

Report to: Cabinet
Date of Meeting: 30 September 2020
Public Document: Yes
Exemption: None
Review date for release None



Subject: **Towards Zero Carbon Development in the West End**

Purpose of report: To set out the key issues associated with achieving large scale zero carbon development in the West End of the District
To provide an overview of the results of a recently completed feasibility study
To seek endorsement for the principle of submitting a funding application to the Heat Network Investment Programme

Recommendation: **It is recommended that Cabinet;**

- Notes the findings of the feasibility study and the key issues associated with achieving zero carbon development at Cranbrook and Skypark.
- Endorses the principle of submitting a funding bid to the Heat Network Investment Programme
- Receives a further report setting out a proposal for the role that Council can play in enabling the delivery of zero carbon development including the investment case

Reason for recommendation: To ensure that there is a clear pathway for achieving large scale zero carbon development in the West End of the District.

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Portfolio Holder: Portfolio Holder Economy and Assets

Financial implications: The recommendations contained in the report do not have direct financial implications at this stage, however the further paper to be presented to Cabinet as detailed in the report will present a financial business case that it is intended for Cabinet and then Council to consider.

Legal implications: The recommendations contained in the report do not have any direct legal implications requiring comment. There may be legal implications arising going forward but these will be addressed in future reports where appropriate.

Equalities impact: Low Impact

Climate change: High Impact

The vision for Cranbrook to develop as a zero carbon town is clearly stated in the Cranbrook Development Plan Document. This project has the potential to secure carbon savings in the order of 20,000 tonnes per

year. This equates to around two thirds of the Council's own carbon emissions and represents the project with the greatest potential to deliver large scale carbon savings in the District.

Risk:

High Risk

This is a complex project involving a wide range of different actors, both public and private. The role for the Council is potentially multi-faceted, from regulatory through to becoming a potential investor. A further report will be required to set out in detail the role that the Council can play including establishing any investment case. This will require all relevant risks to be identified and managed.

Links to background information:

[Zero Carbon Development in the West End, Cabinet Report July 2019](#)
[Cranbrook Development Plan Document](#)
[The Future Homes Standard: changes to Part L and Part F of the Building Regulations for new dwellings](#)
[Cranbrook Heat Networks Detailed Feasibility Study](#)

Link to [Council Plan](#):

Outstanding Place and Environment
Outstanding Homes and Communities
Outstanding Economic Growth, Productivity, and Prosperity
Outstanding Council and Council Services

1. Background and context

1.1 In recognition of the large scale and long term nature of the developments in the West End of the District, the need to factor in increasingly stringent environmental and carbon performance standards has been a key tenet of the adopted approach. In the case of Cranbrook the initial planning took account of the Code for Sustainable Homes and the anticipated timetable for progressing to Code 6 and net zero carbon development in 2016.

1.2 Element Energy were commissioned in 2008 to undertake a study to understand how best to meet these more demanding standards over time. This study demonstrated that it would be much more cost effective to install a district energy network to meet the zero carbon standard rather than rely on fabric and renewable energy measures on each home. Subsequently a requirement for all homes to be connected to a district heating network became a key part of the planning strategy for Cranbrook and the neighbouring Skypark commercial development. Funding made available by the Regional Development Agency to bring forward key infrastructure (such as St Martin's school) was also made contingent upon this network being rolled out.

1.3 Following a competitive exercise EON were selected by the Cranbrook developer consortium as the preferred energy company/operator for the network and an 80 year concession agreement was negotiated. It should be remembered that such a large network on a relatively low density greenfield site had never been delivered before in the UK. This was very much viewed as a 'lighthouse' project and significant public sector investment was required to make the scheme viable. This took the form of a £3.8m grant from the government's Low Carbon Infrastructure Fund plus a further £100k each from the Council, County Council and City Council.

1.4 A second network serving the Monkerton/Pinhoe/Mosshayne area together with the Science Park was negotiated in 2013. This was achieved on a purely commercial basis with no grant. Together there are now over 100km of heat pipe in the ground with a capex of circa £50m. The first permanent energy centre at Skypark was commissioned in 2013 and a second energy centre, currently under construction at Monkerton, is due to be commissioned later this year.

1.5 Ultimately it is expected that over 12,000 homes and 2m sq.ft of commercial space will be served by these networks. Given the length of the concession agreements this is a long term

commitment. It should also be remembered that these heat networks are effectively local monopolies – it is only EON that can supply the heat and, unlike the electricity network, there is no ability for heat customers to swap to a different provider. Price controls and wider service guarantees therefore form an important part of the concession agreement

2. Current Position

2.1 The wider legislative backdrop for and pathway towards zero carbon development has been set back in the intervening period since construction of Cranbrook started in 2011, not least through the abolition of the Code for Sustainable Homes and the scrapping of zero carbon homes target in 2015. During 2019 the Government did commit to there being no fossil fuelled homes from 2025. This is to be enshrined within a new 'Future Homes Standard' for new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency.

2.2 The Government consulted on proposed changes to Part L '*Conservation of fuel and power*' of the Building Regulations during October 2019. To meet the Future Homes Standard by 2025 it was recognised that industry will need to develop the necessary supply chains, skills and construction practices to deliver low-carbon heat, and highly energy efficient new homes. The first steps in facilitating these changes is to provide a clear vision for implementing the Future Homes Standard and to set an ambitious uplift to the current energy performance requirements in the Building Regulations for new homes.

2.3 Two options were set out for tightening Part L of the Building Regulations during 2020 as follows;

Option 1: 20% reduction in carbon emissions compared to the current standard for an average home. It was anticipated this could be delivered by very high fabric standards (typically with triple glazing and minimal heat loss from walls, ceilings and roofs).

Option 2: 31% reduction in carbon emissions compared to the current standard. It was anticipated that this could be delivered based on the installation of carbon-saving technology such as photovoltaic (solar) panels and better fabric standards, though not as high as in option 1 (typically double not triple glazing).

It was made clear that Options 2 was the preferred option.

2.4 In relation to district heating the consultation document included the following paragraph;

Heat networks (sometimes referred to as district heating) are a distribution system that takes heat from a centralised source and delivers it to a number of different buildings. These heat networks also form an important part of our plan in the future of low carbon heat, in particular in cities and high-density areas. Heat networks can decarbonise more easily compared to most other heat sources because new technologies can be added to the system with little disruption to individual householders. They provide a unique opportunity to exploit larger scale, renewable and recovered heat sources that can't be accessed at an individual building level. Heat networks also provide system benefits such as thermal storage and reducing the energy demand of the grid at peak times. It is estimated by the CCC that around 18% of UK heat will need to come from heat networks by 2050 if the UK is to meet its carbon targets cost-effectively. We expect that heat networks will have a strong role to play in delivering low carbon heat to new homes in future

2.5 Whilst the government's response to the consultation has been delayed due to the impact of the Covid-19 pandemic, the direction of travel is clear. This includes in relation to the introduction of the Future Homes Standard and the expectation that an average home built to it will have 75- 80% less carbon emissions than one built to current energy efficiency requirements (Approved Document L 2013). Equally the expectation is that this will be achieved through very high fabric standards and a low carbon heating system. In the words of the consultation, this will ensure that new build homes will be 'will be fit for the future, better for the environment and affordable for consumers to heat'.

3. Cranbrook/Skypark District Heating

3.1 It is in this context that the district heating network at Cranbrook needs to be considered. Policy CB13 of the draft Cranbrook Development Plan Document sets out a policy to achieve the vision of delivering a truly zero carbon new town. This includes ensuring connections to an expanded district heating network. The availability of a decentralised energy network is a core sustainability credential. Clearly this in turn relies on a zero carbon energy source to provide both the heat and the power that is generated. This is particularly the case given the decreasing carbon factor of the wider electricity grid as, for example, coal is phased out and additional large scale offshore wind and other renewable electricity generating capacity is brought on stream.

Section 106 obligation

3.2 In recognition of the need to ensure that the district heating network would meet increasingly stringent carbon performance standards for the first 2,900 homes at Cranbrook, the s.106 agreement attached to the planning permission for the EON energy centre at Skypark included the following provisions;

1. The Facility is to be a solid biomass Combined Heat and Power (CHP) system with supplemental gas boilers and supplemental gas combined heat and power engines (definition of District Heating Facility).
2. Clear direction that the facility shall supply 'heat' to the whole of both Cranbrook and Skypark (paragraph 6.1).
3. Clear direction that the biomass CHP shall be constructed as part of the Facility (para 6.3). It is acknowledged that temporary facilities may have needed to be provided during construction depending how quickly Cranbrook / Skypark developed (paragraph 6.2) but this didn't avoid the need to construct the facility with the biomass CHP as part of it.
4. The Facility needs to be supplying 'heat' to the majority of the buildings granted permission at Cranbrook and Skypark prior to or at occupation of 2,000 dwellings at Cranbrook (definition of Fully Operational and paragraph 6.6).
5. By the same time, the biomass CHP needs to be of sufficient capability (capacity) to be able to supply electricity (2MWe) and heat (2.4MWth), although the latter is predicated on the demand for the heat being sufficient to warrant the capability (paragraph 6.4).
6. If the heating demand is such that running the biomass CHP would result in '*wasting excessive quantities of heat*' then the supplemental gas boiler / gas combined heat and power engines can be used to provide heating to Cranbrook (paragraph 6.5). Once there wouldn't be excessive wasted quantities of heat then the biomass CHP should be used to provide the base heat load with the supplemental equipment being used to provide heat at peak times or during maintenance / repair of the biomass CHP.

3.3 Of particular significance is the 2,000 occupations trigger which has recently been met at Cranbrook. In anticipation of reaching this trigger work has been ongoing over the past two years to understand whether there is a technically and financially feasible solution to meeting the obligations of the s.106 agreement - essentially a solid biomass fuelled combined heat and power plant capable of generating 2MW electric and 2.4 MW thermal.

3.4 With the benefit of further technical advice there is acceptance that the gasification and pyrolysis technologies, which it was hoped would be scalable to 2MW as well as being more efficient and lower cost than traditional steam based technology, have not matured sufficiently in the decade since the s.106 agreement was negotiated to provide a reliable way forward. However, the expansion of Cranbrook to circa 8,000 homes in line with policies set out in the Local Plan and Cranbrook Development Plan Document and the potential for further strategic development coming through the next Local Plan provides an opportunity to reconsider the strategic basis for the choice of technology.

3.5 A report considered by EDDC's Cabinet in July 2019 ([Zero Carbon Development in the West End, Cabinet Report July 2019](#)) sought authority to commit funding of up to £30k to support an

application to Round 9 of Heat Networks Delivery Unit funding. The Heat Networks Delivery Unit (HNDU) is part of, and directly funded by, the Department for Business, Energy and Industrial Strategy (BEIS). The bid was submitted and was successful. Subsequently a detailed techno-economic study was commissioned from consultants WSP.

4. Techno-economic study

4.1 WSP were commissioned in December 2019 to undertake the techno-economic study. The primary aim for this feasibility work was to build from the existing strategy work that has been undertaken to date and to create a framework for achieving zero carbon development for Cranbrook/Skypark and provide a clear pathway for supporting the large scale delivery of zero carbon development that will ultimately comprise around 8,000 homes and 1.4 m sq. ft. of commercial space. The study addressed a number of key areas including;

- heat demand
- energy source(s)
- choice of technology(ies)
- heat network pressure/temperature regimes
- associated cost/project economics/techno-economic cash flow modelling
- funding requirements
- risks.

4.2 The study identified 6 potential local heat supply opportunities of which 3 were modelled in detail. These were;

- The energy from waste (EfW) plant at Hill Barton
- The convertor station for France-Aldernay-Britain (FAB) project connected to a water source heat pump
- Solar thermal with seasonal pit thermal storage

The first two of these involve harnessing waste heat. With regard to the FAB project two sub-options were identified – with and without a second energy centre.

4.3 The overall energy balance from the four scenarios is set out below. This includes accounting for the energy consumption required to run gas boilers and/or heat pumps in order to raise temperatures, meet peak demand and account for periods when the primary heat source is not available.

Energy Balance Results

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Primary Plant	EfW	FAB Link	FAB Link	Solar Thermal
Thermal MWh _{th}	15	9	9	30
Heat output				
Primary heat source output (MWh)	62,187	50,634	51,365	56,269
ASHP output (MWh)	5,685	12,111	12,469	5,958
Gas boiler output (MWh)	3,106	6,643	6,656	8,823
Proportion of low carbon heat supplied	95.6%	90.4%	90.6%	87.4%
Carbon emissions				
Emission savings over 25years, compared to gas boilers	83%	78%	78%	83%

4.4 Overall it can be seen that very substantial carbon savings could be achieved equating to around an 80% reduction relative to using gas boilers.

5. Assessment

5.1 The feasibility study demonstrates that it is possible to secure large scale carbon savings by utilising alternative technologies to the biomass solution that was originally negotiated a decade ago. These would support both the large scale delivery of new zero carbon development as well as contribute to decarbonising the existing network.

5.2 The study includes a detailed techno-economic model. This highlights that the minimum capital cost of the assessed options is circa £60m. Whilst the Energy from Waste connection option has a positive cash flow and rate of return, grant aid is likely to be needed to raise this to the level of a commercial return. Discussions have been ongoing with the Department for Business, Energy and Industrial Strategy with a view to submitting an application to the Heat Networks Investment Programme (HNIP) – a £320m capital programme designed to support the roll out of district heating networks and to secure carbon savings.

5.3 As well as the choice of technology the results of the study raise a number of wider questions, particularly;

What role does the Council need to play? It is possible to identify three specific aspects to the role that the Council can play going forward;

Regulatory – this includes setting the policy framework, determining planning applications and resolving the position with regard to the current s.106 agreement and associated obligations.

Enabling – this includes bidding for grant funding support and brokerage in terms of bringing together various developer parties and securing an energy partner.

Investor – there is potential to develop an investment case and to consider how this aligns with the Council's own Commercial Investment Framework.

More widely consideration needs to be given to who provides long term support for the heat network customers after the development has finished and the developers have departed. Exeter City Council has established the Monkerton Heat Company to perform this role over the longer term and an equivalent structure may be needed for Cranbrook. The ability to pursue wider social objectives, including in relation to addressing fuel poverty for example, also needs to be considered. The relationship with our Local Authority partners including the County, City and Town Councils needs to form part of this wider consideration.

What is EON's role going forward? Clearly EON are the incumbent energy provider but the concession agreement is limited to the first 3,500 homes. Alongside addressing the current s.106 obligations consideration needs to be given to EON's appetite to continue to roll out the network to the expansion areas. Alternatively a different or additional commercial partner could be secured through a market engagement exercise.

5.4 These questions will need careful consideration to resolve. It is clearly essential that the final technological solution is cost effective and does not delay wider development programmes. But, with the potential to also secure grant funding, the opportunity is there to complete the journey that was started 10 years ago and to ensure that district heating performs a fundamental role in underpinning the sustainability credentials of both Cranbrook and Skypark.

5.5 It is a specific recommendation of this report that a further report is brought to Cabinet detailing the role that the Council can play alongside presenting any investment case. This will be on the basis that there is clarity on the future of EON and the potential for finding support from the HNIP programme. The role for the Council can then be presented including in relation to potential legal structures and any investment case.

5.6 Finally it is important to consider the counterfactual - in other words what the position would be if district heating had not been a requirement of the initial phases of development or of the DPD policy. In all probability this would have to lead to the installation of gas boilers in each home. These homes would then need to be retrofitted in the future on a house by house basis to meet decarbonisation objectives– to support an alternative fuel source or technology such as air source heat pumps. For the expansion areas each developer would need to bring forward

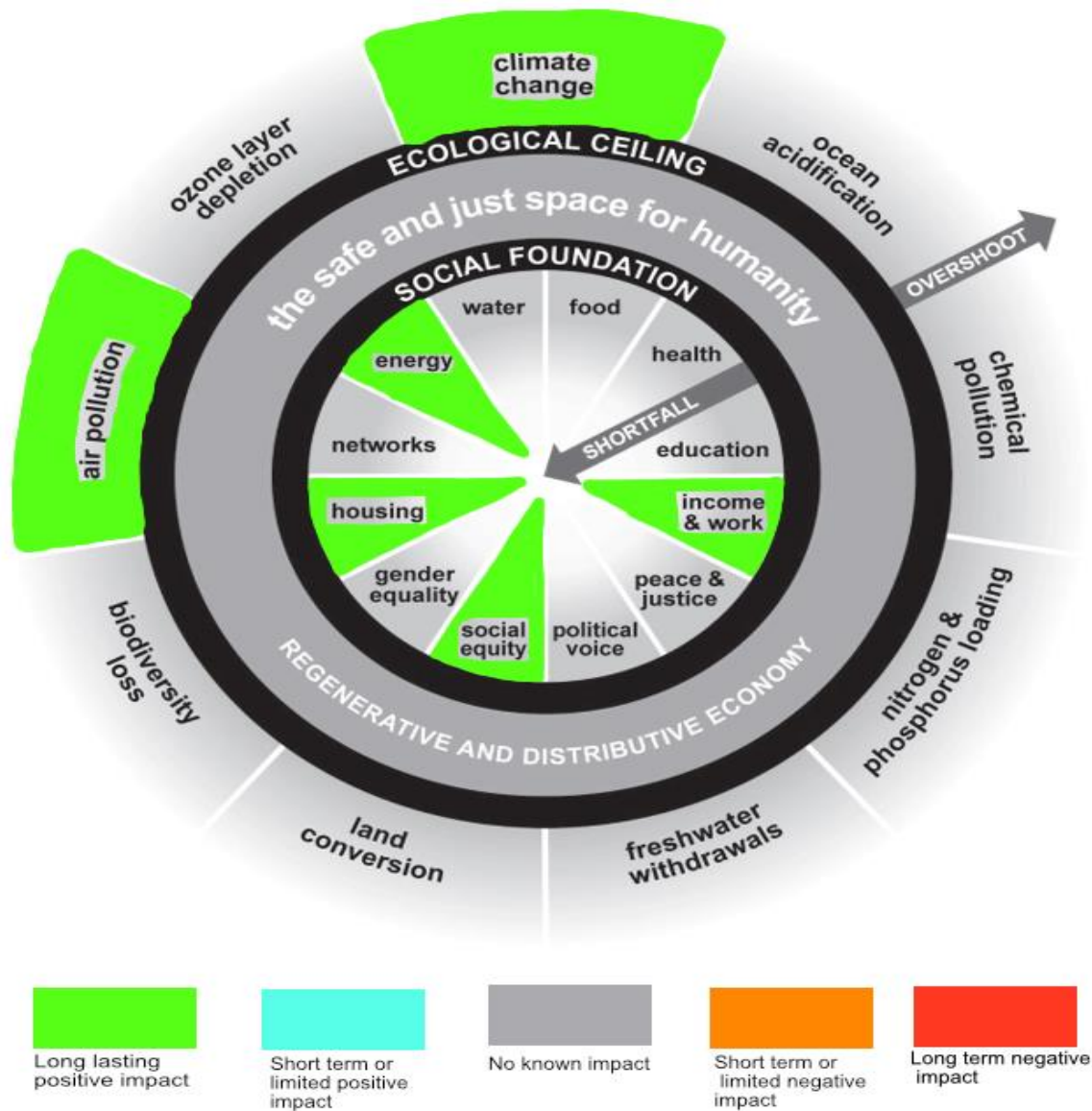
measures to meet the more demanding standards with the possibility that some homes delivered prior to 2025 would still be gas fired. Cumulatively a switch to air source heat pumps might raise the need to substantially reinforce the grid network potentially bringing additional cost and risk in terms of timescales.

5.7 This is also relevant to the consideration of the town centre proposals where there has been some discussion about installing a gas main in preference to connecting to the district heating network. This course of action would lead to a legacy of higher carbon development as each home would not benefit from the ability to decarbonise the existing network. Instead each home would need to be retrofitted individually at the expense of the home owner or landlord.

5.8 In order to bring these issues together and to provide a rounded assessment of the various considerations an appraisal has been undertaken based on the Kate Raworth Doughnut Economics model. This helps to show how projects and decisions will affect the environment and people. The model has two parts - the inner area of the doughnut focuses on social and economic issues. The outer ring focuses on environmental issues like greenhouse gas emissions and biodiversity.

5.9 The assessment is set out below. In framing this account has been taken of the;

- potential to secure large scale carbon savings in line with the vision for Cranbrook to develop as a zero carbon town
- potential for the Council's role to extend to ensuring that social objectives (such as in relation to fuel poverty) are addressed



5.10 The assessment shows significant positive effects, particularly if the Council’s role extends beyond securing carbon savings to addressing fuel poverty. This will be considered in further detail in the next report.

6. Conclusion

6.1 District heating is a key foundation of the sustainability credentials for Cranbrook. Originally this was in the context of increasingly demanding standards being introduced through the Code for Sustainable Homes. Arguably the significance of district heating has only increased in the context of a declared climate emergency, the need to support a green recovery and the forthcoming introduction of the Future Homes Standard. .

6.2 The current feasibility study demonstrates that it is possible to secure large scale carbon savings. Any solution will need to be cost effective and deliverable to a timescale that accords with wider development programmes. Careful consideration needs to be given to the role of both the Local Authorities and a commercial partner, be it EON or another company, in moving forward. A further report will be brought to Cabinet detailing the specific role that the Council can play.