

Bioreactors, in the form of anaerobic digestion systems, are capable of processing plant materials and other food wastes into energy, heating and electricity, which can then be sold off to the national grid as natural gas. It is thought that around 100 million tonnes of organic waste are produced in the UK every year which is suitable for anaerobic digestion systems. If this was to be utilised on a large scale, it holds the potential to generate approximately 10-20 TWh of heat and power. Moreover, the Renewable Energy Association states that if all the UK's domestic food waste was processed by anaerobic digestion, it would be able to generate enough electricity for 350,000 homes. Contextually, the Drax power station, the UK's largest power station, currently produces around 14 TWh using biomass pellets in the form of wood and plant materials. In turn, anaerobic digestion can be used as an effective form of renewable energy.

Feasibility of anaerobic digestion systems in relation to the use of grass cuttings

As of April 2023, there are currently 615 plants that generate a total of 557,931 kWe, with sites existing across Wales. Biogen, for example, have a plant in Denbighshire that generates 1MW of renewable energy from 22,500 tonnes of food waste collected from Flintshire, Denbighshire and Conwy. The Flintshire Biodiversity officer has previously approached Biogen to request the possibility of use of grass cuttings in the facility but was informed that *"this isn't something we would be able to accept into our WAEN site. Grass is not suitable for the AD Process, and should be going to a compost site if possible."*

Recently, there has been a proposal for an anaerobic digestion plant in Flintshire however, lack of any further progress regarding this initial proposal by February 2023 suggests the proposal will not progress to planning application.

Case Studies

It is also important to look at existing case studies surrounding the use of anaerobic digestion systems in order to assess its applicability to Flintshire.

- A 2017 academic paper found that grass cuttings from sport fields “could be a suitable co-substrate in bio-energy generation.”

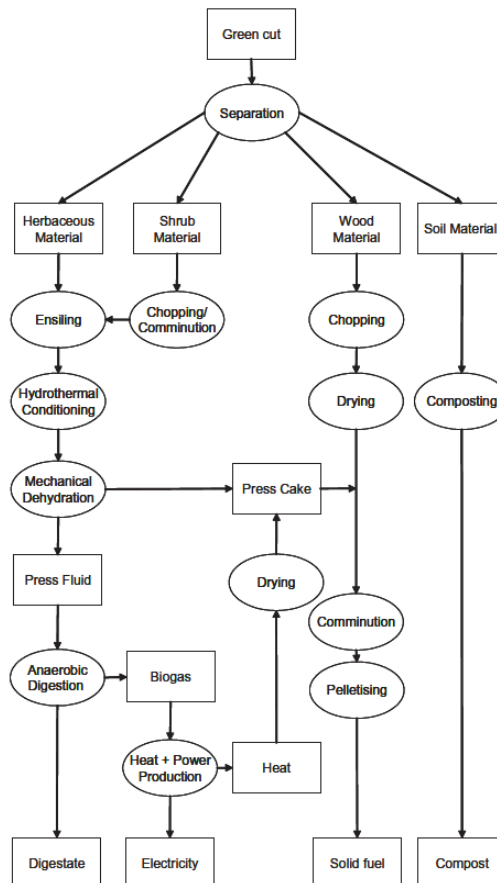


Figure One: Flow chart of separation and processing of green cut material

- Another research paper from the University of Leeds in collaboration with Lincolnshire County Council found that road-verge grass has the potential to be used as a feedstock for anaerobic digestion to produce low carbon energy and to improve the biodiversity of the verges.

The paper concluded, “In the Lincolnshire case study, it was found that there was enough verge grass within transportation distances of 20 km of farm-fed AD plants to replace 6% of the county’s AD feedstock demand. AD operators interviewed were willing to use up to 25% grass in their plants and pay more

than the estimated harvesting cost, suggesting that harvesting may be financially viable without subsidies.”

- Although capable of producing renewable energy, we understand that anaerobic digestion has been informally explored by Denbighshire County Council, with the investigations suggesting that the total costs to create and maintain a site, as well as environmental issues with transporting cuttings may limit the overall effectiveness of an anaerobic digestion system.

The use of biogas that is created in anaerobic systems does release CO₂ into the atmosphere, forming concerns around the ethical use of this type of equipment. However, this can arguably be offset due to the idea that biogas produced will replace fossil fuels when used for heat, power and also for powering transport.

Anaerobic digestion systems are not commonly used as a way of generating energy in the UK, but its renewable potential and application for different substrates may mean it becomes more mainstream. From initial research it does seem feasible that an anaerobic digester may be able to take a proportion of grass cuttings alongside other non grass waste but that the facility would need to be built with this substrate in mind. Further more detailed research would be required.

References

An assessment of road-verge grass as a feedstock for farm-fed anaerobic digestion plants: <https://www.sciencedirect.com/science/article/pii/S0961953420301045>

Using Grass Cuttings from Sports Fields for Anaerobic Digestion and Combustion: <https://www.mdpi.com/1996-1073/10/3/388>