On-site Anaerobic Digestion and Clean Growth - 12th December 2018

Overview – Developing On-site Anaerobic Digestion

This document follows up the meeting held at BEIS on 20th November 2018 to discuss the role of on-site Anaerobic Digestion (AD) with a number of participants from the UK biogas sector. Biogas is a renewable energy source that can be available 24/7 and accordingly can contribute to a range of baseload energy requirements. Produced from diverse feedstocks, on-site digestion offers a versatile bio-energy source for electricity generation, fuel for heating and cooling and the decarbonisation of transport.

On-site AD can boost fossil energy substitution on industrial sites, driving clean growth with a renewed focus on decentralised generation and industrial resource efficiency. To deliver on its commitments for deployment of renewable energy and curbing greenhouse gas emissions, BEIS should put bio-energy at the core of Clean Growth Strategy. The recent IPCC report was a big wake-up call, highlighting the need for companies of all sizes to take responsibility for their carbon emissions and environmental impact.

With the Feed-in Tariff (FIT) scheme due to close in March 2019 and the closure of the Renewable Heat Incentive (RHI) in March 2021, it is a good time to re-assess the future direction of on-site AD. While a limited number of large-scale mixed-feed plants will be built before March 2021, it remains to be seen whether the Renewable Transport Fuels Obligation (RTFO) alone will be effective in incentivising future on-site AD deployment. There is still significant growth potential for on-site AD, based on its ability to process bio-residues on factory sites, farms (using slurry and other feedstocks) and in rural communities.

Resource Optimisation – the Circular Economy

Growing pressure to improve industrial resource use is driving the development of the circular economy. Bio-residues suited to AD do not only include restaurant or household wastes or agricultural by-products and multinational food companies are leading the way with a more circular approach to handling their processing residues that makes environmental and commercial sense. Increasingly, smaller businesses also recognise that clean energy from biodegradable factory residues cuts emissions and saves costs.

In recent years, things have moved in a positive direction with more companies re-thinking their actions on resource efficiency and for exploiting the latent energy value of their by-products. This approach also supports the objectives of the recently released Bio-economy Strategy, “Growing the Bio-economy”.

Converting unused bio-resources to decentralised energy should become a national priority. Over use of the word ‘waste’ should be avoided and replaced with terms like organic resource or bio-residues, that recognise everything in the food chain has a latent energy value. On-site digestion plants can transform a range of liquid effluents, solid residues, by-products and reject product into valuable bio-energy. Thus, residue destruction is replaced with a more circular approach, where everything has a use and a value. Under the waste hierarchy food suppliers are under pressure from the retailers and customers to divert residues to human or animal consumption. Also, many streams are not suitable for use without further processing (and energy demand) to make them fit for purpose. In many cases the best alternative is AD.

Clean Growth from On-site Anaerobic Digestion

In the journey to better resource use, accessing energy from process residues is often an excellent low-risk solution. Fermentation can also act as a springboard for further circular economy measures such as raw material extraction (e.g. proteins or sugars) in industrial bio-conversion processes. Such processes can supplement AD plants, creating new ingredients or innovative products from factory bio-residues. The final residues or by-products from such novel processes can still be used for bio-energy generation.

While on-site AD technology has tended to be installed on larger multinational sites or used for larger-scale crop plants, the process works as efficiently at a smaller scale, such as on livestock farms, factory sites or remote rural towns. There's no reason why every mid-size food processing site can't deploy on-site AD. Driving industrial efficiency and environmental change is an area where BEIS could support the deployment of low carbon solutions. On-site energy generation at the point of consumption will create more sustainable jobs, with potential for technology exports in sectors where the UK is a leading player.

We hope BEIS and other departments will work with the remaining British biogas technology companies to exploit the ability of AD to deliver low carbon decentralised energy. Also, for transport, compressed biomethane (CBM) does not require propane addition. It can power HGV trucks that bring raw materials to factories or deliver finished products. CBM is used in cars or vans and tractors with a range of models commercially available. Alongside hydrogen, it can reduce rural fossil fuel use and transport emissions - including on farms. There is also scope to extract food grade CO_2 (in short supply in 2018) from biogas.

Biogas can unlock the latent energy in a wide range of feedstocks and bio-degradable process residues:

- Biogas from a tonne of livestock slurry has same energy content as circa 10 litres of heating oil.
- A 2-litre truck / delivery vehicle can travel 1000 km on gas supplied from 1 tonne of food waste.
- Factory AD plants can supply 2,750kWh of gross energy (heat) per tonne of COD or equivalent.

Government could do more to endorse the role that biogas can play in delivering cleaner growth within a more circular economy. More should be done to highlight the role biogas can play in meeting national and global targets for heat, transport and power generation, and in cutting greenhouse gas emissions.

Hurdles and Opportunities

It helps businesses develop and expand when government policy is long-term and designed to achieve defined and measurable outcomes. The reduction of AD support through the RHI and FIT is undermining future growth but bioenergy still has a role to play at the interface of the bio-economy and the circular economy. However, industry needs a supportive policy framework to encourage investment. Also, the Environment Agency (EA) could improve its engagement with business, with a more transparent service.

Support for on-site AD requires joined-up thinking from BEIS, DEFRA and other agencies. For instance, grants are available to cover farm slurry stores - where methane gases are still vented to atmosphere. Covers help odour or ammonia abatement but don't reduce emissions as the gases are not destroyed. Covered tanks can be converted into digesters. However, if the covered slurry store is converted into a low-cost digester, it becomes subject to different legislation. A more flexible regulatory approach would make it easier to deploy low-cost on-site solutions that can produce small volumes of useful energy.

Local generation can reduce pressures on the grid and should have easier access to the grid, with costs paid by operators, rather than generators. Statutory powers to install gas pipes or power cables are granted to DNOs but for 'off grid' supplies, ransom action by landlords can delay projects or undermine their economics. With such access rights recently granted to internet cable-laying companies, there is a precedent. This should be explored for AD sites. Also, the way that grid connection costs are allocated.

It will help to have demonstration sites that can show biogas as part of an integrated energy system on farm or factory sites. Is there a mechanism for funding low carbon demonstration sites, as is the case in Scotland? Alongside other on-site renewables, biogas offers a means of matching demand with output throughout the year. AD, if co-located on demo sites with other renewable sources (biomass, PV, wind, GSHP, etc.) will show how combined systems offer fast, reactive output and baseload energy generation.

Suggestions for Policy Initiatives

BEIS (and DEFRA) could do more to recognise the benefits of on-site bio-energy as part of their Clean Growth and Bio-economy strategies. Regulation and policy should reinforce industrial interest in lower-carbon manufacturing. To date, the Scottish government has been more supportive than Westminster, recognising the role of decentralised renewable energy in a more circular economy. Resource utilisation policy needs to be translated into practical solutions. The industry has a number of proposals that could support BEIS in the development of its Clean Growth Policy and Bio-economy Strategy:

1. **Incentives and Support**

- Support for on-site heat generation / distribution post the termination of the RHI. We hope BEIS will engage with the industry to discuss the role of bio-energy within our low-carbon future.
- As we move away from existing incentives, it may help policy formulation if officials were more open to discussing the economics of on-site AD with plant builders rather than consultants.
- Continued support for biogas and biomethane after the RHI's termination could be based on an obligation-based solution similar to the Renewables Obligation (RO) or to the RTFO, with gas suppliers required to supply a percentage of renewable gas to meet a proportion of demand.

2. **Industrial Bio-energy Policy**

- Offer encouragement to factory sites that generate on-site bio-energy from bio-residues with tax breaks or exemptions linked to the carbon footprint reduction (as is happening elsewhere).
- When new buildings or factories with bio-residues effluent streams go to planning, they could be set targets to require them to use a proportion of clean heat/power or low carbon transport - this would be similar to the Merton Rule[1] but specifically applied to factories and industrial sites.
- Support the development of a BREEAM standard equivalent on bio-energy for new factory sites that use latest technology (also on farms for new animal housing and slurry handling systems).
- Put on-site bioenergy at the core of the UK's Clean Growth and related strategies, with a register of factories with high resource-efficiency standards. Better recognition in the tax regime and exempt renewable generation of heat / power from business rates (as is the case for farming).

[1] **Merton Rule** named after the Council that in 2003 adopted a prescriptive planning policy to required commercial buildings over 1,000 square meters to generate at least 10% of their energy needs using on site renewable energy**.**

3. **Technology Demonstration**

- Invite the industry to set up/showcase on-site AD projects where officials and regulators have access in a monitoring role, observing the gestation of projects to understand how they work.
- Create a network of demonstrator sites for biogas production alongside other systems (biomass, PV, wind, GSHP, etc.) to show how AD fits into the decentralised energy mix. An option may be creating national or regional demonstration / pilot sites that are able to handle regular visits.
- Support the creation of a database of smaller scale on-site bio-energy plants, where the REA and others (like the NNFCC) will help co-ordinate the collection of the data for wider dissemination.
- Create showcase farms where AD and other bio-solutions are being used to support soil carbon enhancement and better ways of reducing methane emissions and watercourse pollution.

4. **Environmental Regulation** (working with DEFRA and regulatory agencies)

- Adopt a lighter regulatory approach (with risk analysis) for smaller AD on farms and SME sites.
- Ban sending food waste/bio-residues to landfill, incineration or discharge to sewer (with Defra).
- With projects being delayed by poorly informed / overworked officials in bodies like the EA and Ofgem, which has a direct commercial impact, ensure that KPIs are introduced and/or enforced.
- Avoid bracketing on-site AD with other 'burning' technologies under the Medium Combustion Plant Directive that is being applied to bio-energy generators as well as incinerators (EU/DEFRA).

5. **Other Regulatory Proposals**

- Change the system of statutory rights for crossing land to deliver biogas to customers adjacent to AD plants, which should be extended from DNOs to private heat, gas and power networks.
- Regional cross-sector stakeholder consortia to improve integration / regulation of decentralised bio-energy (including regulators, OEM's, local generators, storage and distribution providers).
- Improve local engagement on viable bio-energy projects (with bodies like LEPs), to support clean growth policy initiatives, including attracting community investment, especially in rural areas.

On-site AD can support the delivery of better use of resources on factory sites as well as on farms and in our rural communities. We hope that BEIS will work with industry to explore how the recommendations and suggestions in this short paper can be built into the Clean Growth policy formulation process.

Conclusions and Next Steps

Better use of bio-resources, avoidance of waste and using residues to supply energy or create novel raw materials is at the core oof a more circular economy. With a supportive policy framework, UK companies (large and small) and Britain's hard-pressed farm sector have the opportunity to access the latent energy from resources currently being wasted in traditional disposal methods. On-site AD supports the creation of a more resource-efficient economy and can be combined with other decentralised energy solutions.

Converting biogas into electricity or biomethane allows heat or power to be used locally and diminishes pressure on the distribution networks. AD also creates jobs: skilled engineers, scientists, site operators or managers and BEIS should not ignore the benefits of developing our engineering skills. Support for on-site bioenergy should be one of the foundations of the emerging Clean Growth strategy. We hope that there can be further engagement with the UK's biogas sector to help move policy forward.