To: Climate Change Advisory Panel
27 January 2022

Local Renewable Power Generation:
Anaerobic Digestion Plant High Level Feasibility
Executive Director of Delivery

1 Purpose of Report

1.1 To update Climate Change Advisory Panel on the outcome of the Atkins report into the high-level feasibility of building an anaerobic digestion (AD) plant in the Borough.

2 Recommendation

2.1 For noting by the Panel

3 Reasons for Recommendation

3.1 The building of an AD plant in the Borough would be a very substantial decision. Whilst the attached reports from Atkins give some high-level information, the Executive have acknowledged that our role in this work is limited to supporting the private sector by encouraging the market to provide a facility within the borough.

4 Alternative Options Considered

4.1 The council could choose to invest in alternative local renewable energy power generation, such as:

- Solar
- Wind turbines
- Hydroelectric
- Micro-nuclear
- Micro combined heat and power
- Hydrogen fuel cell

4.2 The project has discounted solutions that have been badged as local renewable energy power generation, which in fact have been retail solutions. Many councils have been credited with innovative work in this area, however many of these schemes are simply local retail solutions that are buying “green” energy on the open market and selling this locally at a profit. Now that the energy costs have changed due to supply side issues across Europe, these schemes are generating substantial losses to these councils, as they are now victims of the current squeeze in energy costs. Local generation must be creating energy and not just distributing it.

5 Background 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.

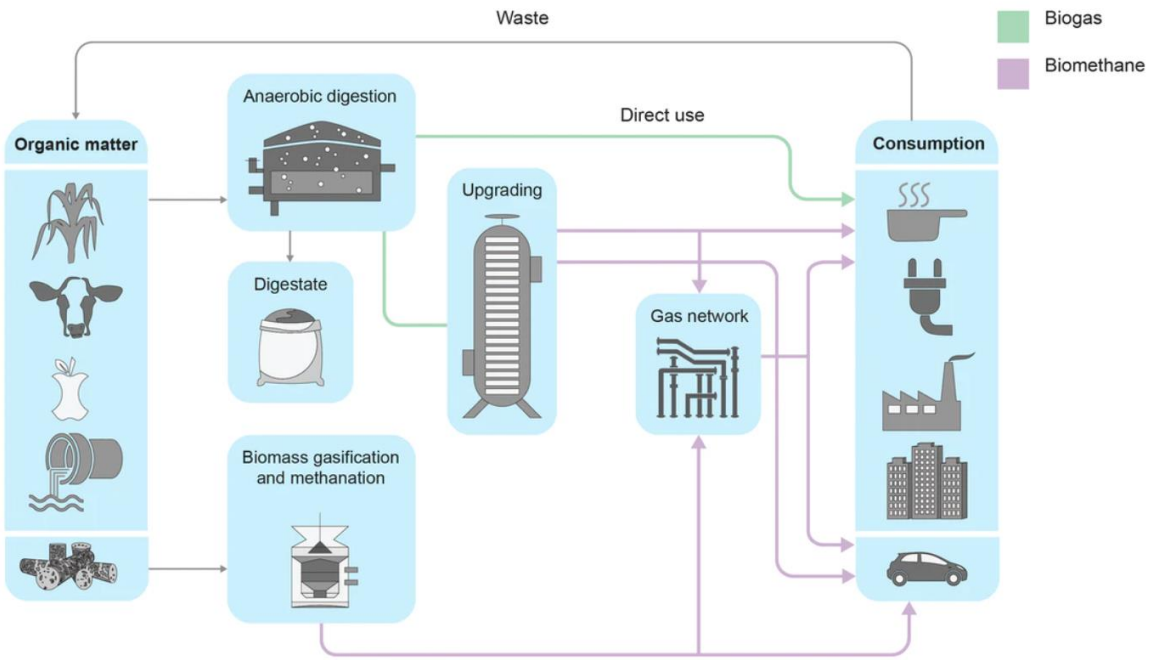
5.3 The disposal of food waste from the Borough is managed through the re3 partnership contract and is currently undertaken through a plant in Wallingford, Oxfordshire. These arrangements are contracted until 2031.

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 Annex 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 (currently £7 per tonne) 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 major consideration for the progression of a scheme is, should the council be engaged in this type of provision directly itself, using its own resources? 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? The recommendation from the Corporate Management Team, which was agreed by the Executive and was no. It is clear that the council, using it place making responsibilities, is better place in encouraging this type of provision, rather than looking

to provide this itself. The council doesn't have the leveller, either in surplus land, ability to access capital or in expertise, to be creditable in this space.

7.4 That said, the market is developing strongly and therefore, their only key issue is location. Location is key, and that 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 example plant would 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 the connection to the grid (gas or electric).

7.5 The Executive have accepted that the skills needed to bring a scheme forward are not currently within the council. However, this is a good idea, to meet our need for local green power generation and to bring in new green technology jobs to the area. The next step is therefore to continue to engage with the market to ensure that they know that the council is supportive of schemes coming forward, albeit that they would be subject to the normal development control assesments.

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.

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, having weighted the potentially long, costly and complex process have concluded that the direct provision by the council should not be pursued.

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
Atkins – Anaerobic Digestion Feasibility Study

Contact for further information
Damian James, Assistant Director: Contract Services, Delivery Department - 01344 351325
Damian.james@Bracknell-forest.gov.uk

Kamay Toor, Assistant Director: Property, Delivery Department – 01344 355183
Kamay.toor@bracknell-forest.gov.uk