Developing an Anaerobic Digestion (AD) Framework Document

The Coalition Government is committed to increasing energy from waste (such as the production of heat, electricity and transport fuels) through anaerobic digestion (AD). This work is led by the Department for Environment, Food and Rural Affairs, working closely with Department of Energy and Climate Change and other government departments. It is part of Defra's Structural Reform Priority to 'support a strong and sustainable green economy, resilient to climate change', and in particular to 'create the conditions in which business can innovate, invest and grow, [and] encourage businesses, people and communities to manage and use natural resources sustainably and to reduce waste'. This document sets out the steps which the Government believes need to be taken to achieve that aim, building on the previous Implementation Plan for AD published in March 2010, much of whose technical analysis remains valid.

Government's approach to promoting the wider potential for energy from waste including through AD, forms part of the Government's wider work on energy from waste (which also includes other technologies such as combustion, gasification, pyrolysis). This work is feeding into the review of waste policies, which is due to report in the spring, and has the potential to contribute to the Government's objectives for renewable energy and for sustainable food production.

This document is intended to provide a starting point for close collaborative work between government, industry and a wide range of interested parties to produce agreement on a programme[1] of work which will be delivered in partnership. This work also aims to place AD in the context of the wider spectrum of waste management technologies and to map out the key work areas that we believe must be addressed to deliver a substantial increase in energy from waste through anaerobic digestion in the UK, but does not assign actions to individuals or organisations at this stage. Further work now needs to be done in order to agree and publish a joint industry and Government AD framework in spring 2011.

Policy context

Many previous publications and statements have highlighted that there are four key drivers for the increased use of AD (outside AD's established place in the water industry), namely:

- Climate Change objectives: AD has the potential to help this country meet several major challenges by reducing greenhouse gases from manure and waste management and by producing renewable energy.
- Delivering renewable energy without causing significant adverse land-use change: AD will make an important contribution to our renewable energy goals through the use of waste feedstocks for biogas production. Biogas can be used to produce heat or electricity or it can be cleaned to produce

[1] This programme is for convenience referred to as an 'AD action plan'. Whether this will exist separately from, or form part of, the output of the waste policy review need not be determined now.

biomethane which can either be injected directly into the national gas grid or used for transport fuels. Currently, biomethane injection is the only way to decarbonise the gas grid and is an efficient way of using the biogas generated by AD. However, there are situations where other uses of the biogas are more practicable, such as for rural areas where it may not be cost-effective to connect to the gas grid or for on-site process use by industry. In such situations combined heat and power can offer a more cost-effective solution.

- Diverting waste from landfill: AD could make an important contribution to achieving our waste management goals through the diversion of waste away from landfill. AD is an important technology for producing energy from waste, AD also recovers valuable nutrients for recycling back to land.
- Creating renewable sources of critical resources such as phosphorus: The digestate that is produced by AD is a valuable source of renewable fertilisers that can be used by farmers to replace inorganic sources.
- AD also has a role to play in the management of manures and the control of diffuse pollution, and nutrient management, and could if developed fully, produce green jobs and develop the green economy as well as improving environmental quality.

The work that will be undertaken to develop this framework for AD will be informed by, and will inform other existing Government initiatives. These include:

- The Government's vision of localism where power is decentralised to the lowest possible level, shifting power away from centralised bureaucracies into the hands of individuals, communities and councils. This includes reform of the planning system to give neighbourhoods more ability to determine the shape of places where they live, provide incentives for the delivery of sustainable development, and streamline planning policy.
- The intention in the Local Growth White Paper to create the right conditions for growth by creating a consistent and efficient framework for investment, with the right planning framework and incentives which ensure that local communities benefit from development.
- The Government response to the Penfold Review on the relationship between planning and non-planning consents.

What will success look like?

- We will know what our AD industry looks like today and thus have an agreed baseline against which progress can be measured.
- We will know what the potential is across the municipal, commercial and industrial waste streams for AD to develop into the future.
- We will have a vibrant industrial sector that generates equipment supply opportunities for UK manufacturers; green jobs and skills at AD plants of all scales.
- We will have a robust evidence base to support the growth of the AD industry with a clear dialogue between industry and research bodies to ensure that research needs are met in the future.

- We will have safe and secure routes for the supply of appropriate, homogenous feedstock into AD plants as well as clearly defined routes for the use of digestate so that renewable resources are recycled sustainably.
- We will have well understood models for financing AD plants in agricultural and urban contexts; and also in cases where AD forms part of a broader waste management solution employing a range of technologies.

Why do we need a shared approach?

The use of AD technology is not new and indeed is well established in the sewage industry where it is routinely used as an important element of the sewage treatment process. Similarly, in continental Europe AD is a well used technology for generating renewable energy on farms where the feedstocks are usually animal manures and energy crops. It is vital that we use this experience to the benefit of our emerging AD industry which has grown rapidly over the last three years. The emphasis has been on introducing AD as a “technology” and we now need to focus on commercialising the markets for input feedstock and digestate use in order to facilitate commercialisation of the technology and access to finance.

Recent growth in the sector has been due to a number of factors but notably clarity of financial incentives, availability of capital grants, development of a digestate standard and quality protocol and perhaps, most importantly, recognition of the valuable role that AD technology has to play in delivering a series of environmental objectives.

In recognition of this, Government policy is to specifically deliver an increase in energy from waste through AD.

We recognise that, at farm scale, some energy crop may be required in combination with slurries and that such crops can be grown as part of the normal agricultural rotation. Furthermore, there is land available which is not suitable for the production of food crops but which may, therefore, be used to supply energy-crop only AD plants. It is not our policy, however, to encourage energy crops–based AD particularly where these are grown to the exclusion of food producing crops.

This document and the subsequent development of a shared programme of work are the key steps in identifying actions that will allow the industry to flourish and develop so that we have a strong and sustainable AD sector in the future. It is vital that we recognise the potential of AD technologies at all scales, from relatively small systems based in rural locations through to centralised plants that accept a range of different wastes that are transported to them. This document recognises that plants of differing scales will have different requirements to deliver a bigger industry in the future. A clear framework that is owned and delivered by industry in partnership with Government and local communities is likely to be much more successful than one produced by Government alone.

How will we take this forward?

This document invites interested parties to be involved in the proposed work. It sets out some proposed outcomes; structure for developing the work; and commits Government to facilitating this process over the next few months until there is an agreed way forward with industry, communities and that the role of each party, in implementing it, is clear and confirmed.

We propose to form a steering group which will be chaired by Government. The steering group will involve all those government departments that have an interest in the development of the AD industry as well as nominated representatives from industry, communities, local government, regulators etc and other sectors. We then propose that this steering group sets up three working groups as follows:

1. Knowledge and understanding
2. Smarter working models
3. Regulation and finance

Membership of the working groups will reflect the sectors with specific interests in the themes below. The secretariat for both the steering group and the working groups will be provided by Government.

The table below outlines eight work themes, each with a number of key areas:

1. Improving our understanding of the AD landscape
2. Raising awareness of AD – community AD and localism
3. Improving access to finance
4. Building UK skills
5. Smarter regulation
6. Building safe and secure markets for digestate
7. Building markets for biomethane for transport fuels
8. AD in the rural community

We propose that themes 1, 6 and 7 are dealt with by work stream 1; themes 2, 4 and 8 in work stream 2 and themes 3 and 5 in work stream 3, although this proposal will be discussed in detail at the start of the work programme.

In each work stream we set out what it is that needs to be done and what will be achieved if we collectively take positive action to deliver the desired outcomes and create an increase in AD. We need to work with key trade bodies, local authorities and others to agree who will help us deliver answers to the questions and what the end point of each work stream will look like. The last key element of work that will be required is a clear communications plan that will lay out how each deliverable will be made available.

We invite interested parties to respond to this document by **12 December 2010 by writing to Defra's AD team at biogas@defra.gsi.gov.uk**.

We welcome views on the proposed work streams and priorities contained within them, and ask for nominations from interested parties and organisations to either lead or participate in the proposed work areas, committing time and resources both to developing the required work stream and to implementing them.

We would be grateful for response to questions attached in **Annex A** to help us start the process.

We will consider all of the responses to this invitation. We aim to have the first meetings of the work streams early in January 2011.

A proposal of the working groups and timeline is attached **Annex B**

What are the key areas that need to be addressed?

The following table poses a series of questions in a succession of work streams. The proposed framework of work would deliver the answers to these questions and in doing so provide government and industry with a series of tools and programmes which will enable the further development of a robust AD industry. The table includes a range of issues which will need to be led and delivered by different parties. It is important to note that whilst there will be some issues where industry and other stakeholders will have a critical role to play in shaping and delivering the actions that are needed, there are also actions such as finalising and publishing levels of financial incentives which are already in train and have an independent timetable of their own. Actions such as these fall to government departments to fulfil.

We are committed to providing support to bring forward renewable heat. As part of the Spending Review, Government announced £860m funding for the Renewable Heat Incentive. Decarbonising the heat that we use will be crucial to delivering our renewable energy and carbon targets and to delivering energy security. We want to support a variety of renewable heat technologies to allow best use for each individual circumstance. As part of this, we are committed to creating a framework that encourages the production of biomethane for injection into the gas grid. We expect to be in a position to announce the details of the Renewable Heat Incentive, including tariffs and technologies supported, before the end of this year, and to be open for business from June 2011.

Work stream	What do we need to do?	What will this achieve?
1	**Improving our understanding of the AD landscape**	**To ensure that a sound evidence base underpins what we do**
1a	***What is the size of the AD industry today?***	
	Establish, agree and publish a baseline map for AD that covers numbers of sites, location, types of plant and feedstock capacity (tonnes and MWe and MWh), gas use and destination of digestate.	A sound base to measure progress against.

1b	***How much material do we have to put in digesters?***	
	Collate, agree and publish data on feedstocks.	To ensure that there is a level playing field for developers implementing waste management solutions and to provide a consistent tool for further modelling work. To determine if there will be sufficient waste to meet future demand.
1c	***If we build lots of digesters will there be enough waste derived feedstock to go round or will we need to grow increasing amounts of energy crops?***	
	Develop an economic model to determine the factors that will influence feedstock for AD in the future.	We currently have a growing number of AD plants being developed. We also currently have seemingly large quantities of waste to be treated. Moving forwards, policy for reducing waste but particularly food waste may decrease this feedstock leaving AD plants to compete for diminishing resources, or paying for purpose grown feedstocks grown locally or imported. Economic and feedstock modelling at this stage in the development of the industry will help us understand how this dynamic will develop. This work will recognise the use of break crops for supplementing farm scale digestion but will not cover systems that run on energy crops that displace food production.
1d	***Which models for AD development fit where in terms of location and feedstock? What are the real costs of AD?***	
	Establish a reference set of agreed costs for the development of AD	Quoted capital and operating costs vary infinitely. Agreed references would aid all those involved in the development of new facilities. Existing data is held by trade bodies etc.
	Create AD models that will pull waste feedstocks to the AD plant.	Research undertaken by WRAP has shown that the most environmentally sound and cost-effective way to treat separately collected food waste is to use properly managed AD technology. However, local authorities need to look carefully at any potential new cost implications for waste collection. This links to community AD described in (2) below. We need to understand which AD technology fits best to different situations so as to allow those who generate and collect waste to benefit from the use of AD, as well as the operator of the plant Links to 2a and 2b.
2	**Raising awareness of AD – community AD and localism**	
2a	***How can we ensure that the benefits of using AD are understood and shared by everyone?***	
	Disseminate information to inform public of the contexts in which AD can be used (a) as part of a multi-technology waste management solution and (b) as a stand-alone plant (c) as part of a PPP or PFI under long term contract or (d) as a merchant plant accepting feedstock on spot or short term contracts.	Different financing scenarios apply to routes (a & c) as opposed to (b & d).

	Develop a robust communications strategy that is open and agreed by all parties. Develop case studies of good practice.	Access to trusted information is key to ensuring that all parties involved in the planning, building and operating of AD plant understand the benefits that the technology can deliver as well as the regulatory and operational challenges that such a plant may pose. It is also vital that this information is available to the population of waste producers (industry, public sector, SME and householders) that delivers waste to the plant.
	Facilitate alignment and joint working to enable the development of schemes and projects where the community is involved in AD projects and shares the benefit of having the plant near to them (community trust funds, shared ownership, local authority ownership schemes, use of renewable heat for public sector buildings etc).	New approaches to community energy are being developed by DECC for info view: http://www.communityenergyonline.co.uk/ And the localism agenda being developed by CLG can help deliver AD. Food waste is a valuable resource for AD plants but too often is seen purely as a problem to be disposed of at cost. We want to ensure that society as a whole benefits from the use of AD and realises the value of the materials that are being thrown away.
2b	***Can we improve understanding of AD by all those involved in planning new facilities?***	
	Develop good case studies that illustrate how to work within the existing planning requirements. Develop robust communications packages for use with businesses, householders and individuals.	Waste management facilities can be unpopular neighbours. We need to ensure that firstly, planning officers and officials in local government can access the right information on AD to aid planning decision making but also that operators consistently understand the importance of ensuring that local society also fully understands the potential impacts and benefits of the technology.
	Exploit and promote the results and findings from the environmental transformation fund demonstration projects that will be commissioned in the next 6 months.	Local authorities, the finance sector and the community at large may be unsighted or nervous over what AD can deliver and so may perceive the technology as being too risky to support. The ETF projects will provide significant information on the day-to -day performance and benefits of AD on real businesses and processes. They present an ideal opportunity to provide core information for all those involved in the development of new plants – planners, operators, finance sector, waste suppliers and biogas and digestate users.
2c	***Can we build on and work with community scale AD projects?***	
	Work with existing vanguard projects that have a strong link to local communities. Links with 2a above.	AD can be operated at a range of scales. To date, our industry remains at the medium to large scale and is run mainly by single commercial operators. If we are to exploit the full range of resource and potential that exists for AD, we need to see a greater diversification in its use to community and farm-scale, with benefits being delivered to a wider cross-section of society.
2d	***Is there more that can or should be done to encourage the development of moresmaller scale plants?***	

	Reduce the capital cost of small scale plant technology.	In general the capital cost per tonne for treatment increases as the quantity of material to be treated decreases. There is thus scope to look at how capital costs could be reduced through learning from other countries and challenging the development of new techniques and plant. There is particular scope for this at the farm scale of operation where operators carry the cost of feedstock production rather than receive a gate fee for receipt.
2e	***How do we ensure that we continue to improve the technology that we are using and fill any knowledge gaps?***	
	Help industry and research bodies identify remaining knowledge gaps and research needs. Develop a clear dialogue between research bodies and industry to ensure that market needs are underpinned by relevant R&D.	We have an ongoing and developing research base for AD technology. We need to ensure that current ongoing funding for research is carefully targeted to ensure that we get best value for money in terms of delivering R&D outputs that fulfil industry needs.
	Learn from experience of using AD elsewhere.	Continue to build on the sound scientific work undertaken in the UK and elsewhere but also ensure that we are aware of work undertaken by others and can make sure that this is available to new developers.
3	**Building investor confidence**	
3.a	***How do we work with banks and finance houses to reduce risks associated with projects and improve access to finance for projects of all scales?***	
	Reduce due diligence costs though agreed protocols and accreditation. Co-develop standard financial models industry can use that will reduce costs of obtaining debt and equity finance and reduce the financial risks associated with AD, particularly smaller scale projects.	Currently, it can cost as much to obtain debt or equity finance for an AD project as it does a large scale renewable energy project of several 10s of MW, so reducing the finance sector's appetite to support AD projects. This is acting as a serious barrier to the development of AD.
	Review existing loan and leasing scheme and develop a replacement that could be used by operators to cover plant developments costs.	Existing financial incentives 'ROCs' for example do not kick in until a plant is built and generating energy. Residual value lease schemes and loan schemes could be used to provide important funding and to lower project risk for other funders.
	Help industry develop financial models that can be used to reduce costs of obtaining debt and equity finance and reduce the financial risks associated with AD- particularly smaller scale projects.	To help deliver localism agenda and encourage small scale decentralised use of energy.
	Increase the "input / output" contractual robustness of small scale projects in order to improve their financeability.	Without access to finance nothing will happen
4	**Building UK skills**	

4.a	***How do we enable a skilled and competent workforce that is equipped with the knowledge that it needs to run a safe business in an environmentally sound fashion?***	
	Develop and promote industry led training that fulfils the requirements of all regulations and regulators.	AD is a technical process that needs well trained and experienced personnel to run it. Initiatives already exist to develop training programmes and courses for industry operators, regulators, planners etc. These need to be led and delivered by industry for operators at all scales including the farming community.
	Encourage an environment that minimises barriers to growing a competitive domestic AD manufacturing base.	Currently the majority of AD capital equipment is imported from abroad. Whilst there is no intention to suppress this import trade, the development of a new AD industry presents the opportunity to grow green jobs and green skills in a time of economic challenge.
5	**Smarter regulation**	
5a	***Is the current regulatory framework the best that it can be or is there some room to improve?***	
	Continue to improve the regulatory process, guidance and training to ensure that the route to obtaining an environmental permit and APBR authorisation is smooth.	Current environmental regulations have recently been reviewed and revised. Feedback from industry indicates that there is a need to evaluate the impact of the changes that have been made and consider if there is a need for further guidance for operators.
	Clarify when biogas is no longer a waste	Creation of a specific Quality Protocol
5b	***How do we enable the use of digestion capacity within the water industry?***	
	Clarify and simplify the regulation of waste at sewage treatment works.	This is a complex area where more than one regulatory regime is used to control the environmental impact of the activity. Discussions are already in train between the water industry, OFWAT, the Environment Agency and various trade bodies to resolve a number of outstanding issues. This work will need to be completed, and where appropriate, referred to Government with recommendations for regulatory change.
5c	***How do we ensure that operators can make the best use of biomethane for heat and for transport?***	
	Identify and remove regulatory barriers (where they exist) to biomethane injection into the gas grid and to the use of biomethane as a transport fuel[2].	Ensure that the regulatory regime is able to facilitate an increase in biomethane injection into the gas grid and use as transport fuel
6	**Building safe and secure markets for digestate**	
6a	***How do we ensure that digestates are recognised as a safe and secure sources of renewable fertilisers?***	
	Build confidence in the use of digestate for all parties involved in	Closing the loop. Digestate is a valuable renewable fertiliser, but is not currently used

[2] More widely the issue of a tradable market for green gas will be looked at as part of the development of the energy from waste policy

	the food supply chain.	widely. As more digestion facilities become available there will be more digestate used and there is a real need to ensure that quality products are used in quality markets and that those who buy the produce from the land where the digestate is spread are happy with. We need to move digestate from being seen as a problem material to get rid of to being viewed as a highly valuable resource and ensure that there is a sufficient land area to spread these and other products.
	Promote the use of existing standards and best practice advice for the use of digestates.	A quality standard and associated certification scheme already exist and are being taken up by industry. Further promotion and evidence of use will help support confidence in the digestate product.
	Develop and disseminate a robust evidence base that will allow technical debate of the benefits and potential hazards associated with the use of digestate products.	Sound scientific evidence is key to dispelling misconceptions. Evidence is available from both the UK and from other countries (see 1 above).
6b	***How do we develop new markets for digestates?***	
	Encourage academic institutions, research councils and industry to work together to develop new products for new markets or to improve digestion technologies to tailor products for existing markets.	Digestates are already used as direct replacements for inorganic fertilisers, but there is potential for them to be used in other markets or even as raw material feedstocks for other processes. Technological advances are required to add value.
7	**Building markets for biomethane for transport fuels**	
7a	***How do we ensure that operators can make the best use of biomethane for transport fuels?***	
	Understand the issues of low uptake of biomethane as a transport fuel.	Using biomethane produced from AD as a transport fuel has high carbon savings potential and the technology to enable it is commercially available.
8	**AD in the rural economy**	
	How do we ensure that the development of a robust AD industry includes an increase in on farm scale AD plants?	
	Encourage industry to develop models and capital equipment that is appropriate at the farm scale level.	
	Ensuring that clear and appropriate regulatory guidance is available for farm scale operators.	The use of AD on farms will mean that farmers come into contact with a raft of regulatory requirements for the first time. It is important that the need for appropriate regulation is well understood and that access to obtaining permits and authorisations is made simple to reflect the scale of the operation and the feedstocks that are handled.
	Ensure that the body of existing work that has been undertaken on farm scale operations is made available to farmers in accessible format.	There is a body of academic research undertaken both here and in other countries that could be communicated to interested parties using new communication routes such as those operated by CLA/NFU/ NNFCC etc.
	Ensure that we understand the impact	We see that there is scope for the expansion

	of growing energy crops on potential land-use change	of rural scale AD plants that can utilise energy crops for renewable energy production, but we need to fully understand the impact of crop production systems on our ability to grow food crops.
	Ensure that training and education is available for farmers entering the AD arena.	Training is covered specifically under workstream 4. It is vital that training for farmers is appropriate, targeted and delivered by relevant bodies so that it is taken up by a wide audience.

Questions to aid your respond **Annex A**

1. Please indicate which of the thematic Working Groups you/your organisation would like to contribute to?

2. To what degree do you wish to be involved? Please indicate below...
    - Wish to be involved as an active participant in Working Groups
    - Happy to attend meeting and provide input as necessary
    - Just like to have information on the project

3. Do you feel we have identified the correct issues that need to be addressed?
    - Yes
    - No – please tell us what other issued must be considered?

4. Which are the top five priority areas you would like to see addressed? Please list
    - a
    - b
    - c
    - d
    - e

5. Which area/s of work do you foresee would have most impacts in your organisation? Or cause most concerns?

6. Who would you like to nominate to participate in the steering groups/work strands? If you're a Trade Association please nominate individual/s capable of representing your industry.

Annex B

ANAEROBIC DIGESTION FRAMEWORK DOCUMENT

Proposed working groups

This paper provides an outline process map to producing an AD strategy by May 2011 to meet our structural reform plan commitments. We hope to achieve this by setting up the followings:

Three Thematic Working Groups:

1. Knowledge and understanding
2. Smarter Working models
3. Regulation and Finance

Work Stream areas:

Group 1

- Improving our understanding of the AD landscape
- Building UK skills
- Building safe and secure markets for digestate

Group 2

- Raising awareness of AD – community AD and localism
- Building markets for biomethane for transport fuels
- AD in the rural community

Group 3

- Improving access to finance
- Smarter regulation

Purpose:

Each working group will be responsible for working out the details of each work strand e.g. specific actions, deliverables, timescales etc and report to the Steering group to seek approval.

Proposed Timeline:

Date	**Activity**
12th Dec 5th Jan	Preliminary discussions with organisations, groups and individuals on arrangements for working groups.
W/C 5th Jan	Initial steering group meeting. Chairs of working groups given clear instructions on what needs to be delivered. Plan the work streams.
W/C10th Jan	Initial individual working groups meet (half a day) for all 3 work groups to set out all the operating structure, details/actions for each work strand.
W/C 31st Jan	All 3 working groups hold individual meetings, (1 day meeting). These events will focus on the details required to deliver the final product. Chairs to feed back to steering group.
W/C 14th Feb	Steering group meeting to ensure outputs of working group are completed and are usable.
W/C 21st Feb	Finalising meeting for working group (1/2 day meeting) for each working group.
W/C 28th Feb	Final steering group meeting to finalise details and hear final reports from working group Chairs.
21st March	First draft of AD strategy/action plan complete.
28th March	Discussion of document with all groups,
May	Publish final industry and government agreed Framework Document.