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Report of the Strategic Director Corporate Services to the meeting of the Environment and Waste Overview and Scrutiny Committee to be held on 28 February 2017.

AB

Subject:

Civic Quarter District Heat

Summary statement:

This report sets out the progress made towards achieving the councils ambition to develop a City Centre based District Energy Network supplying low carbon heat and electricity on commercial terms to City Centre civic buildings, other public sector buildings and commercial properties.

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Overview & Scrutiny Area:
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1. SUMMARY

This report sets out the progress made on achieving the councils ambition to develop a City Centre based District Heat Network supplying low carbon heat on commercial terms to City Centre civic buildings, other public sector buildings and commercial properties. The report summarises the progress made so far, changes to the network from the initial proposals, next steps and likely delivery timelines (A glossary of technical terms is included in Appendix 1).

2.0 BACKGROUND

District Heat Networks (DHN) offer an opportunity to create significant new long term secure income streams and contribute to corporate cost reductions.

UK government has identified DHN as a significant contributor to reducing UK GHG emissions and as a component in the transition to low carbon energy. BEIS (Formally DECC) is playing an enabling role and making financial and technical resources available to support project development.

In 2010 Bradford Council agreed to reduce its carbon emission from its own activities and for the District by 40% by 2020. The Council also agreed a target of 20% for energy for delivery of its own functions to come from renewable sources (Council March 2010)

Executive considered a renewable energy report on 3 May 2013. This presented a discussion of the Link Member Report Bradford Power 2020 and Beyond, Renewables Future for Bradford Council and set out the Councils approach to deploying a range of renewable electricity and heat projects. The Report set out progress to date on a number of renewable technology projects deployed across Council assets and includes the case for use of biomass systems. Executive endorsed this approach.

Funding from the Heat Networks Delivery Unit (Part of BEIS) has allowed us to commission consultants to undertake a technical and economic feasibility of a number of DHN scenarios using Civic Quarter as an anchor estate for the scheme and complete the current level of design work. We have also been successful in bidding for funding that will help us to develop the legal and commercial structure and documentation and the detailed financial case.

2.1 Network extent and Future proofing

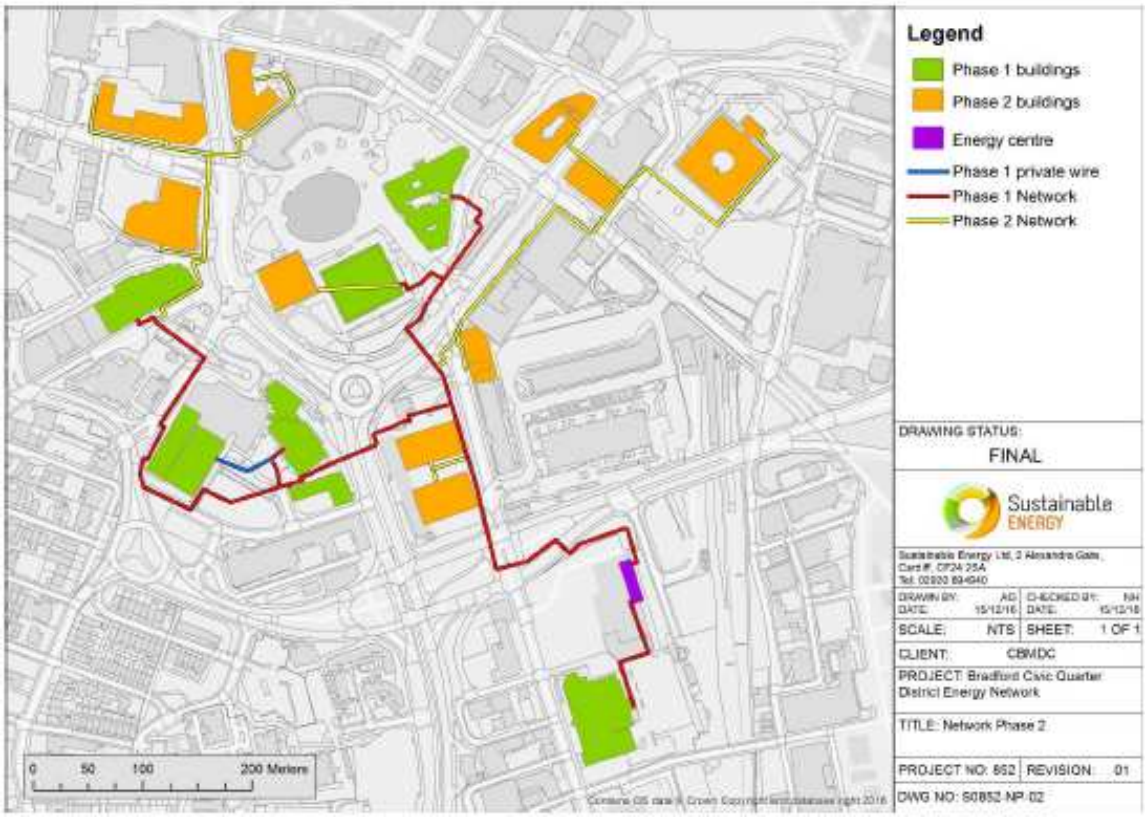

Fig 1

Rank	Building Name	Annual heat demand (kWh)	Peak heat demand (kW)	Notes
1	Odeon Building	2,136,960	1,614	Modelled energy demand based on information provided by developer's engineer
2	City Hall	1,489,498	1,782	Actual data from 2014 / 2015
3	Jurys Inn	1,385,280	463	Benchmarked energy demand based on similar buildings
4	Nelson St Police Station	1,371,036	303	Actual data from 2015 / 2016
5	Magistrate's Court	1,163,186	1,094	Actual data from 2013 / 2014
6	Combined Courts Building	1,050,900	989	Actual data from 2013 / 2014
7	Alhambra Theatre	1,038,558	1,026	Actual data from 2015 / 2016
8	Provident Building	705,282	663	Benchmarked energy demand based on similar buildings and very limited data provided by building owner
9	Margaret McMillan Tower	646,013	891	Partial data from 2015 / 2016
10	Britannia House & Argus Chambers	551,504	1,219	Actual data from 2015 / 2016
11	Public Service Hub Phase 1	522,911	492	Benchmarked energy demand based on high level development information
12	Public Service Hub Phase 2	522,911	492	
13	City Exchange	509,049	153	Benchmarked energy demand based on planning information
14	One City Park	470,620	443	Benchmarked energy demand based on high level development information
15	West Yorkshire Pension Fund	381,149	359	Actual data from 2015 / 2016
16	Sir Henry Mitchell House	337,601	509	Partial data from 2015 / 2016
17	St George's Hall	315,893	162	Actual data from 2015 / 2016
	Total	14,598,351	7,221 (diversified)	

Fig 2

The planned network is shown in Fig 1. This highlights the expected location of the energy centre, though this may be subject to change depending on demands for the current site at Nelson St. Fig 2 shows the buildings on the network that have been engaged as part of the stakeholder programme and have expressed an interest in District Energy and have engaged with the development process. The network is designed to meet the heat requirements of these buildings plus an additional 30% of headroom for further expansion.

2.2 Changes to the network

Since the initial feasibility work was previously presented to this committee and also Executive there have been changes in the likely extent. These are primarily:

- The loss of the In-Communities social housing to the south of the network. In-Communities were unable to commit to the project.
- The loss of the city centre swimming pool.
- The addition of electricity consumers Wardley house and the Ice Rink.
- The addition of other public sector buildings, Magistrates Court, Combined Court and Trafalgar House.
- The addition of private sector businesses Juries Inn, Provident and Almondbury House

These changes have changed both the capital cost and the financial income and expenditure model. This information is attached in appendix 1.

2.3 Current priorities and Next Steps

In December 2016 a potential source of capital finance became available. This European Regional Development Fund money is being administered as European Structural and Investment funds and there is £16M available for low carbon projects in the city region. Officers have prepared and submitted a bid for 50% of the capital cost requirement of the project.

TASK	DEADLINE	NOTES
Complete ESIF outline bid and submit to management for approval (Stuart ME & Ben M)	Completed 10th Feb	JBA consulting has been commissioned to carryout bid writing. Bid based on current business case
Submit bid to LEP	Completed 17th Feb	Outline bid expected review period up to 6 months. Response expected by June/July at latest
RIBA stage 1 & 2	31st March	
RIBA stage 3	14th April	
Submit planning applications	11th April	Energy centre & pipe network
Planning application completed	18th July	
ESIF Detailed business case application	August	3-6 months to confirmation of bid success
Executive Report	October	

Table 1

2.4 Reading the Feasibility Report

Officers will present a summary, at the meeting on 28th February 2017, of the current development proposals, options and financial models and will be available to answer detailed technical questions and expand on headline data.

It is acknowledged that a project like this is essentially technical in nature and the feasibility report has content that is difficult to interpret. The notes below should help to navigate the reader through the report.

The challenge for the consultants in developing and designing the energy network for Bradford City Centre includes:

- Agree the range of civic, other public sector and commercial building scoped in to the study. This has been particularly difficult as the council has actively reduced the size and complexity of its own estate whilst stimulating redevelopment of other sites.
- Develop an energy consumption model that profiles heat and electricity consumption across a diverse range of buildings to optimise energy demand across the 24 hour day and over 365 days of the year. The skill in design comes from reducing where feasible spikes of consumption with high demand or energy surpluses at times of low demand. The Civic Quarter building scope includes traditional office uses, leisure buildings, some residential, hotel and domestic which helps to provide this optimal demand profile.
- Site the energy production facilities, biomass boiler and gas Combined Heat and Power engines, in a location that enables optimal energy, particularly heat flows around the network, minimising losses in transmission. This includes the design of a hydraulic flow model that takes heat (hot water) through a pipe network of different sizes over a distance of hundreds of metres, taking in to account sub-ground conditions, other services and highways issues.

The Bradford Civic Quarter District Energy Study Revised Feasibility Report covers these complexities and provides a headline summary of technical design, cost and output issues addressed.

1. The consultants scope Page 2:
    - Review impact of removing Nelson Street leisure centre from scheme
    - Options appraisal – reconsider phasing
    - Assessment of energy generation and distribution systems
    - Update of high level financial model
    - Assess requirement for grant funding
    - Identify risks & opportunities

The section, pages 3-18 considers the range of buildings in scope and their energy demand profiles and tables technical risks and issues associated with potential network connections for each site.

In designing the capacity of the network it has been important to consider potential growth

in both commercial and residential demand within the civic quarter and a wider geography. Designing a network with headroom for future expansion enhances resilience but the costs of building out extra capacity must be weighed alongside opportunities for securing future energy supply contracts. Pages 19-22 set out future proofing options

Pages 23-28 look in a little more detail at pipe routes and issues identified. This includes modelling to optimise energy flows around the network and key sub-ground issues, things like Bradford Beck or cable congestion. In addition the report considers the linear heat density i.e. how the demand changes across the actual pipe route as heat is shipped from building to building. Again this is about minimising transmission losses and balancing supply and demand at peak and other times.

2. Consideration of building in scope Pages 3-11
    - Includes changes from original 2015 study, bringing estate up to date as at January 2017
    - Setting out headline energy data availability
3. Key Heat and Electricity demands across agreed buildings Pages 12-18
    - The tables consider:
        - overall energy demand as this determines the generation capacity of the system equipment
        - Peak energy demand, which informs designers about the system demand spikes where generation capacity needs to be provided but for limited duration

4. Maps show development areas and other future potential Pages 19-22

5. Maps and text identify pipe route hazards and heat density diagram Pages 23-28

Development Phasing

The original feasibility work considered options for a phased build-out initially across the civic estate and a limited number of adjacent buildings progressing then to an expanded network with wider commercial energy off-takers in supply.

Keys issues explored include the relatively costs and benefits of infrastructure and energy capacity for a multi-phase development programme. In effect the capital investment requirements for phase 1 spread across income and energy savings models are disproportionately higher than when modelled for a single build-out project.

The section of the report, Pages 29-53 sets out 2 scenarios or development phases, considers the energy demand models, impacts of energy pricing, headline financial costs and return, future proofing, system viability issues and risks.

6. Tables setting out tariffs, rates and assumptions for council, other public and commercial customers which underpin the detailed modelling. Pages 30-33

7. A summary of the network connections energy demand profile graphs for

annual consumptions patterns are shown. It is clear that electricity demand is relatively constant across the annual cycle but has daytime peaks within each 24 hour period. Heat has a clear seasonality pattern to demand as well as shifts in demand within a 24 hour cycle. Pages 34-42

8. The graph on page 39 shows the proportion of energy demand met by the Gas CHP and biomass generation capacity within the system.

9. A summary is provided of energy demand, capital development costs, impacts of grant aid and return on investment for a phase 1 limited development Pages 40-42. Future proofing issues and network viability are considered. The impacts of "up-front" capital investment for a limited network development are shown clearly in the table in page 40. The simple return on capital is pushed out to 15-20 years and gives modest Internal Rates of Return. The network at this scale is viable as a long term energy proposition.

10. A presentation of data is set out for a second scenario which is for an expanded Civic Quarter development Pages 43-52. The summary business case for this scenario on page 49 shows a significantly improved business model. Whilst the scale of investment is greater the rate of return improves. The proposed network is viable at this scale and over a minimum 40 year lifecycle offers returns on the investment. The potential of capital grant aid further improves the viability.

The Report concludes with a brief summary review of key opportunities Pages 54-58. It sets out next steps at page 59; this should be read in conjunction with Table 1 at 2.3 above.

11. A consideration of battery storage for electricity is given Pages 56-58. This has the potential to offer interesting business opportunities beyond standard system supply. There is currently financial value to be unlocked from energy players who can offer grid demand management capacity, associated changes in the Capacity Market and triad revenue.

3. FINANCIAL & RESOURCE APPRAISAL

The development of the project to date and the headline business case has been presented to Strategic Director Corporate Services (Director of Finance) and will include continuing discussions with capital finance team as the project team prepares a final submission for Executive approval.

Work to develop and set out a detailed financial operating model will be commissioned. This will include development of revenue budgets for an operating network including options for Customer relationship Management (CRM).

5. RISK MANAGEMENT AND GOVERNANCE ISSUES

The Feasibility Report sets out project risks and mitigation. The continuing development of the CQDHN will follow the council's standard capital project governance structure.

The property implications for the proposals have been presented to the councils Property Board in January 2017.

6. LEGAL APPRAISAL

A suite of legal documentation appropriate to the development and operation of the network will be commissioned. This will include for example commercial energy contracts. In addition the legal aspects of any regulatory compliance will be undertaken.

7. OTHER IMPLICATIONS

7.1 EQUALITY & DIVERSITY

N/A

7.2 SUSTAINABILITY IMPLICATIONS

The Civic Quarter District Heat Network will contribute to delivering a more sustainable Bradford District by developing a local energy generation supply chain enhancing resilience to global energy market price forces and mitigating some price rise impacts.

The project is consistent with the Councils Climate Change Strategy and contributes to climate change mitigation by reducing greenhouse gas emissions.

7.3 GREENHOUSE GAS EMISSIONS IMPACTS

The Council reported 19000 tonnes of CO_2 emissions for the reporting year 2015/16 under Carbon Reduction Commitment. The expanded network as proposed identifies about 2000 tonnes of CO_2 emissions savings. This contributes an additional reduction in annual corporate emissions for the council of 10% and will bring the Council to around a 37% reduction from corporate energy use by 2020.

7.4 COMMUNITY SAFETY IMPLICATIONS

N/A

7.5 HUMAN RIGHTS ACT

N/A

7.6 TRADE UNION

N/A

7.7 WARD IMPLICATIONS

The Civic Quarter District Heat Network will be delivered in City and Bowling & Barkerend wards. Public sector, commercial and domestic energy consumers may be impacted.

7.8 AREA COMMITTEE ACTION PLAN IMPLICATIONS (for reports to Area Committees only)

N/A

8. NOT FOR PUBLICATION DOCUMENTS

Appendix 1: Updated feasibility study The Bradford Civic Quarter District Energy Study Revised Feasibility Report

9. OPTIONS

None

10. RECOMMENDATIONS

Recommended -

That members note the progress made on development of the scheme, its technical scope and current delivery timetable.

11. APPENDICES

Appendix 1 – **CONFIDENTIAL NOT FOR PUBLICATION** Updated feasibility study The Bradford Civic Quarter District Energy Study Revised Feasibility Report

Appendix 2 Glossary of terms

12. BACKGROUND DOCUMENTS

None

Appendix 2 Glossary of terms

• DHN – District Heat Network, pipes in the ground that move heat between buildings, central heating for cities

• CHP – Combined Heat and Power, an engine that burns gas to produce electricity and the waste heat is captured and used

• Load – the amount of heat required by the system at any time

• Base Load – the typical load required during periods of light use of the system

• Peak Load – The highest heat requirement at any point of the day, week, month or year

• Heat exchanger – a device that allows heat to be moved in to or out from the DHN without having to mingle the fluid that the heat is being carried in. Allows systems to operate at different temperatures and pressures

• Heat Interface unit – See Heat exchanger

• Heat Meter – measures the flow rate of heat carrying liquid and the temperature difference allowing accurate billing for every unit of heat consumed

• Boiler – burns fuel to provide heat

• Biomass – usually wood fuel, either in chipped form (cheaper) or industrially formed into pellets (more compact and consistent quality). Can also be straw, miscanthus or other fuel crops.

• Energy From Waste (EFW) – a facility that combusts municipal waste and harnesses the heat to generate electricity, heat left after this process can be distributed via a DHN

• Losses – energy lost during distribution through heat leakage or electrical resistance

• Private Wire Network (PWN) – a privately owned and operated electricity distribution network

• O&M – Operation and Maintenance – the team or mechanism that keeps the technical equipment running smoothly

• CRM – Customer Relations Management – the team or mechanism that deals with customers including billing, complaints and new customers