Agriculture and Food Development Authority

Head Office
Oak Park, Carlow,
Co. Carlow, Ireland
Príomh-Oifig, Páirc na Darach, Ceatharlach
Tel: 059 917 0200
Tel Int: 00353+59 917 0200

Teagasc Opening Statement to the Joint Oireachtas Committee on Agriculture, Food and the Marine concerning Biomethane Renewable Gas, 4th May 2023.

A Cathaoirleach, and members of the joint committee. I would like to thank you for the opportunity to speak to you this evening on the topic of Biomethane Renewable Gas.

I will start off by saying that Teagasc as an organisation is fully committed to embracing biomethane and the establishment of a demonstration anaerobic digestion facility on our Grange campus is enshrined in the Teagasc Statement of Strategy.

Various EU and Irish policy and industry targets exist which provide a key role for biomethane in the decarbonisation of the energy sector and a diversification opportunity within agriculture. As the agricultural industry is Ireland's largest contributor to greenhouse gas emissions, accounting for 37.5% of emissions in 2021, it is a key area of focus for reductions. The EU has set the target of building a net-zero carbon economy by 2050 as outlined in the European Green Deal in January 2020 along with ambitious goals in the Farm to Fork strategy.

On a national level, the Food Vision 2030 report and the AgClimatise report both include goals around anaerobic digestion. The Climate Action Plan (2023) increased the target for Anaerobic Digestion to 5.7 TWh biomethane by 2030 (which will require in the region of 150 to 200 Anaerobic Digestion plants) recognising the role Anaerobic Digestion can play in reducing emissions and creating a circular bioeconomy. We have considerable ground to cover between now and 2030 to achieve these targets.

AD is legislated within the EU by the Renewable Energy Directive (RED) II which sets a target of 32% of energy coming from renewable sources by 2030. RED II sets limits for GHG emissions offset by the generation of renewable fuels of 65% for transportation fuels and 80% for electricity, heating and cooling by 2026.

Ensuing from these various EU policies and industry documents, it is also recognised that the agricultural sector will have a part to play regarding the decarbonisation of the energy generation sector.

Development of biomethane energy generation in agriculture has the potential to have three major benefits for Ireland, including the Agriculture sector:

1) Enhanced energy security through the displacement of fossil fuels will bolster our national energy self-reliance through the consumption of locally generated renewable heat or electricity in place of electricity or heat generated from imported fossil fuels.
2) Farm diversification: income generated from selling biomass to an AD biogas plant will provide additional income streams for farm families in rural Ireland and provide a land use alternative.
3) Renewable biomethane generation is better for the environment and generation of biomethane will help contribute to our national efforts in the area of decarbonising the heat and electricity sectors.

DAFM in partnership with the Department of the Environment, Climate and Communications (DECC) is currently developing a National Biomethane Strategy that will define the strategic direction for the production and delivery of 5.7 TWh of indigenously produced biomethane; Teagasc are contributors to this working group.

AD in Ireland in context

AD has been operational in Europe on a small scale in niche areas particularly since the oil crisis in the late 1970's. On a small scale the biogas generated, which typically comprises 55% methane and 45% carbon dioxide, is combusted for heat. Since the 1990's there was a development of large scale AD utilizing the biogas for electricity generation driven by legislation and incentives. The electricity is generated from a Combine Heat and Power (CHP) unit with a trend to increasing biogas storage on site and providing power on demand at a premium. More recently biomethane has come to prominence whereby the biogas is upgraded to >99% methane which can be injected into the gas grid with certificates generated and traded for this renewable or green gas.

To date in Ireland the development of the AD sector has been slow by comparison with other European countries. A combination of planning and licensing, grid connection costs, prevailing electricity tariffs, financing issues and uncertainty in waste policy have led to relatively few plants in Ireland to date. AD plants generally require financial support to compete with fossil fuels, which has been the case in establishing the respective industries across Europe [1].

The role of Teagasc in Biomethane Renewable Gas Research

Teagasc has been very active in the area of energy in agriculture for many years and launched its first dedicated publication on energy use in Agriculture in 2011. Furthermore, Teagasc has compiled a suite of factsheets on energy use and renewable energy generation covering all farm enterprises, which were updated recently. Biogas has been a key measure in the Teagasc

MACC since it was first published in 2012. Teagasc is also a key partner at the Energy in Agriculture Show at Gurteen Agricultural College.

The CAP 2023 target of 5.7 TWh of biomethane by 2030 is equivalent to approximately 10% of total natural gas demand in Ireland. Meeting this target will require a substantial quantity of feedstock (biomass and manure). With over 80% of agricultural land in Ireland in grassland, the potential grass resource is substantial. Indeed, the National Heat Study [2] showed that the available biomethane grass resource could be 4-8% of Ireland's current gas fuel demand and that this could rise to 11% of current gas demand by 2030 if changes to livestock occurred and land was freed up from other uses. It is evident from this that (1) the 5.7 TWh target by 2030 is achievable and (2) biomass-based resources such as grass/clover silage will have a key role in meeting this potential, provided economic, environmental and social sustainability is considered.

Teagasc estimate that, at a national level, total land area of 120,000 ha (less than 3% of available land) will be needed to produce the silage to feed the AD biomethane plants required to reach the 5.7 TWh target. In addition, winter slurry from 1.3 m cattle will be required which represents approximately 20% of all winter cattle slurry produced in Ireland. The above assumes an equal mix of grass silage and slurry on a fresh weight basis. The above land area requirements are based on current average yields on Irish grassland farms in which case some displacement of livestock is a likely consequence, or it could displace some existing tillage crop production. The availability of, and transportation costs associated with, slurry is an important consideration such that proximity of AD biomethane plants to large resources of livestock slurry is paramount.

Research by Teagasc [3] has indicated that there is substantial scope to increase the availability of forage from Irish livestock farms in excess of livestock requirements by improving grazing management practices. For example, beef farms typically utilize approximately 6 t grass DM per ha which is far below that being achieved by the top performing demonstration farms where grass utilization typically exceeds 10 t DM per ha [4]. In a scenario where grassland management and utilization practices improve, the CAP 23 targets could be met with little livestock displacement. Importantly however, increasing the availability of forage should not be achieved by increasing the application of nitrogen fertilizer due the impact on GHG offsetting and forage production costs. Also, use of chemical nitrogen to grow biomass for anaerobic digestion would make it difficult to achieve the RED11 sustainability criteria.

Current research by Teagasc (Beausang et al., forthcoming) indicates that the production of forage crops with the capacity to produce high yields with low levels of fertilizer N such as red and white clover-based crops are best placed to meet the feedstock requirements for an AD industry. Furthermore, improving grasslands to support a biomethane industry must be consistent with the national biodiversity strategy which aims to conserve biodiversity in

the wider countryside through the enhancement of high nature value farmlands [5].

The use of grass resources for AD biomethane has a distinct advantage from a farm diversification perspective in that it is a familiar practice for livestock and crop farmers. In this context, the willingness to adopt land use change is being assessed by an SEAI-funded FLEET (Farm Level Economic, Environmental and Transport modelling) project led by Teagasc, which is identifying farm scale, landscape level and national level economic and environmental implications of farm supplied alternative feedstock for AD at a regional level [6]. Clearly, the financial returns to the farmer will have an important bearing on the acceptability of producing grass for AD biomethane. The traded value for grass silage can be used as a guide for this diversification option; however, an additional premium is likely necessary, the extent of which being influenced by individual farmer's commitment to their existing enterprise and prevailing attitude to innovation and change.

Digestate is the residue of the feedstock that remains following the digestion process. The nutrient content of the feedstock is largely retained and therefore, digestate is a valuable nutrient for grassland and cereal crops and can replace artificial fertiliser. Nutrients in agricultural AD digestate, particularly N, are more freely available for plant uptake than in untreated organic slurry or waste sources. For example N availability in digestate is increased by up to 10% and for this reason, application using low emissions slurry spreading technologies (LESS) and/or post-processing options such as separation, acidification or ammonia recovery is recommended. Odour from agricultural AD digestate is generally not as strong as the undigested feedstock material. The AD process can also reduce microbial pathogens and the germination capacity of weed seeds found in the raw feedstock. Digestate is an important resource that could be processed to replace chemical nitrogen fertiliser. Research in Teagasc is investigating a range of processing technologies to both reduce emissions from land spreading and to recover digestate nutrients to replace chemical fertiliser.

Teagasc research at Grange and Johnstown Castle is investigating the sustainable production of AD feedstocks, including impact of recycling of the resultant digestate as a source of nutrients for plant feedstocks and its fertilizer replacement value. The project includes various plant diversity communities to better understand their suitability to the AD system. This project is also pursuing the optimisation of the AD process to improve biogas/biomethane yields. Opportunities to deploy chemical amendments to reduce gaseous emissions from slurries and digestate thereby improving biomethane yields during the AD process are being assessed.

Teagasc is committed to the development of an agri-centric AD industry in Ireland and have invested heavily to resource it's research and knowledge transfer capabilities in this area, particularly so on the new Teagasc Climate Action Strategy. Recently we have recruited two permanent staff in this area. We have invested ~€1.6 m in a pilot-scale AD biomethane plant in Grange. The Teagasc Grange plant will produce 70-100m3 of biogas per hour

(560,000 – 800,000m3 per annum). The annual gross output of the plant can be specified as 12.3 TJ or 3.42 GWh. The biogas will be converted to biomethane which will be compressed and injected into the gas grid or used to fuel trucks or tractors on site.

Recommendations

- The DAFM/DECC led working group on the development of the National Biomethane strategy will be essential in the development of the industry and achievement of the CAP 2023 targets.
- A prerequisite to the successful development of a biomethane AD sector in Ireland, which is agri centric, is that it should be sustainable from an economic, environmental and social perspective, with research gaps on business models and assumptions evident.
- There is an urgent need to demonstrate agri-centic AD biomethane at scale. The Grange pilot plant will play a key role in achieving this important objective.

I will finish up by saying that a prerequisite to the successful deployment of a biomethane industry, is that it should be profitable and provide confidence to investors and farmers who decide to provide crop feedstocks on a contractual basis to future biomethane plants.
I would like to thank you for the opportunity to present this information to you this evening and welcome any questions the members of the committee would like to ask.

References

[1] A. Auer et al., “Agricultural anaerobic digestion power plants in Ireland and Germany: policy and practice,” J. Sci. Food Agric., vol. 97, no. 3, pp. 719–723, 2017, doi: 10.1002/jsfa.8005.

[2] Sustainable Authority of Ireland. National Heat Study - Net Zero by 2050. Key Insights, Evidence and Actions, 2017, https://www.seai.ie/publications/National-Heat-Study-Summary-Report.pdf accessed 26 April 2023

[3] McEniry, J., Crosson, P., Finneran, E., McGee, M., Keady, T.W.J. and O’Kiely, P., 2013, How much grassland biomass is available in Ireland in excess of livestock requirements? Irish Journal of Agricultural and Food Research, 52, 67-80

[4] Teagasc, 2027 Beef Sectoral Roadmap, 2020, https://www.teagasc.ie/media/website/publications/2020/2027-Sectoral-Road-Map---Beef.pdf accessed 26 April 2023

[5] Department of Culture, Heritage and the Gaeltacht, 2017, National Biodiversity Action Plan 2017-2021 https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf accessed 26 April 2023

[6] Deasy, M. and Thorne, F. (2023) A Bio-Economic Model of producing silage as a feedstock for Anaerobic Digestion in Ireland, conference paper at the UK Agricultural Economics Society Conference 2023, Warwick University, March 27th-29th 2023.