To: EXECUTIVE MEMBER FOR THE ENVIRONMENT
26 APRIL 2022

AENEROBIC DIGESTOR INVESTIGATION & FINDINGS
Executive Director of Delivery

1 Purpose of Report

1.1 To outline the high-level feasibility work of building an Anaerobic Digestor (AD) plant in the Borough

2 Recommendation

2.1 That the Executive Member support a suitable developer / partner to invest in building or funding an AD plant in the Borough subject to site suitability and planning.

3 Reasons for Recommendation

3.1 The Council has commissioned a report on the building of an AD plant in the Borough. Whilst the project appeared to be financially viable it is a complex and costly development. The Council does not now have the means to borrow funding for work outside of its core responsibilities. Additionally, the skills to design and build an AD plant are not available within the Council.

3.2 The feasibility study (appendix A & B) was debated by the Climate Change Advisory Panel in February 2022. The recommendation form the panel was 'that members are in favour of the Council's proposal of establishing our own Anaerobic Convertor on the basis of a Public/private partnership.'

4 Alternative Options Considered

4.1 The funding and building of an AD plant does appear to be financially viable at a high level. However, this is not core business for the Council.

5 Supporting Information

5.1 The council, in formulating its Climate Change strategy, highlighted a deficit in the local production of renewable energy. This hasn't been an area of council focus, over and above the inclusion in new building schemes of PV Solar cells, and combined heating and power systems. However, the issue was highlighted as an area of development for the borough, by Friends of the Earth, in their borough-by-borough metadata assessment of local authorities, albeit that their assessment included retail green schemes.

5.2 The main areas for this work are Solar PV cells on an industrial scale (solar farms), which the council is also exploring, plus community wind turbines and community batteries. A hydroelectric solution would seem to be less viable for Bracknell Forest due to the lack of fast flowing watercourses. The council does use energy from waste, as one of the disposal routes currently employed by the council to dispose of

waste that would have ended up in landfill. The council also uses, via the re3 waste disposal partnership, Anaerobic Digestion to process its food waste. So, the benefit sought from this paper is looking at the possibility of diverting some or all of this biowaste to address this in borough strategic green power need.

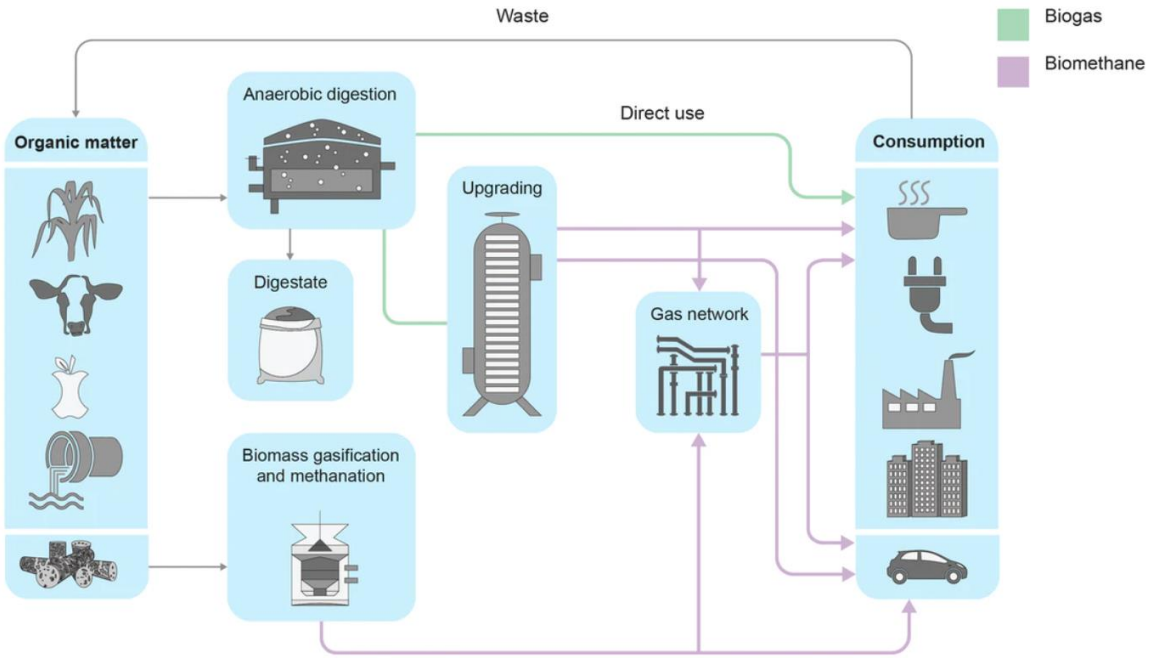
5.3 The disposal of food waste from the Borough is managed through the re3 partnership contract and is currently undertaken through a plant in Wallingford, Oxfordshire. These arrangements are contracted until 2031.

5.4 At COP26, 105 countries, including the UK, pledged to cut methane emissions by 30% by 2030. Significant amounts of this gas come from sources, such as livestock farming and decaying waste in landfill sites. The UK Anaerobic Digestion and Bioresources Association (ADBA) believes that "*… over 140 million tonnes of readily available organic wastes [is] still being left undigested in the UK every year. Left untreated, they release methane… directly into the atmosphere, which contributes to climate change and causes human health issues. Recycling these through AD instead means that these emissions are captured and the organic wastes turned into valuable bioresources, such as a storable, flexible green gas (biogas), a rich-in-nutrient bio-fertiliser (digestate), bioCO2 as well as other valuable bio-products. These products can help decarbonise carbon-intensive sectors such as heat, transport and agriculture*".

6. High level analysis

6.1 Anaerobic Digestion is a flexible technology for power generation. Plants can be built on many different scales, from large facilities treating sewage sludge or municipal waste, to smaller ones handling materials from a particular farm or a small community. Biogas, which is one of the end products of the AD process, is approximately 60% methane and 40% CO2 by volume.

6.2 This variation of biogas composition means that the energy content of biogas can vary; the lower heating value (LHV) is between 16 megajoules per cubic metre (MJ/m^3) and 28 MJ/m^3. One cubic metre of biogas at 60% methane content converts to 6.7 kWh energy. Biogas can be used directly to produce electricity, through a combined heat and power (CHP) unit, and heat or as a renewable energy source for cooking. Biogas is required to be upgraded for most uses and for injection into the gas grid as per the diagram below. https://www.iea.org/reports/outlook-for-biogas-and-biomethane-prospects-for-organic-growth/an-introduction-to-biogas-and-biomethane.



6.3 A single home uses an [average of 2,900kWh (£588 pa) of electricity and 12,000 KWh (£576 pa) of gas every year]. To scale this up, 2,000 houses would require circa 5,800,000 KWh (5,800 MWh) of electricity and 24,000,000 KWh (24,000 MWh) of gas per annum. 1 Kilowatt hour (kWh) is equal to 0.001 megawatt hour (MWh)

6.4 Feedstock is any input into an AD plant. In this example, for illustration, this report uses food waste as the feedstock for the calculations. The average village size is around [1]2,000 homes, and these would require ~0.7 MW_e electrical power or 5800 MWh_e/annum, which is around 17,000 tonnes of food waste (or other feed stock). This is just under the current annual re3 food waste tonnage of 19,000.

6.5 To build an electricity to grid AD plant would require circa £9m capex and a biomethane to grid circa £8.7m (excluding land costs). Opex costs would be circa £245k and £368k per annum respectively for a 19,000 tonne AD plant. Opex is made up of the day-to-day costs of running the plant. https://birchsolutions.co.uk/how-much-does-it-cost-to-build-a-biogas-plant/

6.6 If the energy is fed directly to a local settlement then additional costs of infrastructure would be required, and these would vary depending on location, type of energy, and distance from the plant to the relevant infrastructure. Clearly if this were a new settlement, the developer could include this within their scheme, however retrofitting would mean that the costs would either need to be picked up in the scheme development costs or could be a shared cost with the national grid.

6.7 In appendix B the report details the key characteristics of process configurations for two different size AD plants. Processing food waste from 19,000 tonnes p/a requires a land space of approximately 0.8 hectares. If additional feed stocks were sourced to increase that tonnage to 50,000 p/a then a plant would need to be sited on land of approximately 2.1 hectares. This size plant would generates circa 3 MWh of

[1] Broadly, a village tends to have a population of between 500 and 2,500, making it larger than a hamlet but smaller than a town - https://www.designingbuildings.co.uk/wiki/Village_definition

electricity, which could power up to 6,000 homes (11% of the borough's housing stock).

6.8 Currently, to supply the Wallingford AD plant, Re3 has 780 (65 per month) vehicle movements to transport the 19,000 tonnes of food waste. It is estimated to supply a plant to power 6,000 homes, would need circa 700 (14 per week) movement per year.

6.9 The table below shows the average unit rate price change per kWh for gas and electricity prices from 2019 to 2022 prices. Trend is upward.

	2019	2020	2021	2022*
Gas pence/kWh	1.94p	2.07p	2.52p*	2.82p*
HH Electric pence/kWh	09.88p day, 05.81p night	12.797p day, 9.94p night	14.63p day, 10.91p night*	16.68p day, 12.22p night*

Average kWh unit rates for gas and electricity between 2019 to 2022 *Estimated CCS Basket Average Rates

6.10 Finding a suitable location for the plant would be a major task for any project. The value of land would vary significantly but an estimation from the Property team suggests that a 2-hectare plot of land would be worth circa £9m.

7 Conclusions

7.1 In terms of assessing the general proposal, from a "doable" standpoint, this report confirms the assertion that the basic business case does hang together as a solution to local sustainable power generation. However, even though this report points to the achievability of the project, from this piece of work a number of fundamental questions still need to be answered and hurdles addressed.

7.2 On the positives, the economics of power generation are such that the plant would make economic sense and a good business investment opportunity. Broadly the scheme would need £18m for land and build costs, plus the cost of connecting to the grid or wherever the power was going to be deployed to. Clearly if a developer were to provide the land as part of their scheme, then the economic business case improves considerably and many of the barriers to the project would be overcome. It also makes sense from both a waste disposal standpoint; costs would be no greater than our current solution and savings would be generated with reduced road miles for disposal. The climate change credentials are very strong too, AD is seen as an efficient route to deal with biowaste and the associated greenhouse gas emissions that are methane; a gas that the UK has committed to reduce by 30%. A local solution that could be offered to agro-waste producers would, on a surface review, appear to be welcomed.

7.3 Of course the first consideration of this scheme is, should the council be engaged in this type of provision? Regardless of the finding of a pressure group, is this an appropriate space for a local authority to be engaged in? Is this something that the market could provide or with the council's help, something that the council could stimulate and nurture, rather than lead and provide?

7.4 That said, location is key, as the site will need to be acceptable to its neighbours, although its green credentials could help with this. Secondly the accessibility of the location, given the number of vehicle movements required to feed the plant. The plant will need 14 feedstock vehicle movements per week as a minimum, and this will pose an issue everywhere in the borough. A 1-hectare size plant would accommodate the Re3 waste, setting the land costs at £3m, plus access roads and connection to the grid (gas or electric).

7.5 The skills needed to bring this scheme forward are not currently within the council. Therefore, specialist resources would be needed to develop the project and a commercial partner would be needed to run the facility (which would eat into the yield). This may be a good idea, for which resources are not available to develop or properly client. Therefore, this should be a risk factor that should be weighed carefully in decision making and in granting authorisation of the next step.

8 Consultation and Other Considerations

Legal Advice

8.1 Nothing to add at this stage

Financial Advice

8.2 It is not possible at this stage to provide a detailed assessment of the potential financial implications to the Council of participating in such a proposal. As the report indicates, further specialist expertise would be required to undertake more detailed analysis of the high level options identified. In addition, recent and current consultations undertaken by CIPFA and DLUHC into proposed changes to the capital financing regime for local authorities have the potential to significantly restrict council investment in assets that are not directly related to core service delivery. Further consideration would need to be given to available options when these changes are finally confirmed.

Other Consultation Responses

8.3 N/A

Equalities Impact Assessment

8.4 N/A at this stage

Strategic Risk Management Issues

8.5 Council investment in an AD scheme would be a significant risk. This report is the potential start of a long, costly and complex process. Significant amounts of further work would be required prior to any formal decision being taken by the Council. To appoint the Councils Managing Partner, Atkins, to progress the project to develop a concept design, would incur fees in the region of £70-£80k (plus an additional circa £5k fees for Property Services to oversee and manage Atkins)

Climate Change Implications

8.6 To process the Borough's (and potentially other Authorities) food waste at a location closer than currently is a positive move in relation to climate change. A reduction of

miles travelled will result in a fuel and carbon saving. Using gas or electric generated by an AD plant is also a positive climate change impact particularly if done so locally.

Background Papers
Appendix A
Appendix B

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