timescales and associated bid costs. In section 6.4 we described a range of approaches intended to increase the efficiency of procurements. **We recommend the Heat Network Support Unit should facilitate the development and implementation of procurement efficiency on a project-by-project basis**. This could include, for example, piloting a two-stage procurement process on a live project, evaluating the outcomes and disseminating lessons learnt via a case study.

For the other enabling mechanisms considered in section 6.4, we do not consider that these merit any specific recommendations at this stage. In relation to **Heat as a Service**, we will continue to maintain a watching brief on how business models in this area evolve. For the **'private company with public purpose'**, this could have a potential future role in the longer term, for example as a corporate structure to manage large consolidated networks, if Scottish Government were to establish a Regulated Asset Base Model (DM12). We are not recommending either of these as short- to medium-term interventions.

Appendix A: stakeholder engagement – list of organisations

The following organisations participated in 1:1 stakeholder engagement sessions with Scottish Futures Trust to inform the preparation of this report. This engagement took place over the winter of 2022 / 23.

Local authorities

- Aberdeen City Council
- City of Edinburgh Council
- Dundee City Council
- Glasgow City Council
- Stirling Council

Contractors

- Amaresco
- Pinnacle Power
- Scottish & Southern Energy
- Vattenfall
- Vital Energi

Investors

- Asper Investment
- Equitix
- Scottish National Investment Bank
- UK Investment Bank

Advisers

- BTY
- Pinsent Masons

Appendix B: Evaluation scores

	Model Name & Attribute Scores											
Attribute	DM1 (Public sector ownership)	DM2 (Service concession)	DM3 (Third party ESCo)	DM4 (LA JVs)	DM5 (Comm. Co)	DM6 (Unbundled)	DM7 (Merchant)	DM8 (Centrally led)	DM9 (LA led, SG stake)	DM10 (RESCo)	DM11 (PPP)	DM12 (RAB)
Ease of Deployment	2	2	3	2	1	1	2	1	1	1	1	0
Potential for Private Investment	0	2	2	2	1	2	1	2	1	2	1	2
Simplifies Delivery	1	2	1	3	0	0	1	1	2	3	0	1
Contributes to Policy Objectives	2	1	0	2	2	1	0	3	3	2	1	2
Skills & Capacity	1	1	1	2	1	1	1	1	3	3	1	2
Demand Risk	1	1	1	1	1	0	1	1	1	2	1	3
Transition to self-sustaining market	1	2	1	2	1	1	1	2	2	3	1	2
Replicability	1	1	0	2	0	0	1	2	2	3	0	0
Supports Expansion / Interconnection	1	2	0	2	0	1	1	2	2	2	0	3
Installation ahead of demand	1	1	0	1	0	1	1	2	1	1	0	2
TOTAL SCORE	11	15	9	19	7	8	10	17	18	22	6	17
Ranking of Model	7	6	9	2	11	10	8	4	3	1	12	4

Scoring Matrix

Evaluation score	Score description
0	Potentially negative impact in relation to this attribute; fails to meet attribute at all.
1	Is broadly neutral in relation to this attribute; neither benefit nor negative impact.
2	Performs well against this attribute.
3	Performs very well against this attribute.

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