APPENDIX 1

Outline Business Case for Funding for a Detailed Project Development Study for the Development of Bromsgrove Heath Network

Author:	A. Wardell-Hill
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Contents

1. Executive Summary

The purpose of this business case is to identify the opportunity to take the District Heating Feasibility Study forward to Detailed Project Development (DPD) Phase. This will require funding from Bromsgrove District Council (BDC).

The need to invest in energy systems that ensure resilience against increasing energy costs, energy instability and carbon emissions is ever more pressing. The threat that climate change presents to Bromsgrove District, the UK and the Global community with increasing regularity, is real and present in everyday life. Urgent mitigation interventions are required to lessen the human influence on climate change of which energy usage in heating systems is a major contributor.

A heat network connects multiple consumers and supplies heat and power from a centralised energy centre, with the express aims of reducing energy costs and carbon emissions. Decarbonising heat supply is generally challenging and a heat network is an important opportunity that can deliver deep and sustained carbon reduction in an area, particularly as it facilitates future expansion and the inclusion of alternative technologies over time.

An energy mapping and master planning study and a techno-economic feasibility study have both been completed to identify the suitability of a district heat network within Bromsgrove Town. The outcome to date suggests there is the potential for a heat network to work in the identified area and that a Detailed Project Development project is now required to develop commercial, modelling, legal structuring, financial modelling, a procurement strategy and a full business case for the network.

The work to date has been part funded through the Department of Business, Energy and Industrial Strategy (BEIS) Heat Network Delivery Unit (HNDU), Bromsgrove District Council and Worcestershire LEP North Worcestershire Economic Development and Regeneration unit (NWEDR).

The proposal for Bromsgrove is a Ground Source Heat Pump and Combined Heat and Power with the bore holes and Energy centre being located on the site of Bromsgrove School. This option allows for the most preferential emission, energy output, and economic

model to be implemented however the option of biomass was also investigated and is viewed as an alternative option should the GSHP become unfavourable.

The GSHP / CHP scheme would save an annual average of 1,560 TCO2, 5% reduction in energy costs[1] plus further benefits such as operational payback in reduced plant liability, inward investment in the town, opportunity for new energy ventures and also to secure existing business and new businesses into the town.

The network identified consists of numerous properties covering retail, leisure, residential and healthcare establishments. Key Stakeholders, with over 54% of the total annual heat demand are Bromsgrove School, Princess of Wales Community Hospital, Bromsgrove District Housing Trust and Bromsgrove District Council. Stakeholders have already expressed support for the future development of the scheme and expressed a willingness to commit financially should the project progress to DPD. To prove commitment, give confidence and allow the project to develop, a joint stakeholder project group will be necessary to drive the DPD forward and deliver any future outcomes.

Project structuring and financing options have not been explored and these will be considered and proposed in the DPD.

HNDU are able to provide further support for the DPD stage where BDC are able to bid to secure 66% of the total amount required, plus a fully funded experienced Project Manager to driver the project onto the next stage. The full cost of the DPD is likely to be around £250,000 of which BDC can bid for £165,000 from HNDU funding. To date key stakeholders have committed £10,000 towards this project therefore leaving a shortfall of £75,000 to fund.

There has never been more support for funding and supporting Heat Network Developments in the UK however, in order to make use of this support a bid will need to be delivered to HNDU by the end of December 2019 and an HNIP bid will need to be submitted during 2020.

[1] Heat Network Study for Bromsgrove, 2019, Greenfield

2. Introduction

2.1. A heat network connects multiple consumers and supplies heat and power from a centralised energy centre, with the express aims of reducing energy costs and carbon emissions. Decarbonising heat supply is generally challenging and a heat network is an important opportunity that can deliver sustained carbon reduction in an area, particularly as it facilitates future expansion and the inclusion of alternative technologies over time.

2.2. A feasibility study for a heat network in Bromsgrove has been completed for Bromsgrove town, part-funded by Department of Business, Energy and Industrial Strategy (BEIS), Heat Network Delivery Unit (HNDU), Bromsgrove District Council (BDC) and Worcestershire Local Enterprise Partnership (LEP) North Worcestershire Economic Development and Regeneration unit (NWEDR).

2.3. The study is a detailed investigation involving mapping of loads (energy demands), and, identification, initial concept design, and, techno-economic testing of heat network solutions.

2.4. The heat network identified connects a number of consumers, including public buildings, offices, schools, and, residential properties, supplying heat and/or power utilising low carbon energy systems. Key consumers with over 54% of the total annual heat demand include Bromsgrove School, Princess of Wales Community Hospital (POWCH), Bromsgrove District Housing Trust (BDHT), Council properties, and leisure facilities.

2.5. The heat network is planned to originate from the Bromsgrove School site where the energy centre is proposed to be located. The main network build-out is proposed over three years period really to present a relatively pessimistic roll-out for the school. It is assumed that Bromsgrove School and South Bromsgrove High School are connected in Year 1. Year 1 refers to the first year of construction which may not be possible before 2021, due to the preceding planning stages which may take 18 months to 2 years to finalise. Year 2 sees expansion into the southern part of the town centre and then Year sees expansion to the Leisure Centres, Hospital and other

consumers in the northern part of the town centre. It is important to reach the hospital as soon as possible (since they need to resolve their ageing boiler plant). The last buildings to connect are assumed to be the ASDA store and adjacent properties, in year 11. This is linked to the retirement of the Air Source Heat Pumps currently used at the store.

2.1. The report provides a credible economic and environmental case for a heat network in Bromsgrove Town and a reasonable ROI could be delivered (with typical risks and uncertainties) with the model incorporating the required HNIP grant funding.[2] The recommendations from this report are:

i. The Council seeks executive and member support to take the project forward, focusing on a ground source heat pump (GSHP) / combined Heat and Power (CHP) hybrid solution. A solution utilising biomass would be a fall-back option should the GSHP/CHP not be realised.

ii. The project is moved on to a Detailed Project Development (DPD) phase.

2.2. Bromsgrove School have committed £10K towards the next stage of the project and Worcestershire Health and Care NHS Trusts have expressed their willingness to commit financially to the project by submitting a business case the to the Trust Board and would be asking for a contribution in the region of £10K.

2.3. Worcestershire LEP have indicated they would like to contribute towards the DPD however due to Central Government withholding additional funding due to the unresolved issue associated with the overlapping LEP geographies. This may change and Officers will keep communications with the LEP open in order to realise any funding via this route.

2.4. BDC are advised to take advantage of the current funding into UK Heat Networks, as research and investigation is costly and requires specific expertise, and there is no reliance that the offerings present through HNDU will persist into future years.
In order to make use of this support a bid will need to be delivered to HNDU by the end of December 2019 and an HNIP bid will need to be submitted during 2020.

[2] Modelling incorporates BEIS forecasted increases for gas and electricity prices and the Biomass price has been assumed to inflate based on Bank of England 2% CPI target

HNDU are able to provide further support for the DPD stage where BDC are able to bid to secure 66% of the total amount required, plus a fully funded experienced Project Manager to driver the project onto the next stage.

3. The Strategic Case

3.1. The strategy behind the development of a DHN fits with the following Councils Strategic Purposes:

- Keep my place safe and looking good.
- Do sensible things to improve my locality.
- Help me run a successful business.
- Help me back to financial independence

3.2. BDC views climate change as a serious issue and as such, declared a Climate Change Emergency in July 2019. By this action, Councillors have committed to taking urgent action against climate change and that activities taken up to this point have not been sufficient to limit the change required.

3.3. The DPD will cost an estimated £250k and will consist of a test borehole, full lifecycle project management, the DPD report. It should be understood at this point that the borehole is an intrinsic part of understanding the future of the project. Although British Geological Survey Data has been used in the analysis of the feasibility report, until a borehole is taken, much of the costings remain uncertain as the actual geology of the land is not known. In saying this, the survey data is robust and is very likely to represent the actual ground conditions.

3.4. The proposal is for Bromsgrove District Council to facilitate and part fund the subsequent stage of the district Heat Network project and take this onto DPD. The sum of £75K [3]is required from BDC in order to commit to the DPD stage and allow the project to deliver the identified benefits.

[3] This amount is anticipated to be reduced following confirmation that the project will move to DPD stage as Bromsgrove School and Worcestershire Health & Care NHS Trust have indicated a financial commitment of a minimum of £10,000

Table of Cost Breakdown for DPD Phase

Item	Cost
Project Management	Fully funded by HNDU
Test Borehole	£100K
DPD	£150K
Total	*£250K*
Funding from HNDU@ 66%	£165K
Funding from Bromsgrove School	£10K
Funding from NHS Trust	to be determined
Funding from BDHT	to be determined
Remainder to Fund	*£75K*

Case for Change

3.5. The threat that climate change presents to Bromsgrove District, the UK and the Global community with increasing regularity, is real and present in everyday life. Urgent mitigation interventions are required and BDC need to actively engage in and promote interventions to lessen its impacts.

3.6. Energy usage for heating is a major contributor towards climate change where traditional gas and electricity is consumed for space heating. Whilst it is understood that decarbonisation of the grid will occur as increased renewables are fed into the network, there is still much consumers can do on a local level.

3.7. District Heating Networks (DHN's) have been identified as a key component in decarbonising the energy used in heating and thus minimising carbon emissions to the environment. [4]

3.8. DHN's are also able to more easily be converted from one fuel type to another than individual heating systems due to the very nature of having one centralised energy centre with a shared network of pipes supplying multiple properties. This therefore guards against having legacy systems that become redundant over time. This added resilience allows for staged progression towards increasingly renewable forms of energy as time allows.

3.9. The DHFS identified the following deliverables based on the scheme proposed[5]:

- 32% Reduction in carbon emissions[6].
- 5% Reduction in consumer energy costs[7]
- Ability to deliver sustained carbon reduction for the town[8].
- Around £20m inward investment into the town of (construction costs)[9]
- Operational benefits e.g. reduced plant liability and releasing space
- Development of a local energy generation / supply entity
- Encourage commercial/residential tenant retention in the town
- Training and the educational support opportunities [10]
- Reputational benefits for the town, local authority and other stakeholders

Spending Objectives

3.10. In order to realise the deliverables identified by the DHFS BDC is required to be the lead partner to see the project through to DPD stage. The DPD will then identify opportunities for development of project board and future business vehicles to continue the venture.

[4] The Climate Change Commission identify 18% of heat will need to come from heat networks by 2050
[5] GSHP & CHP Hybrid
[6] *Calculated of the first 25 years of the project*
[7] Existing costs have been modelled as baseline
[8] Through expansion and easy transition to future low carbon technologies
[9] Not including subsequent short term employment in construction stage
[10] Staff and students at Bromsgrove School, South Bromsgrove School and HOW college

3.11. The work to date has been part funded through the Department of Business, Energy and Industrial Strategy (BEIS) Heat Network Delivery Unit (HNDU), Bromsgrove District Council and Worcestershire LEP North Worcestershire Economic Development and Regeneration unit (NWEDR). In the investment of relatively moderate sums of money at the developmental stage BDC will be able to follow through on its commitment to take action against climate change and secure all the other benefits outlined in 3.9.

Existing Arrangements

3.12. All the properties identified in the DHFS suitable for connection to the network have individual energy supply for power and heat. They are individually metered to mains supplies and as such are subject to market conditions with increasing energy costs.

3.13. None of the properties identified for the network utilise any significant forms of renewable or low carbon energy sources.

Consultation

3.14. Liaison with stakeholders has been a crucial part of requirement gathering throughout the DHFS process and consultation has taken place to a lesser or greater degree dependent on the nature of the building type and the level of detail required in calculating energy loads and demand profile.

Feedback presentations have been delivered to the Key Stakeholders (Bromsgrove School, Worcestershire Health and Care NHS Trust (for POWCH) and BDHT. All stakeholders were positive and encouraged to see the opportunity that the DHFS had identified and as a result all have expressed a desire to move this project forward to the DPD stage.

Business Needs

3.15. It is clear that BDC have an expressed desire and drive to work towards supporting lower carbon opportunities for the District with it declaration of the climate change emergency.

3.16. BDC further had a responsibility to ensuring the local area highlighted in the Strategic Purposes and the Council Plan.

Potential Scope

3.17. The outcomes of the proposed heat network are wide reaching with 70 properties in total having been identified for potential connectivity with the network, notably the impacts on some of the consumers will be considerable. There are numerous sheltered housing, retirement and care home facilities housing elderly and often vulnerable residents to whom a secure, efficient and affordable energy supply is crucial.

3.18. The public buildings including schools, Council offices, Library and other Government buildings would also benefit considerably from the reduction in energy costs enabling to demonstrate their commitment towards delivering cost effective publically funded services.

3.19. The initial network has the ability to be further developed over time allowing future developments to link in and benefit. This coupled with the opportunity deliver deep and sustained carbon savings with future expansion and the inclusion of alternative technologies over time. The presence of a heat network within the town will provide confidence and set a precedent for future build within the town and the wider boundaries of the District. Reputational benefits for the town, local authority and other stakeholders are far reaching and should not be underestimated.

3.20. Other significant opportunities present themselves with the development of a heat network including the development of a local energy generation and or supply entity

which in itself allows for commercialisation of the project. The interest in new business to the town should not be overlooked as the benefits of reduced energy costs and carbon saving are key and of growing importance to the vast majority of businesses.

3.21. There are also noteworthy opportunities in training and the education sector where there are opportunities for training and development utilising the heat work and an educational asset, where students will be able to gain interest, career aspirations and training as a precursor to work in the low carbon economy.

Benefits and Risks

3.22. Table Benefits and Risks associated with the DPD & Heat Network

Issue	Benefit	Risk
£75k required to progress project onto detailed project development stage and necessary borehole works	Will confirm the future direct of the project and the technical solution that that been proposed by the feasibility study.	May result in spend of £75k with no deliverable project.
Borehole investigation	Identifies positive conditions for GSHP and progression to full DPD study	identifies unfavourable conditions and resulting in increasing construction costs identifies unfavourable conditions for GSHP and need to revert to biomass option If project is deemed unsuitable at this stage there

		is no requirement to progress to full DPD stage - project
Progression to DPD and beyond	Operational Heat Network	No Heat Network and spend of £75k does not produce desired outcome
	Building and sustaining relationships with the wider community	Poor Reputation given the opportunity to further progress to DPD into develop and beyond
Carbon emissions	Reduced carbon delivering 39,000T reduction over 25 year period	No/ little control over the carbon emitted when buying energy direct from supplier
Instability in energy supply	Removes issues with interrupted supply	mains supply risks instability on supply
	Assurance over source of fuel supply (GSHP/ CHP)	No control over fuel source type renewable or no renewable)
Energy Cost	5% reduction in energy costs	Guaranteed increasing energy costs
	Control over increasing costs as new low cost technologies more easily rolled out and implemented	Exposure to market conditions and increasing energy costs
Stakeholder support	Stakeholders commit strategically and financially	Stakeholder support is fragile risking further development of

	enabling the heat network to reach full potential	the project. Particular risk is losing the site for energy centre

3.23. Mitigation against spending the full £75k with no viable project to take forwards can be managed by carrying out the borehole investigation in the first instance followed by the full DPD if conditions are favourable. The will decrease the actual loss of financial commitment should the borehole identify conditions that would render the proposed project unfeasible. The full £150k for the DPD study is then likely not to be required.

3.24. Stakeholder management is required to ensure all partners are fully aware of potential benefits and risk to the project.

3.25. A full breakdown of Risks for the proposed scheme itself can bee see in the DHFS report Appendix 11.

Constraints and Dependencies

3.26. The DHFS has investigated the potential scope of a HN for the town as far as current data, research and other factors allow. The next stage is to undertake a test borehole on the site of the proposed build in order to validate the BGS geological information to assess conditions and suitability of the site itself. Should the test borehole dictate conditions are not compatible with the original BGS data, amendments may be made to the original feasibility study which may increase or decrease costs dependent on the features identified below ground. There is also the fall back option of moving to a biomass technology option[11].

4. The Economic Case

[11] Full details of the biomass option can be seen in the feasibility report

4.1. **Table of Short List options**

Option Reference Number	Option
1	Do Nothing
2	BDC Facilitate & fund DPD with GCHP/CHP
3	BDC Facilitate & fund DPD with Biomass
4	BDC Facilitate & fund DPD with GCHP/CHP with fall back to Biomass

4.2. The DHFS itself does investigate two technology options in the deliverability of the project itself and this is GSHP with CHHP and Biomass, a comparison in the capital cost summary can be seen in the table below. The study concluded that the GSHP and CHP option was the stronger solution for the network, however to the options have been used below together with the fall back option of reverting to biomass should the GSHP / CHP option prove unworkable

4.3. **Table of Evaluation against selected criteria**

Evaluation Criteria	**Option 1 Do Nothing**	**Option 2 BDC Fund & facilitate GSHP & CHP DPD**	**Option 3 Facilitate & fund DPD Biomass**	**Option 4 Facilitate & fund DPD GSHP / CHP with option to revert to Biomass**
a) Further deliver on Strategic Purposes	**No**	**Yes**	**Yes**	**Yes**
b) Significant reduction in Carbon Emissions for the town	No	Yes (32.2%)	Yes (61.4%)	Yes (32.2 >61.4%)

c) Reduction in Energy costs for those connected	No	Yes	Yes	Yes
d) Internal Rate or Return on investment	No	Yes	Yes	Yes
i) no grant	0	3.5%	1.1%	3.5-1.1%
ii) with £5m grant	0	7%	6.1%	7-6.1%
ii) with £7m grant	0	10%	6.9%	10-6.9%
e) Total CAPEX				
i) no grant		20.1	15.4	20.1>15.4
ii) with £5m grant		12.7%	32%	12.7-32%
ii) with £7m grant		24.7%	39.5%	24.7-39.5%
f) Revenue (Full Scheme)	No	Yes (£2.2 m/yr)	Yes (£1.8 m/yr)	Yes (£2.2 >£1.8 m/yr)

4.4. **Table of Capital Cost Summary.**

Baseload supply technology	**CHP + GSHP £K**	**Biomass Boilers £K**
DH Network (steel)	7,428	7,428
Heat substations, HIUs & metering	1,515	1,515
Private Wire network	942	0
Energy Centre	6,042	3,709

Utility connections (gas, power, water, drainage, telecoms)	447	107
Thermal Store	139	139
Development costs[12]	1,725	1,110
Contingency (10%)	1,824	1,401
Total capital costs £K	**20,061**	**15,408**

4.5. **Table of Economic Modelling.**

Item	*unit*	GSHP/CHP	Biomass
Total CAPEX (full scheme)	£m	20.1	15.4
Total REPEX (full scheme)	£m	8.7	6.8

[12] *Including detailed engineering costs, professional fees, project management, and project development*

Total OPEX (full scheme)	£m/yr.	1.2	1.3
Annual revenue (full scheme)	£m/yr.	2.2	1.8
Gross margin (full scheme)	£m/yr.	1.0	0.5
Consumer heat tariff costs (full scheme[13])	£/MWh	57.5	57.5
Total connection fees	£m	2.4	2.4
NPV (25 yr @ 3.5 %)	£m	0.1	-3.6
IRR (25 yr)	%	3.5 %	1.1 %
Social IRR (25 yr)[14]	%	3.4 %	2.5 %
LCOE (25 yr)	£/MWh	75.8	90.2

4.6. The techno-economic analysis shows a marginal economic performance for the Ground Source Heat Pump (GSHP) / Combined Heat and Power (CHP) hybrid option with a 3.5 % IRR (25-year) for the base case, with a worse result for the biomass option at 1.1%. These figures account for social costs of climate changes as per HM Treasury guidance

4.7. Whilst there are potential opportunities to improve economic performance there are also risks to it. As such, it is anticipated that grant support, notably from HNIP, will be required if the project is to proceed. For the GSHP / CHP hybrid option £2.6m grant would be required to achieve 5% IRR, £5m for a 7% IRR and £7m for a 10% IRR. It is anticipated that these values would fall below state-aid constraints and that

[13] Average across all consumers to the wider community and society as a whole. The calculation includes net impact on heating costs, carbon emissions and air quality.

[14] Social IRR accounts for impacts accrued to the heat network operator and those connected to the networks, as well as

the project, in principal, could be structured as a publicly or privately funded project (or a combination). The project structuring options have not been explored and this would need to be considered in any further work.

4.8. In principal, it is considered that the project could be supported by HNIP, but it should be noted that this is an open and competitive process and is time-limited with an application for the DPD to be submitted by end of December 2019.

Cost Benefit Analysis

4.9. For the financial elements of the analysis the reader should refer to the full feasibility study and relating appendices. The conclusion being that Option 4 is preferable.

The Preferred Option

4.10. Option 4 – Facilitate & fund DPD with GSHP/ CHP
(with option to revert to Biomass should indications from the DPD suggest GSHP is not feasible).

5. <u>The Commercial Case</u>

For a full commercial case on the study please refer to the DHFS and associated appendices.

<u>6. The Financial Case</u>

6.1 The proposal is for Bromsgrove District Council to facilitate and part fund the subsequent stage of the district Heat Network project and take this onto Detailed

Project Development phase (DPD). £75K [15]is required from BDC in order to commit to the DPD stage and allow the project to release further potential.

6.2 The DPD will cost an estimated £250k and will consist of a test borehole, full lifecycle project management, the DPD report. It should be understood at this point that the borehole is an intrinsic part of understanding the future of the project. Although British Geological Survey Data has been used in the analysis of the feasibility report, until a borehole is taken, much of the costings remain uncertain as the actual geology of the land is not known. In saying this, the survey data s robust and is very likely to represent the actual ground conditions.

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Funding from Stakeholders	£10K to date
Remainder to Fund	*£75K*

7. The Management Case

7.1 The bid to HNDU will also request specialist project management support for this project for which full funding from HNDU is available. Officers feel this is necessary in order to deliver on the technical and specialist nature of this project.

[15] This amount is anticipated to be reduced following confirmation that the project will move to DPD stage as Bromsgrove School has showed a financial commitment of £10,000 and Worcestershire Health & Care NHS are seekgin board approval for a similar amount.

7.2 A Project Board will be formed in order to deliver on the high level strategic elements of the project together with a Project Team that will be responsible for the day to day delivery of the project.

7.3 The project manager (PM) will be responsible for managing and monitoring the risk register associated with this project and elevating issues as they arise to the Project Board.

8. Next Steps

If the business case is successful in securing the £75K required, Officers will complete the application to HNDU for the DPD stage of the project and consequently look to recruit and appoint a suitable PM via the necessary mechanisms.