Item 3

28th May 2024

Glasgow City Council

Net Zero and Climate Progress Monitoring City Policy Committee

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UPDATE ON THE POLMADIE DISTRICT HEAT NETWORK FEASIBILITY STUDY

Purpose of Report:

To provide Committee with an update on the feasibility study into the potential for a District Heat Network from the Glasgow Recycling and Renewable Energy Centre in Polmadie.

Recommendations:

The Committee is asked to:
1) Note the contents of this report, and
2) Note that further updates on next steps will be provided within 12 months.

Ward No(s):	Citywide: ✓
Local member(s) advised: Yes ☐ No ☐	consulted: Yes ☐ No ☐

1. Introduction

1.1 The purpose of this report is to provide a summary of the findings of the feasibility study and subsequent addendum report undertaken by Buro Happold into the potential District Heat Network from the Glasgow Recycling and Renewable Energy Centre in Polmadie.

1.2 Glasgow's Climate Plan set a target for the City to reach net zero carbon by 2030. One of the largest contributors to Glasgow's emissions is energy consumed for heating buildings. Decarbonisation of our heating systems is one of the key drivers for an accelerated growth of district heating opportunities across the city. The Glasgow Climate Plan also contains a specific action (#14) on the development and delivery of our Local Heat and Energy Efficiency Strategy.

1.3 The commitment and ambition of the City in relation to the potential for district heat networks has been more recently confirmed within Glasgow's Local Heat and Energy Efficiency Strategy (LHEES), the creation of which is a statutory obligation on Scottish Local Authorities and was approved by the City Administration Committee in December 2023 (link here). The LHEES outlines zones across the city where there is potential for the development of district heat networks to address both a reduction in emissions, and to provide access to locally generated, affordable energy.

1.4 The Scottish Government's Heat Network Support Unit (HNSU) aims to support the growth of heat networks by working with the public sector to address key challenges and build capacity through advice, expertise and financial support. In 2023, GCC secured funding from the HNSU to refresh feasibility work previously completed on a heat network in this area. There were a number of drivers for this review, which include the need to revise the financial viability based on the current economic and policy/regulatory conditions and to utilise the heat demand profiling work that was undertaken through the creation of the LHEES to build a deeper understanding of the technical and economic viability of this network. The GRREC is highlighted as a key strategic consideration within the LHEES and falls within one of the primary indicative heat network zones.

1.5 Buro Happold were appointed by Zero Waste Scotland, a lead partner with the Heat Network Support Unit to undertake this feasibility.

1.6 The purpose of undertaking this study is to build confidence that district heat networks are technically and economically viable in locations across the city. This work provides detailed commercially sensitive information that will be critical in preparing Glasgow City Council when progressing the development of both the Delivery and Investment vehicles approved by the City Administration Committee in March 2024 (link here).

2 Feasibility Approach

2.1 This study is focussed on undertaking and analysing techno-economic modelling (TEM) of potential heat network scenarios at feasibility stage, considering costs and revenues relative to conventional heating systems, therefore enabling comparison of the heat network against known counterfactuals and alternative systems.

2.2 Within a TEM for a heat network, the revenues achievable by the network operator, realised through network connection fees as well as fixed and variable heat tariffs, can be considered from different perspectives. A reasonable range for consideration spans from existing costs of heat (typically based on existing gas heating systems) to the (often higher) costs associated with installing and running alternative low carbon heating systems.

2.3 To understand if a heat network is likely to offer the best value approach to the decarbonisation of heat supply, TEM input assumptions, relating to costs and revenues, are set based on benchmarked costs for agreed low carbon counterfactual technologies (typically building-level systems, such as individual or communal air source heat pumps). Connection fees are modelled as a heat network revenue, and these reflect the capital costs associated with installing the alternative, building-level heating systems.

2.4 Similarly, to understand affordability of low carbon heat supplied through a network, consideration of the cost of heat from the network opportunity relative to existing / Business as Usual (BaU) heating costs is needed.

3 Summary of Findings

3.1 The initial Polmadie Heat Network Feasibility study undertake by Buro Happold explored the potential for a heat network opportunity utilising heat from the Glasgow Recycling and Renewable Energy Centre (GRREC) utilising current information in relation to technology, regulations, and costs.

3.2 There are numerous in-development and operational heat networks in the UK and beyond that are supplied with heat from Energy from Waste (EfW) plants. EfW is a source of heat that's recognised as being relatively low cost (in comparison to other low carbon heat sources), and this can act as a catalyst for heat network development if there is high heat demand density in the local area. A potential benefit to the GRREC is that heat generation from the waste resource is significantly more efficient than electrical generation, therefore heat supply to a network could significantly improve the overall energy efficiency of the facility.

3.3 In exploring the demand opportunity local to GRREC, a study boundary was agreed that aligned with Glasgow's LHEES Indicative Heat Network Zone South 2.

3.4 The feasibility work carried out an analysis of demand density across the study area, focusing on larger heat demand buildings (anchor loads), which, alongside consideration of building typology / ownership, helped to establish a core connection scenario in the local area. The core cluster (Fig 1 below) represents an initial (phase 1) build-out of a heat network, allowing consideration of this opportunity through techno-economic assessment to understand if the initial investment is likely to offer a return (40 years of operation are modelled).

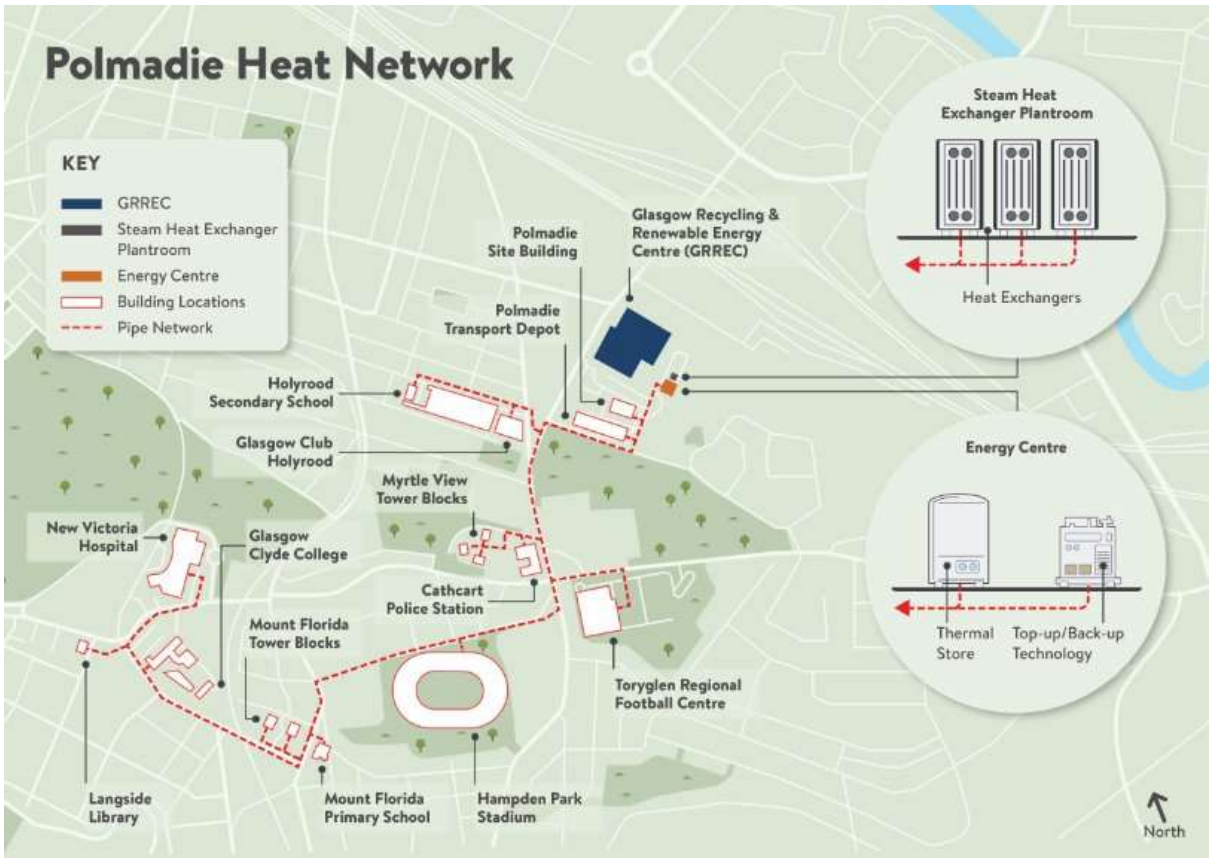

Figure 1: Scenario 1: Core connections

3.5 The peak heat demand of this core cluster (rather than the peak demand of each of the connections considered) was estimated at 10.2 MW. The key demands identified are primarily GCC-owned buildings, other public sector buildings and high-density social housing.

3.6 In terms of supply-demand matching, there is good alignment between the specific heat source at GRREC considered and the demand identified within the core cluster.

3.7 Both gas and electric boilers were considered as a back-up supply for periods of maintenance and outage of the GRREC facility.

3.8 The feasibility report proposes that heat exchange equipment for the EfW supply be sited on the GRREC site, with an energy centre building, housing back-up boilers and thermal storage, on adjacent GCC land. This is helpful in building confidence for investors in delivery of the network as it identifies land within the Council's control for these assets, thus reducing risk of constraints in developing and energy centre.

4. Feasibility Conclusions and Outputs

4.1 Following the initial feasibility work, it was agreed that the results presented reflected a public sector funding and ownership model and did not fully consider private sector investment and ownership/operation.

4.2 An addendum study to the initial feasibility work was therefore undertaken in March 2024 and included:

- Soft market research to explore modelling assumptions from an operator's perspective.
- Revisiting economic modelling assumptions relating to heat sales tariffs and connections charges, informed by soft market research with the aim of better understanding commercial delivery potential.
- Refreshing the techno-economic model for the core set of connections considered in the feasibility study (Scenario 1), as well as for Scenario 2, which explored growth of the core network route through further phased connection of nearby demands.

4.3 To achieve the target indicative rate of returns considered in the report, assumptions have been made regarding connection fees, heat tariffs, and grant funding, with some variation. A capital cost of £24.15M has been estimated for the build-out of the core network. The majority of capital cost is required for installation of the buried pipework (~4,000m). As outlined in table 1 below.

4.4 The modelling in table 1 suggests a 6% IRR is achievable without grant funding, with a heat sales tariff that is comparable to existing costs of heating (gas supplied for the majority of heat demand considered).

4.5 To achieve levels of return that align with commercial delivery models (10% IRR), a heat sales tariff between existing costs and low carbon counterfactual costs was modelled, and a proportion of grant support was included.

4.6 The modelled revenues for the heat network include connection fees from customers, which are aligned with benchmarked costs for installing alternative low carbon heating systems. The total costs to customers are influenced by the

assumptions made within the feasibility, and ultimately by the delivery model should the heat network go ahead.

	Public-ownership type (IRR target ~6% at 40 years) Core Connections	Commercial-ownership type (IRR target ~10% at 40 years) Core Connections
Scenario	**Scenario 1. Core Connections**	**Scenario 1. Core Connections**
Grant Funding (e.g. HNF)	Without funding	£2.8M (11.6% of CapEx)
Capital Expense	£24.15	£24.15
NPV at 40 years	£9.3M	£19.5M
IRR at 40 years	6.6%	10%
Connection Charges	Phase 1: £5.57M	Phase 1: £5.57M

Table 1: TEM addendum outputs for the core connection scenario

4.7 The addendum model outputs suggest that a heat network supplied by GRREC is likely to offer the best value route to heat supply decarbonisation for the core connections considered. This remains the case whilst supporting levels of return on investment likely to be required by commercial delivery models.

4.8 As with all heat network feasibility assessment, a key risk relates to ability to secure the connections considered, and to agree the terms of connection and acceptable costs for heat. Detailed stakeholder engagement work is typically progressed at the subsequent stage of project development (Outline Business Case) to explore these uncertainties.

4.9 The high temperature of heat available from GRREC allows for network operating temperatures to be chosen that align well with the operation of existing heating systems. As a result, it is not anticipated that significant enabling / fabric improvement works will be required at building level to support connection to the network. The exception from the core network connections considered are the high rise blocks (eg Myrtle Place), where existing electric heating systems would need to be replaced by wet systems to support connection.

4.10 A carbon emissions analysis suggests a saving of ~81% is achievable through development of the core heat network opportunity, relative to the continued operation of existing heating systems. These savings are estimated with gas boiler back-up over a 40-year assessment period. There remains potential to

further reduce carbon emissions (relative to the modelled assumptions) through diversification of heat supply in future, or transition to electric back-up over time.

Scenario	Total CO_2 Emissions after 40 years (tCO_2)	% Carbon Saving from BAU
Business as Usual	199,261	-
Counterfactual	5,895	97
Scenario 1: core connections (with backup gas boilers)	37,847	81

Figure 2: Carbon Savings vs BAU

4.11 The addendum work also gave consideration to growth potential of the network, through exploration of connections along / near-to the core network route over time. The additional connections considered were a mix of smaller non-domestic properties, and mixed residential properties (primarily tenement blocks). However significant assumptions were made when applying the timescales for this aspect of development.

5. Summary

5.1 In summary the feasibility and subsequent addendum work have concluded that the development of a heat network which utilises energy from waste from the GRREC is technically and economically viable, and commercially attractive enough to engage the private sector's interest.

5.2 A number of assumptions have been made to enable the TEM to be undertaken, which are highlighted within the report. As examples, these assumptions include costs of the steam plate heat exchanger / condensate return plantroom and heat network connection costs. However, this report should be seen as one of the core baseline reports for the portfolio of projects that will be developed for the Climate Investment Vehicle.

6. Next Steps

6.1 The findings of the feasibility study will be added to the portfolio of asset information for inclusion in the development of a Climate Delivery Vehicle.

6.2 Further opportunities for heat networks and renewable heat supply potential are being explored with the Scottish Governments Heat Neatwork Support Unit in connection with the actions set out in the LHEES. Subsequent information will be shared with committee as appropriate.

6.3 Further updates on next steps will be provided to this committee within 12 months.

7. Policy and Resource Implications

Resource Implications:

Financial:	Progressing this work will need investment. It is expected that this investment will come through the development of the Climate Investment vehicle.
Legal:	Legal support will be required when assessing private sector involvement in the project development.
Personnel:	The further development of this work will be managed through the creation of the Delivery and Investment vehicles.
Procurement:	Procurement resource may be required to support further development.
Council Strategic Plan:	This work contributes to Grand Challenge 3 -Fight the Climate Emergency in a Just Transition to a Net Zero Glasgow and Mission 2 - Become a net zero carbon city by 2030.

Equality and Socio-Economic Impacts:

Does the proposal support the Council's Equality Outcomes 2021-25? Please specify.	The project does not have any impact on equality impacts at this stage. Should the project develop further and be

	successfully delivered, it has the potential to support the Council's equality outcomes. This will be explored at each stage of the project development.
What are the potential equality impacts as a result of this report?	No significant impacts.
Please highlight if the policy/proposal will help address socio-economic disadvantage.	The project has the potential to deliver locally generated heat into the Polmadie area and insulate against energy price fluctuations in future. Therefore having the potential to address elements of socio – economic disadvantage in relation to energy security.

Climate Impacts:

This report has been used to trial the new CCIA process. The outputs of which can be found here.

CCIA Outcome	**Yes /No Or / Not At This Stage**
Was a significant level of negative impact arising from the decision identified?	No
Does the decision require to be amended to have a positive impact?	No
Does a more detailed Climate Change Impact Assessment need to be undertaken?	Not at this stage

Does the proposal support any Climate Plan actions? Please specify:	This project provides a specific response to actions 14 of the Climate Plan: To adopt the LHEES which will identify areas suitable for investment in renewable energy generation and heating in the city;
What are the potential climate impacts as a result of this proposal?	This project has the potential to provide locally generated dependable heat, contributing to the ambitions of decarbonisation of heating across the city.
Will the proposal contribute to Glasgow's net zero carbon target?	Yes, this proposal will positively contribute to Glasgow's net zero carbon target.
Privacy and Data Protection Impacts:	None

8 Recommendations

8.1 The Committee is asked to:

1) Note the contents of this report, and
2) Note that further updates on next steps will be provided within 12 months.