Anaerobic Digestion Roadmap
December 2012

Summary

- The UK has 92 AD plants outside the water sector, and around 150 sewage treatment sites which use the technology to treat sludge.
- The central range for production of biogas estimated by the Committee on Climate Change is 20 TWh by 2020, with final energy (after conversion) of around 15 TWh, and 30 TWh by 2030
- If it achieves its potential, the industry would employ 35,000 people from a wide range of sectors.
- Challenges to deployment include confidence in financial incentives/government policy, access to feedstock, finance/minimising investment risk, providing simpler and more cost effective grid connections, supporting use of biomethane as a transport fuel, supporting markets for digestate and ensuring support from the planning system.
- Biogas is a constantly generated, flexible form of renewable gas that can be stored, helping to address energy security issues and decarbonise otherwise difficult areas such as HGVs. AD recycles the nutrients in the feedstock returning them to land as fertilisers, helping to address food security issues and support climate smart farming. Biogas and AD therefore have strategic value in addition to their potential in pure energy terms.

Priority actions:

- **Confidence in financial incentives and government policy/strategy**: reassure industry and financiers around long-term support for the sector at sufficient levels to reflect the risks, ensure capacity triggers are set at sensible levels and introduce a workable pre-accreditation system across all incentive schemes, as well as a clear strategy with supportive policies. Ensure that issues around the FIT and RHI are resolved, that biomethane is better supported as a vehicle fuel, that the Green Investment Bank will support the technology, that the other issues highlighted here which create risk are resolved.
- **Access to feedstock**: ensure a greater volume of material is available for processing through AD by instituting a ban on biodegradable material to landfill and supporting source segregated organic waste collection services. Confirm that Purpose Grown Crops will be treated commonly with all other forms of bioenergy.
- **Ensuring cost effective grid investment and connection for biomethane**: produce a standard exemption for biomethane injection from Gas Safety Management Regulations as a priority, create an obligation on gas suppliers to purchase green gas, take forward the recommendations of the Energy Market Issues in Biomethane group to a tight timeframe and establish a civil service lead within the department working solely on green gas injection, along with appropriate resourcing in Ofgem.
- **Supporting use of biomethane as a transport fuel**: biomethane as a transport fuel offers some of the greatest carbon savings possible from biogas, but current incentives do not directly support biomethane producers to upgrade biogas for vehicles.
- **Supporting markets for digestate**: government and industry to continue to work together to ensure that domestic and European end of waste specifications minimise demands on AD operators as far as possible and support the development of the digestate market. Dialogue between farmers, farm assurance schemes, food processors and supermarkets and the AD sector should aim to recognise the value, and increase the use, of digestate as a low-carbon biofertiliser.
- **Ensuring support from the planning system**: monitor the effect of the National Planning Policy Framework to ensure it is applied consistently to proposed AD projects on the ground, and introduce a National Waste Management Plan for England which supports planning for anaerobic digestion facilities across the country.

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Current deployment

1.1 As at December 2012, there is over 85 MW of installed anaerobic digestion capacity in the UK across the 92 plants outside the water sector. Plants on sewage treatment sites number around 150, with installed generation capacity of 110 MW. Together this capacity is capable of generating over 1.3 TWh of energy per annum.2

1.2 Anaerobic digestion plants generate biogas constantly, except when maintenance is required, mechanical failure takes place or feedstock is not delivered to the digester. Therefore the load factor for an AD plant, typically above 80%, is much higher than for intermittent renewable energy generation technologies. This gas can be stored, as indeed the raw feedstock can be for later processing.

Deployment potential

1.3 Figure 1 below shows the central range of projected energy generation from biogas in the UK up to 2030.

1.4 The central range for deployment uses estimates consistent with the report for DECC by SKM Enviros,3 which was also used for evidence by the Committee on Climate Change.4 This gives a figure for biogas production of 21 TWh in 2020 and 30 TWh in 2030. The final energy production depends on the conversion technology used, but SKM estimate a contribution of 15 TWh in 2020 assuming most of it is used for grid injection or transport fuel – a much more efficient way of producing useable energy than electricity generation, especially where the heat co-generated cannot be used. Clearly this is a significant increase from current production levels.

1.5 This level of deployment requires that a reasonably high proportion of organic waste – which is the source for almost two thirds of this potential – becomes available for digestion, and that a reasonable proportion of the UK’s bioenergy requirement is delivered through AD. It also assumes that the other challenges identified in this roadmap are resolved, to make it easier to build and finance AD plants, and that biogas is converted to useable energy efficiently.

1.6 The ultimate potential of the industry is limited by a combination of feedstock availability - with all available feedstock being used for AD the UK would be able to produce just over 40 TWh of biogas – and how this is converted to useable energy. 40TWh converts to around 30TWh if injected into the grid or used as a transport fuel, or 16TWh if converted to electrical energy.

2 ‘Hit the gas: how to get the anaerobic digestion sector moving’, Centreforum, 2012.
Deployment pipeline

1.7 WRAP has estimated that there is around 270MW of AD capacity at various stages of planning or development. However, at current support levels they expect only around 10% of these projects to reach operation. This conversion rate is low compared to other renewable technologies, largely because there is a greater number of variables for AD projects (for example around sourcing feedstock and grid connection issues) than for most others. Figures on the current pipeline are reflected in the figures on deployment potential.

1.8 Tackling the challenges to deployment outlined below should help get projects which are currently in the pipeline to commission. New proposals will also be required to come forward to meet the 2020 ambition, longer term decarbonisation and the government’s commitment to a ‘huge increase in energy from waste through anaerobic digestion’.

Journey to deployment

1.9 Figure 2 below presents a developer journey map for anaerobic digestion. This outlines the stages of the delivery process for AD projects and the delivery partners who contribute to it. The average time from identifying a site to exporting energy to the grid is around two years, although this varies considerably by project. The process for developing a larger scale project is illustrated below, with key areas of challenge highlighted. To increase build rates, shorten development time and reduce project risks, we must tackle the barriers set out below.
Challenges to deployment and actions

Minimising Investment Risk

1.10 As a relatively young industry, the biogas sector is still reliant on government incentives to attract finance, build confidence and achieve growth. A recent study from the NNFCC which examined the financial aspects of AD on farms confirmed that current support levels were only sufficient to create an Internal Rate of Return (IRR) of up to 12%, acknowledging that these levels would be too low to attract equity investment. UK Green Investments confirmed at ADBA’s Finance Forum in June 2012 that the risks associated with building AD plants are not yet debt risks (see further below), which means that the returns needed to build the AD industry need to be large enough to attract equity finance.

1.11 Investors in the market are easily put off by uncertainty over the tariff levels and the perceived risk an investment would therefore entail. The way changes to the solar PV FIT rate were made exacerbated some of these concerns, as did the threat – now removed – of a consultation to remove AD projects below 5MW (i.e. almost all) from the RO.

5 Farm-scale Anaerobic Digestion Plant Efficiency, NNFCC, March 2011, p.3.
In combination with very low capacity triggers and high degression rates just brought in for the FIT, and challenging sustainability criteria on the RHI (see further below), confidence in government incentives is now very low and needs to be greater if this industry is to get anywhere near delivering its potential.

1.12 The number of uncertainties under the RHI is unhelpful, with a large number of recent consultations, government responses still to come on aspects of support (notably the 200 kWth limit for support for biogas combustion) and the post-2015 budget for the scheme unclear. Clarity and certainty is needed on these aspects of the RHI to release the investment needed for AD.

1.13 As well as the issues around feedstock availability outlined above, there are a range of other risks including political, operational, regulatory, grid connection and markets for digestate which other renewables do not face. The actions set out elsewhere in this roadmap are also needed, therefore, to help minimise investment risk.

Actions:

- To reassure financiers and AD operators that the government will continue to support the sector and allow them to achieve a high enough IRR to reflect the risks, long term support and certainty is essential. While setting out plans for long term cost control is a step in the right direction, there must be caution over the implementation of capacity triggers which stymie investment. Smooth introduction of a pre-accreditation system at financial close across all incentive schemes (FIT, RHI, RO, RTFO) is needed to ensure the backing of investors and banks.

- The government should give early consideration of how the FIT will absorb the extra capacity no longer able to be supported under the RO once it closes to new installations in 2017. Degression capacity triggers should also be reconsidered, particularly at the small scale.

- Government should lay out the long-term future of incentives as soon as possible, particularly considering the future of FIT and RHI budgets after 2015, to give industry the certainty to start developing projects which would come on line after that point.

- DECC and BIS should work together to ensure that the Green Investment Bank supports AD, and that viable projects are available for it to support. It should then be possible for AD schemes part financed with funds from UK Green Investments or UKGIB to be refinanced once they are operating successfully, allowing funds to be recycled to other projects.

Access to Feedstock

1.14 When AD uses waste feedstocks it diverts material from landfill, which is a priority as we have a dwindling number of suitable landfill sites and are committed to complying with the EU Landfill and Waste Framework Directive, which seeks to reduce methane emissions. Methane is a powerful greenhouse gas which biodegradable waste emits in landfill. Currently around 7 million tonnes of food waste is sent to landfill in the UK each year, a rate which the EU categorises as a ‘midrange’ level. AD is financially and environmentally the best way to deal with this food waste.

1.15 Plants which treat waste feedstocks often struggle to secure long-term supply contracts for feedstock. Waste management companies and local authorities, especially in England, are not rolling out separate food waste collections fast enough, which is restricting the sector’s ability to treat the widest possible range of feedstock. Current infrastructure processes about 1.5 million tonnes of food waste a year, but about 8 million tonnes of additional segregated food waste could be available.

1.16 The Bioenergy Strategy (April 2012) set out the principles of the government’s framework of support for bioenergy, including purpose grown crops for AD. However, there has been concern in the AD industry about specific statements that government will look to regulate against crops for AD if there is a wide expansion in crop-only plants, separate from the general criteria and controls on other forms of bioenergy. The industry is developing a code of practice for purpose grown crops which will manage the environmental risks common to all farming practice, which government is supporting.
Actions:

- The government should build on the commitment in the Government Review of Waste Policy 2011 to “review the case for restrictions on sending other materials to landfill over the course of the Parliament, including looking specifically at... biodegradable waste.” This should consider the model adopted by the Scottish Government, which has committed to source segregated waste collections by 2015 and banning biodegradable waste from landfill by 2020.

- The government should consider whether there is a case for providing direct financial recognition for methane mitigation from AD for waste treatment, including farm wastes such as slurries. This would provide an incentive to use waste feedstocks, and drive positive contributions towards the UK’s greenhouse gas reduction targets.

- The government should also consider offering financial support to local authorities to facilitate switching to split-body collection vehicles, or adding segregated organic waste collection to existing services. Councils’ support for source segregation has been demonstrated recently with bids for funding under CLG’s Weekly Collection Support Scheme to support weekly household waste collection, although the intention of the scheme was to encourage councils to return to unsourced segregated weekly residual waste collections. There is widespread recognition of the benefits of source segregation in terms of cost savings, reduction in waste arising, increased recycling rates and popularity with local residents. Almost 10 TWh – around a quarter of the potential energy from AD – is dependent on local authority waste as a feedstock. The UK will therefore be missing out on a significant renewable energy resource if this action is not taken.

- Government should reconfirm support for the code of practice for purpose grown crops in AD, and confirm that crops for AD will not be treated differently to any other form of bioenergy. ADBA is leading the production of guidance for farmers on growing crops for AD sustainably.

Ensuring cost effective grid investment and connection for biomethane

1.17 With injection into the grid forecast to account for well over 50% of biogas generated by 2030, removing the current obstacles to this deployment is an urgent priority. There are currently two plants which inject gas into the grid and two more due to come online by the end of 2012. However, other projects are being discouraged by issues around cost of upgrading equipment and grid connections, Gas Safety Management Regulations which were not designed for biomethane, and the early stage of biomethane market development. Biomethane is strategically important as a domestically-generated fuel which could reduce gas imports and the risk of brownouts, and as one of the most energy-efficient uses of biogas.

Actions:

- The relevant gas regulations around grid injection are based on North Sea gas composition (GSMR) and require less than 0.2% oxygen, whereas biomethane may contain up to 5% oxygen. The UK’s two plants that currently inject have been given exemptions from the usual gas regulations and instead have their own specific version. Similarly, two more plants which will go online by the end of 2012 summer have also received exemptions. The HSE should seek to produce a standard exemption for biomethane injection as a priority, allowing the market to spread.

- DECC and Ofgem must also be proactive in taking forward the recommendations of the Energy Market Issues in Biomethane group, which has been looking at creating a simplified standard approach to biomethane connections across the gas distribution networks. This includes supporting the development of one simplified Network Entry Agreement across the GDNs, and Ofgem approving new biomethane to grid skid designs in order to reduce project development costs. A timeframe should be agreed between DECC, Ofgem, the GDNs and the biomethane industry for delivery of the EMIB action points.

- DECC should appoint a civil service lead within the department working solely on green gas injection, along with appropriate resourcing in Ofgem.
To increase certainty for projects, DECC should consider how to ensure that green gas can be sold at least at market rate, for example by creating an obligation to purchase. They should also consider how market-based solutions which place a premium on green energy can be encouraged, initially alongside direct subsidy.

**Supporting use of biomethane as a transport fuel**

1.18 The Carbon Trust and others have shown that some of the greatest carbon savings from biogas – particularly as the electricity grid decarbonises – will come through upgrading to biomethane to replace diesel in heavy goods vehicles. Biomethane also makes very significant reductions in particulate emissions from vehicle exhausts, significantly improving air quality. However, the incentives do not directly support biomethane producers to upgrade biogas for use in vehicles, and the RTFO does not provide a sufficient level of support to compete with gas grid injection or electricity production.

**Actions:**

- The government should consider how better support could be given to biomethane for use in vehicles, for example through modification to the RTFO and exemptions to duty for gas as a vehicle fuel.
- ADBA will produce a strategy for biomethane in transport in 2013 which will set out how the UK can realise the full benefits of biomethane.

**Supporting markets for digestate**

1.19 Digestate produced from AD and used as a fertiliser displaces GHG emissions associated with the use of synthetic fertilisers, which currently account for 1.1% of the UK’s total emissions. AD preserves the nutrients in the feedstock, allowing them to be recycled back to land. This is particularly important in relation to phosphates, a finite resource with no known alternative which is essential to all life forms. When produced in close proximity to agricultural land, digestate saves transportation costs associated with commercial fertilisers. Digestate can be applied to land in either liquid or solid form, and there is an increasing body of evidence demonstrating its benefits to crop production.

1.20 The nutrients in digestate alone could be worth over £200 million a year, but the market is still immature and disposing of digestate is currently a cost for most plants. This is largely because digestate is seen as new and unproven, so work needs to be completed demonstrating its effect on soils and crops. This will become increasingly important as finite materials such as phosphorus become more scarce and difficult to get hold of, making it strategically important to the UK to return them to land.

1.21 Uncertainty over the value of digestate is also being created by the potential requirement for transition from UK end of waste specification (PAS 110) to a proposed European specification which is currently in development. More widely, the industry reports inconsistent application of legislation around digestate production, processing and application, which has affected plans for plants as well as those in operation.

**Actions:**

- Defra, WRAP and the AD industry to continue to work together to ensure that – if the European Commission does publish it – the end of waste specification minimises demands on AD operators as far as possible and does not halt the development of the digestate market. In particular, they should ensure a lengthy transition period from the UK’s existing PAS 110.

- More education about the benefits of digestate amongst farm end users and major supermarket buyers is also needed. Led by the EA and WRAP, government should promote dialogue with the NFU, supermarkets and the AD sector to discuss the safety and value of digestate and how it can be most useful for farmers.

- Defra, EA and AHVLA to work together to generate standard guidance for field agents on interpreting legislation on digestate production and use, to ensure consistency.
Reforming the planning system

1.22 Defra recently identified that there were 123 plants which had received planning permission, with over two thirds of these to use waste feedstocks. Earlier in the year, WRAP had identified that there were 80 plants still within the planning system, awaiting the outcome of their application.

1.23 Many plants have found planning consent relatively simple to achieve, but for some it can be an onerous expensive stage, with some local communities raising objections based around perceived problems including odour and transport disruption.

1.24 New planning guidance under the National Planning Policy Framework and new permitted development rights for AD plants have recently been introduced. Both appear supportive to AD projects, but as with any new guidance or regulation need to be closely monitored to ensure that they are working as planned.

Actions:

1. The new simplified planning guidance, the National Planning Policy Framework, must be applied consistently to proposed AD projects on the ground. The government must ensure that there is clarity over the interaction between the localism agenda and their overarching AD strategy.

2. The forthcoming National Waste Management Plan for England should support planning for anaerobic digestion facilities across the country. As the waste review has identified, anaerobic digestion realises the greatest environmental benefit of any treatment option for food waste, so should be a key part of a plan which moves the UK towards making the best use of its resources.