Annex 3 to REA's response to Biomass Strategy:

Examples of Biogas and ACT projects

Biogas and ACT Case Studies

This document has been compiled to accompany the REA's response to the Biomass Strategy Call for evidence.

It provides case studies demonstrating high quality biogas and ACT projects, mostly utilising Agri-Food and drink industry residues

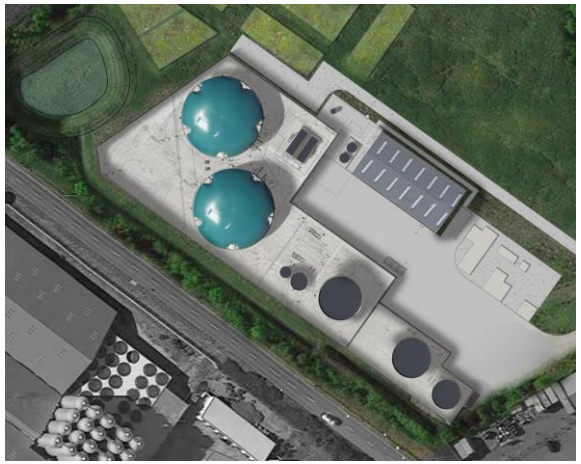
The case studies demonstrate:

- The potential industrial application of onsite small-scale AD, within the food and drink industry.
- The need to fully utilise feedstocks that can be derived from agri-food processing residues (in addition to purpose grown crops). This could be facilitated by a national survey of food and farming businesses to understand what bio-resources are available.

We hope that the Biomass Strategy will drive a more ambitious agenda that makes full use of biogas, ACT and the potential volume of food waste available.

BrewDog, Ellon – Biogas Utilising Waste from the Drink Sector

Project details: Onsite 2MWth Biogas: biomethane grid injection for brewery site.



What heat is used for: The onsite biogas will use site process residues to replace natural gas and make the Ellon site carbon neutral during 2022.

Why is biogas the optimal technology in this situation?: The site has committed to deliver Scope 1, 2 and 3 zero carbon by 2022 and this onsite AD plant will make use of all the site's organic process liquors (OPL) that are currently being land applied locally.

What are the estimated carbon savings?: The plant will allow the site to cut natural gas used in the brewing process from its carbon footprint - 52.4% or 2,696 tonnes of CO2e (2019 data).

Other project benefits: the onsite biogas plant will allow the brewery to expand and cut OPL disposal costs. It will facilitate grey water recycling on-site and replace imported CO2 with onsite supply.

Describe how Government support has made this possible: the project, which involves gas upgrade and grid injection plus grey water reuse has been pre-accredited for the RHI.

Could the project lead to future innovations?: Yes - it will put Brewdog in a brewing sector leadership position but also act as a showcase project for the food and beverage sector.

Cheese Manufacturing – Small AD used in food manufacturing

Project details: Dairy Processing 600kWth Biogas Plant (early 3D model image)

What the heat is used for?: produced from creamery residues (and cow slurry) the site will supply biogas back to the creamery, for use in heat supply to cheesemaking and for HGV fuel.

Why is biogas the optimal technology in this situation?: The creamery produces whey that has be to transported away from the site. The AD solution means that it can be used to supply clean energy and help decarbonise the site.

What are the estimated carbon savings?: the project is still in the final design phase but it is estimated that it will save 500 tonnes of carbon pa by replacing fossil fuel heat, plus, c. 800 tonnes from replacement of diesel.

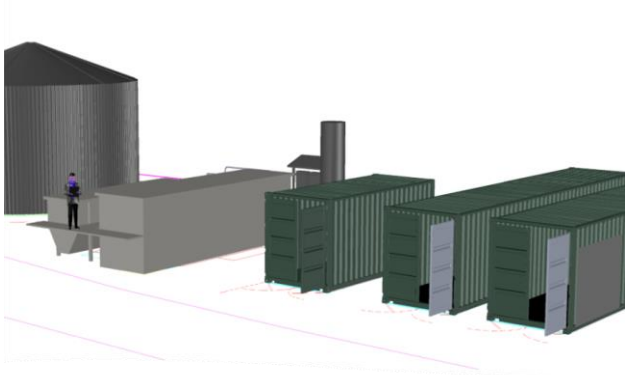
Any other benefits of the project: The small on-site AD process will contribute to development of an integrated energy system for the creamery, supplying clean heat and HGV fuel.

Describe how Government support has made this possible: This project has received support from the Scottish LCITP (low carbon infrastructure transition programme) but has missed the RHI deadline.

Could the project lead to future innovations?: Yes, it has been designed to combine the need for the creamery to dispose of its process residues and should be replicable on other sites if included in the GGSS.

Abbey Ecosse – Forss – Biogas utilising coproducts from a distillery

Project details: Biogas for industrial site in Caithness (200kWth).



What heat is used for?: The Abbey Ecosse project will use a small-scale modular biogas plant at their Forss site to extract biogas from distillery co-products from the nearby Pulteney Distillery and will supply the site with heat and power.

Why is biogas the optimal technology in this situation?: The gas will be fed to an on-site CHP unit, to supply 110kW hours of power to the site and up to 90 kW of heat.

What are the estimated carbon savings (CO2 tonnes per annum)?: carbon saving will c. 200 tonnes annually and will increase in phase 2 with gas use for feedstock haulage.

Any other benefits of the project: The project will help with the transition of the business park to low carbon operation, supplying electricity and heat along with investment in a smart grid, heat storage and EV charging.

Describe how Government support has made this possible: This project received support from the Scottish LCITP (low carbon infrastructure transition programme) but is expected to secure the RHI.

Could the project lead to future innovations?: Yes, it is innovative in a number of ways: modular design, remote location and choice of feedstock.

Biogas Case Study – My Fresh Bedford

Project details: 500kWe industrial biogas plant - treating vegetable residues.

What heat is used for?: Heat and power from the AD plant help power the factory site.

Why is biogas the optimal technology in this situation?: The AD plant is fed with process residues (liquid & solid) from the vegetable processing site that were previously treated in a way that consumed fossil fuel.

What are the estimated carbon savings?: Using 400m3/day of liquid process residues & 20 tonnes/day of solid bio-wastes, the plant is reducing the site's emissions by circa 20%.

Any other benefits of the project: The plant has allowed the site a more sustainable process of residue management. The upgrade could be replicated on other sites with the GGSS, which under current rules would not be possible.

Describe how Government support has made this possible: The plant benefitted from the FiT and RHI.

Could the project lead to future innovations?: Yes, this design of on-site project could be replicated on many such food processing sites across the UK but many sites will not be eligible.

Biogas Case Study – Malaby Biogas, Wiltshire

Project details: 1MWe commercial food waste biogas plant - treating C&I waste.

What heat is used for?: Heat and power from the AD plant help power the biogas plant and produce quality Biofertiliser (PAS110/ADQP).

Why is biogas the optimal technology in this situation?: The process diverts food waste from landfill and generates renewable electricity for 2,500 houses. Approx 30,000 tonnes per annum digestate is used as a certified quality Biofertiliser on farm crops

What are the estimated carbon savings?: 2020 Bath University Life Cycle Analysis (LCA) case study assessment established up to -163gCO2eq/Mje (including energy & resource offsets)

Any other benefits of the project: A pioneering plant supporting R&D projects, operational innovations & optimisation, conversion of excess biogas to decarbonised HGV fuel (compressed biomethane).

Describe how Government support has made this possible: FiT and partial RHI (50% wasted heat due to changes in RHI eligibility rules in 2013) underpinned development although rule changes hindered deployment.

Could the project lead to future innovations?: Yes! Onsite innovations are leading to cost effectiveness improvements as well as new markets. Regulatory constraint significantly hampers delivery of innovation potential.

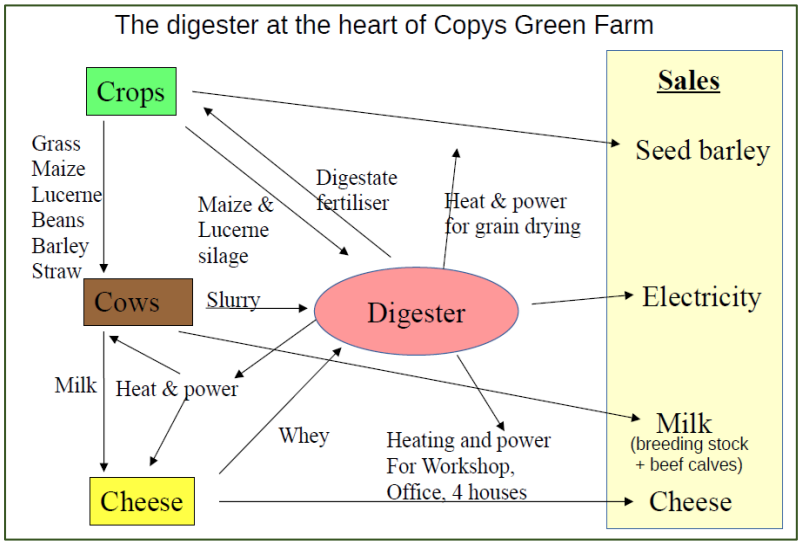
Biogas Case Study – Copys Green Farm 140kWe small farm

Project details: 140 kWe dairy biogas plant – utilising slurry (100 T/yr) from 100 cows, maize silage from (2,500 T/yr) and whey from cheese making (210 T/yr)

What energy is used for?: Dairy hot water, cheesemaking, grain drying, 4 houses, office, workshop, cow drinking water and irrigation pump

Why is biogas the optimal technology in this situation?:

Part of total farm decarbonisation plan using own residues.



What are the est. carbon savings?: Not known; no access to relevant models.

Any other benefits of the project: The dairy herd has moved from loss-making to being profitable. Cows get only the best silage; AD gets the rest. Enabled electrification of farm

Describe how Government support has made this possible: The farm benefits from FITS and ROCs without which this would not have been possible.

Could the project lead to future innovations?: Farmer has been involved in innovation activities, as well as experimenting with recycling sulphuric acid.

EQTEC plc for Mostos Vinos y Alcoholes, S.A. (Movialsa), Ciudad Real, Spain - ACT Biomass-to-energy facility for combined heat and power (CHP)

Project details: EQTEC installed the first advanced gasification facility, a bubbling fluidised bed gasifier, at Movialsa, one of Europe's largest producers of olive products and wine.

What the energy is used for: Electricity (MWe) and heat (MWth) for industrial (agro-business) processes and on-site facilities. This is especially helpful to Movialsa, as the energy costs associated with olive oil production rise annually.

Why biomass gasification is the optimal technology in this situation: Dried, olive pomace waste disposal is a well-known challenge around the whole of the Mediterranean, given that its wet or burnt form changes the acidity of soil and can pollute water, removing landfill as an option. EQTEC's biomass gasification technology converts this agricultural food waste into pure syngas that is highly efficient and drives maximum operational availability for electricity and heat production.

Estimated carbon savings: 25 – 30% less 'total lifetime' (10-year) CO_2 than incineration

How UK Government support has made this possible: N/A (this was funded by the client, Movialsa, based in Spain)

Future innovations based on this project: The Movialsa case study has led to EQTEC's development of Greece's first olive pomace waste plant in Thessalia and a range of others upcoming in Greece, Croatia, Italy, Bulgaria and USA.

Further information available here.

Any other benefits of the project: We are able to make seasonal adjustments to the balance of electricity and heat production from the plant for Movialsa to use as an on-premise CHP solution.

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