Renewable and Low Carbon Energy Assessment – Post publication critique.

Contents

Abbreviations

Abbreviation	Full Term
AD	Anaerobic Digestion
AECOM	AECOM is a global provider of professional technical and management support services to a broad range of markets, including transportation, energy and water systems, enhancing environments and building communities.
DHN	District Heating Network
LDP	Local Development Plan
REA	Renewable and Low Carbon Energy Assessment

Introduction

1.1 A Renewable and Low Carbon Energy Assessment (REA) and District Heating Network (DHN) Evaluation were published by AECOM as part of the energy evidence base for the Local Development Plan (LDP). Consultation was undertaken with key stakeholders to provide the opportunity for additional more detailed information to be presented, either in support of the findings or particularly where there were any differences of opinion, to ensure a robust and balanced piece of research. The consultation record in Appendix A includes a list of participants, along with details of the consultation.

1.2 This paper includes a note of all discussions, feedback and further work that was carried out following receipt of the REA and DHN Evaluation.

Comments on the REA

Anaerobic Digestion

Renewable Energy Assessment for Powys - Comments from Severn Wye Energy Agency in Respect of Anaerobic Digestion Potential

The way in which anaerobic digestion is handled within the report is not considered to be helpful. In order to consider the full, identified, potential of the technology reference has to be made to the various sections within the Energy from Waste chapter. There is no reference to AD in the Biomass chapter – largely because non-woody biomass has been completely excluded.

The restricted definition of biomass is compounded when it comes to the discussion of “energy crops” which commences on page 33. Energy crops are not just woody materials suitable for burning - with thousands of AD plants in Germany providing testimony to this. Whilst the UK government position appears not to favour AD from energy crops, it is likely that many farm, manure based, systems are likely to input some energy crops in order to render a system economically viable. This does not necessarily mean a conflict with food production as the “energy crop” might be a break crop (a green manure crop planted in order to provide continuous cover to the soil) or possibly a second cut of grass. In sharp contrast to the figures in the report for land suitable for energy crops, most enclosed land in Powys would be suitable for growing grass silage – a fine energy crop for a digester.

As an aside, the calculation of available land for short-rotation coppice and the like ignores the work that was undertaken by the Wales Biomass Centre. There is no need to limit crops to grade 1, 2 and 3 land. It is also a very questionable assumption that such material would go for electricity production.

The report almost certainly significantly underestimates the potential for energy from AD but it is very difficult to fully correlate against the figures used. Knowing the number of cattle and pigs is not entirely useful in isolation. Even as a crude estimation there must have been some sort of averaging of the size, age and weight of the cattle in order to provide the information on manure. A dairy cow clearly produces much more slurry than a Welsh Black beef animal for instance – let alone young stock. My calculator would suggest that 225,000 tonnes of slurry would produce fuel for more than a 1 MW engine/s but this would depend upon assumptions about the dry matter content.

On page 40 it appears to be suggested that farmyard manure (FYM) is no good for an AD plant and that only slurry can be used. This is simply not true. They are handled differently and preferably mixed but FYM is perfectly acceptable. Slurry on its own is generally too liquid (there's no energy in water!)

The section on poultry litter is pretty much standard to the AECOM REAs but is not very helpful. There seems to a mixing up of technologies. The dedicated 10 MW Poultry litter plant referenced on page 41 is presumably not an AD plant? Chicken litter is too high in nitrogen to be generally used as anything other than a minority component of an AD plant's feedstock. The ammonia kills the methane forming bacteria! High carbon feedstock (eg grass) is usually required to balance the nitrogen. Chicken rearing units can be a great place to site an AD plant because they have a high heat demand - so a cattle unit with chicken sheds is a potentially good site.

All of this brings us round to the point that it is very hard to treat AD in the kind of agglomerated way that has been done in the report. Many (most) farms will not be suitable for one reason or another but there are going to be quite a few that might be able construct plants if the new systems that are in the range 50 -150 kW prove themselves. They will probably use mixed feedstocks and only the best ones will utilise anywhere near all of the available heat. There

will be some occasions when a livestock unit should be strongly encouraged to build an AD plant – for waste and nutrient management as much as energy production. The UK Advisory Committee to the Biomethane Regions project will be asked to consider some ideas that might be offered to the County Council in terms of planning policies for AD.

An article (see Appendix B) by Andy Bull of Severn Wye Energy Agency (SWEA) highlights some recent research from their time in Brittany.

RenewableUK Cymru – Response.

RenewableUK Cymru is the trade association representing the wind, wave and tidal energy industries in Wales, we have a significant number of members with active interests in Powys, concentrated mainly in the Strategic Search Areas, though with smaller developments elsewhere in the county. With regards to the consultation process on this document, we are concerned that it appears to have been carried out “behind closed doors” and as the industry body we were only made aware of the consultation period by one of our members – this is clearly not an ideal situation.

It is our understanding that a Renewable Energy Assessment is recommended by Planning Policy Wales and it is in this light that Powys has undertaken this REA. Whilst we welcome the approach taken to establish a clearer evidence base for the potential that exists within Powys it would be helpful if to identify timescales envisaged by the document. Current wind energy targets are set for 2015-17 and 2025, and we would expect revision of targets once these are met or missed. We would also expect that a section on renewable energy is inserted into the LDP as a greater understanding of the potential is now available.

The significant identified potential in Powys, more than twice the current Welsh Government target for wind energy across Wales, means Powys

County council should consider ways in which to leverage investment in schemes of up to 25MW in the identified areas1. Powys CC should particularly look at Radnorshire where there is little existing development and where cumulative impacts may be lower. There is also a need to assess and evaluate the potential for renewable energy on brownfield sites2. There is significant potential for a large proportion of the 300MW target, above and beyond the identified capacity of the Strategic Search Areas to be constructed in Powys and for the benefits and associated investment and employment to be retained within Powys. We are therefore concerned that despite the highlighted potential within Powys, the scenario presented in the study for 2025 identifies no deployment of onshore wind within the county in future – this seems unlikely as it is probably that at least a proportion of what is currently in planning will come forward for construction in the medium to long term future.

The document notes political and other concerns that constrain development and Powys should consider the best ways in which to utilise its resource in order to meet Welsh Government targets and its own obligations whilst minimising the risk that these concerns may pose to investment. We do not agree with the implicit conclusion, hinted at by the scenario that these constraints are a blockage on all development. Powys must consider ways in which to enable the sensitive development of the resource available through the development management process and latterly the LDP. Powys CC must focus on delivering the economic development that would be associated with construction and operation of smaller scale wind projects in the county.
On a more specific note in Appendix B, the distance constraint from major waterways is not listed, this means that the results of the study are not replicable and independently verifiable at present. It also appears that the calculations of existing and potential wind energy generated are incorrect in the Table on page 55 - existing generation should be 536,638MWh and potential generation is 10,667,052MWh.

[1] Welsh Government endorses this approach in Planning Policy Wales
[2] ibid

We would recommend that the REA is now used in a serious assessment of what Powys may be able to achieve in the future. Whilst we feel the REA provides a robust assessment of the potential available within Powys it does not go far enough in assessing the best means in which to achieve greater generation of renewable energy. Given that the most widely deployable, and cheapest technology available remains onshore wind, Powys must consider it a key part of the energy mix.

West Coast Energy's Response to the Powys Renewable Energy Assessment

Introduction

West Coast Energy Ltd (WCE) welcomes the opportunity to provide comments on the Powys Renewable Energy Assessment. WCE is a leading independent wind energy developer based in Mold, North Wales. The company was established in 1996 and operates throughout the UK. The company has a team of highly experienced professionals that specialise in the identification, design, planning and development of wind energy projects. WCE has been involved in the development of over 600MW of wind power generation, with several other schemes proposed for future.

The comments provided below are almost all focused on the wind energy element of the REA as this makes up WCE's core business.

Introduction

Firstly it is welcomed that Powys County Council have commissioned independent consultants to develop the Renewable Energy Assessment. This will provide a firm basis upon which to take informed decisions in the County as the LDP progresses.

Aims of the REA

There is general support for the aims set out in the REA.

The third aim set out in the REA relates to onshore wind “Thirdly, in the case of wind developments, it can assist officers in understanding why a developer has chosen a particular location to develop a scheme.”

Whilst this aim is supported, a further link towards timescales should also be made here. Whilst the REA may help the Council understand why a developer has chosen a site or scheme, this should also be set in the context of national targets – at both UK and Wales levels. For example, onshore wind targets are expected to be delivered in the main by 2015-17 – however this will not tie up with the timescales of the LDP. Reference should therefore be made to target delivery times somewhere under the Aims of the document. This would enable a greater understanding of these issues by both the Council and developers.

If there are genuine conflicts between the timescales for delivering national targets and those of the preparation of the LDP, this should be acknowledged up front and addressed. If it is not practical or realistic to wait for the LDP to be prepared before rolling out renewable energy policy to meet national energy targets this should be addressed in the next stages.

It is also recommended that a more explicit reference is made to the role of planning policy through Planning Policy Wales in the Aims – particularly as this document makes direct reference to undertaking Renewable Energy Assessments.

Consultation

Whilst we are very grateful for the opportunity to comment on this document, we do have some serious concerns that other industry representatives were not made aware of such an important document. The REA should be consulted with any industry stakeholders with an interest in Powys.

Local Development Plan

In particular, it is a concern that the first formal consultation draft of the LDP did not include a section on renewable energy, due to the fact that the REA had not been published at the time. It is hoped that this element of the LDP is now formally and widely consulted.

Energy Deployment

The REA is intended to “inform action to support deployment and delivery of renewable energy installations on the ground”. Deployment and delivery is one of the biggest constraints to the development of renewable energy – therefore this is a critical element of the report. However, this issue is in fact largely silent within the report, and may be considered a missed opportunity. It is recommended that an assessment of factors behind the lagging deployment of onshore wind in Powys should be made as this will help future deployment. Serious consideration should be given to deployment and delivery of projects within appropriate timeframes as part of the next stages.

Planning Policy

There is support for the reference to PPW as the driver in this Section, although as referred to above it may be better to include reference to this in the overall aims of the REA. 3

With regard to the aims of PPW and REA, it is not considered that the REA goes far enough in guiding “appropriate renewable and low carbon energy development by undertaking an assessment of the potential of all renewable energy resources and renewable and low carbon energy opportunities within their area, and include appropriate policies in development plans [PPW paragraph 12.9.2].” Whilst it does provide an initial overarching assessment it does not take this to the next stage or suggest planning policy to address this.

Potential Renewable Energy Capacity

It is noted that the predominant technology in terms of existing and future capacity is wind. The role that this technology plays in Powys, and in

delivering Wales and UK wide targets, is clearly strategically very important. Whilst this message is clear in the document, it does not really come out of the conclusions at all. There should also be clear guidance as to what the next stages are – this is absent but should be communicated clearly as this strategy moves forward.

Development Management

It is a flaw in this document to solely focus on planning policy, rather than development management. Development management is inextricably linked with the deployment of wind energy, and this should be considered. As stated above, if developers wait for the LDP to adopted prior to progressing any developments Welsh Government targets will be missed. Therefore delivery and deployment necessitates an understanding of the Development Management's system in delivering renewable energy developments. Under this Section on Page 11 it also states that the REA "also contains guidance and examples on how to translate the evidence base into policies and targets." However, such guidance and targets are lacking and this omission should be addressed.

Soundness

The statement that the "…REA does not provide a definitive template for sound evidence" and that "the responsibility of preparing evidence for LDP policies and decisions taken in the LDP is the sole responsibility of the LPA" is contested. The REA is an independent assessment of the renewable energy context within Powys and should be considered as contributing to a sound evidence base.

Renewable Energy Target - Deadlines

No reference is made to the 2015-17 target referred to in the Wales Energy Strategy. The REA makes assumptions that sites will be developed only once the LDP policy is in place. However for developers - site identification to site operation can take several years. This issue requires addressing if the practical implementation of renewable energy targets is to be addressed.

Existing Commitments

The REA sets out the total existing renewable energy capacity in Powys for large scale renewable technologies was calculated as 212.3 MW of electrical power - of which existing wind energy accounted for 204.2 MW. Whilst not a direct comment to the REA it should be noted in any subsequent documentation the importance – or even dominance - that wind energy plays in the energy mix.

Setting Targets

Whilst the recognition that Powys could theoretically provide in excess of 4GW of further wind energy is a useful starting point, it is important that some sort of practical or sensible target setting forms the next logical stage. Whilst there is a Section on 'Setting LPA Wide Renewable Energy Targets', the conclusions appear to be arbitrary and have no justification. Given that wind power makes up the vast majority of existing capacity and has by far the greatest scope for future growth, it can only be described as bizarre that the scenario of a 0% uptake should be applied in the future. Some more realistic and appropriate scenarios should be put forward in this Section, particularly given the significant benefits that wind farms can bring to the County – see section below.

Furthermore, it appears that the calculations of existing and potential wind energy generated are incorrect in the Table on page 55 - existing generation should be 536,638MWh and potential generation is 10,667,052MWh.

Benefits of Wind

The future uptake scenario portrayed above does set some alarm bells running about the political will to capitalise on the substantial environmental, economic and social benefits that wind can bring. It is hoped that when any subsequent LDP consultation is raised on this issue, the full benefits of this form of generation are clearly communicated.

Conclusions

It is supported that Powys Council have undertaken this REA in line with advice in PPW. It sets out the strategic importance of wind in the County both in terms of existing provision and future deployment. The theoretic potential and scope for further renewables development is clear and it is important now that this is taken forward under a clear and consistent policy framework.

Consultation Notes

Meeting with Andy Bull, Severn Wye Energy, 10th January 2013

General Discussions

Details missing for anaerobic digestion (AD) due to strategic approach - offered to provide detailed report for us at no cost.

Check the numbers of pigs in Powys as pig waste is the most effective for AD, however it was thought that pig farming is not very popular due to the expense of keeping them and lack of capacity for appropriate sheds. 'Catchurable muck' is the key and the ease of the process e.g. easy to collect manure from inside sheds than from open fields.

Poultry sheds have a very high heat demand. Locating an AD plant next to one would therefore be effective, however extra material high in carbon (e.g. grass silage) would need to be added to the waste mix to balance out nitrogen levels.

Previously it was thought that AD plants needed to have at least an installed capacity of 100KW to be viable, but with better technology capacity of 50KW may be viable.

Different designs of AD plants e.g. American plug flow reactor with horizontal orientation (flexible system allowing for addition of units on the side to more easily increase capacity) or the more commonly used German vertical cylinder reactors.

Better to focus on agricultural waste rather food waste due to complex regulations. Food waste has recently been reorganised for Powys/Ceredigion consortia, exporting the waste to Oxfordshire.

It is far easier to deal with own farm waste rather than e.g. importing from neighbour, as the potential increase in pasteurisation/sterilisation would mean increased capital and running costs. Less complications with no contracts as well.

Could request Management Plan with applications.

Could have an AD manager of e.g. 5 farms.

Need to avoid heat ‘dump’. Renewable Heat Incentive. Policies need to allow for farms to be flexible and opportunistic to allow for other uses to use up the remaining heat through further farm diversification.

Examples of AD include: Porthamel in the Brecon Beacons National Park, Gloucestershire DHN project, Cambridgeshire, Ludlow, Evergreen Gas etc…cluster of companies.

In relation to District Heating Networks (DHN) it was suggested it would be of more benefit to focus on existing development, rather than new development as there is less opportunity to increase/have an impact on energy efficiency with higher regulations on new properties. Older properties would benefit more as they are likely to be far less energy efficient.

Concern over expense of DHNs. Suggestion of use of Allowable Solutions contributions from houses being built in one place to provide a carbon emissions saving district heating network somewhere else.

Actions going forward

Agreed outcome is for Severn Wye Energy to produce a detailed report on the options to deal with agricultural waste through anaerobic digestion (including suggestions for policy wording) and to include a more general response to options put forward in the REA and DHN by AECOM. This will go through Severn Wye Energy’s Advisory Committee.

Powys County Council to investigate local funds available for AD plants through Allowable Solutions (look at Cambridgeshire SPB example of setting up fund). Option either to use money to fund viability gap or use profits to feed back into more projects. LDP could specify where the grand should be used.

Options to aid the Deliverability of Energy Schemes

Anaerobic Digestion

Provide leaflets/guidance note on Anaerobic Digestion for example so that research is not lost in policy. Powys County Council in partnership with Powys County Council could provide this.

Suggested policy

Preamble

Over the last few decades there has been a shift in livestock farming practices that has seen more and often, bigger buildings that are used to house chicken, pigs and cattle. Even some dairy units now are “zero grazing” – ie the cows are housed in buildings for almost all of their lives. The Council is concerned to ensure that the wastes that arise as a result of these more intensive forms of livestock rearing are managed well – and preferably used in a constructive manner to maintain local soil structure and provide renewable energy. Anaerobic digestion (AD) is a process whereby agricultural wastes can be converted to a methane rich biogas and a digested slurry (known as digestate). The digestate is a valuable fertiliser and soil improver that contains nitrates, phosphates and potash, all of which are in a form that is readily up-taken by growing plants. When handled correctly this material will produce less odour when spread than undigested manures and slurries and is considered safer from a food safety perspective.

AD 1 Organic Waste Management for Major Livestock Units

Where it is proposed to construct a new or extended livestock housing unit that would in itself, or in combination with other buildings on the same farm take the number of livestock units (of single or mixed species) housed for over 9 months of the year, to more than 300, the local planning authority will

require that the planning application will be accompanied by a report identifying the alternative options for the management and productive utilisation of organic wastes arising from the proposed operation. This will include the feasibility of incorporating an anaerobic digestion (AD) system. Where that report indicates that an AD system would be feasible and desirable, the local planning authority will expect to see it, along with the productive and efficient use of the resulting biogas and digestate, incorporated into the proposed development. If an alternative to AD is proposed to be adopted then full justification for this approach should be provided.

The policy uses "livestock units" as its basis for determining the threshold at which the requirement for a feasibility report is to be triggered. This is an officially recognised unit that is defined in terms of feed requirements – and thus is a reasonable indicator of excrement production. The ratios for converting numbers of animals into livestock units for some of the animals commonly kept in Powys are:- dairy cows (black and white) 1, beef cows 0.75, beef cattle (12-24 months) 0.65, broilers and pullets in lay 0.0017, upland ewe 0.08, breeding sow 0.44, horses 0.88.

AD2 On-farm AD Plants Digesting Agricultural Wastes

Proposals for the construction of anaerobic digestion units on farms will generally be acceptable where the following criteria can be met:-

1. *No part of the unit (digester, the feedstock store, digestate store, gas store, or generator) is within 400m of the nearest sensitive building (other than any dwellings directly associated with the farm) unless there is at least one intervening building that was designed and is currently used to house pigs, cattle or poultry – in which case the minimum distance to a sensitive building may be reduced to 200m.*
2. *No part of the unit (digester, the feedstock store, digestate store, gas store, or generator) is sited more than 40m from an existing building that forms part of a farm building complex that consists of at least three buildings/structures.*
3. *At least 75% (by weight) of the feedstock for the digester arises from within the same or immediately adjoining agricultural unit/s and the remaining quantity is made up solely of agricultural, horticultural or grounds maintenance wastes.*
4. *At least 90% (by weight) of the resulting digestate can be spread on the same or immediately adjoining agricultural unit/s in compliance with relevant legislation and best practice.*

The siting of an AD plant on a livestock farm, that is compliant with the necessary licensing requirements under other legislation, will generally be no more disruptive to neighbours or the wider public than existing farming operations. The digestate store is likely to be similar in character to existing slurry stores – but with less associated odour. The criteria set out above are designed to ensure that this is true by protecting neighbours from new adverse issues (particularly odours), that there would be few, if any, new vehicular movements generated and the plant would sit within or adjacent to the existing farm buildings complex.

The biogas from an on-farm AD plant will usually be used to generate electricity. A bi-product of generation is the production of heat energy and the LPA is keen to see this utilised where practical. It will, therefore, be sympathetic to planning applications for the introduction of appropriate new enterprises with a demand for the available heat.

AD3 AD Plants other Than Those Complying with Policy AD2

Proposals for the Construction of anaerobic digestion units other than those that comply with policy AD2 will be permitted so long as:-

Access, landscape, neighbours, etc. Treat like a waste management facility.

Appendix A – Consultation Record

Renewable and Low Carbon Energy Assessment Consultation

Name	Title	Company	Address	Contact Number	Email	Document/s Provided	Date Sent	Location of Communication	Actions	Date Comments Received	Main Feedback	Location of Record of Feedback
LDP Working Group		Powys CC Cllrs				REA+ DNHE	22/11/2012	..\Renewable Energy Assessment\REA	Presentation findings of REA to Working			

									Presentation to LDP WG.ppt	Group		
Trystan Mabbit	Senior Planning Officer Specialist Projects	Powys CC	The Gwalia	01597 82 7395		trystan.mabbitt@powys.gov.uk	REA+ DNHE	04/12/2012 (reminder sent 21/01/2013)	email 04122012 SF to Gwilym and Trystan_REA Consultation.pdf	Sent email	verbally in mtg with SF, Co B,	write up notes from mtg

											PW 13/03/2013
Gwilym Davies	Principal Planning Officer	Powys CC	The Gwalia	01597 82 7344		gwilym.davies@powys.gov.uk	REA+ DNHE	04/12/2012 (reminder sent 21/01/2013)	"		Sent email

Jonathan Cawley	Planning and Development Manager	West Coast Energy Ltd	Mynydd Isa, Mold Business Park, Maes Gwern, Mold, Flintshire, CH7 1XN	01352 705248	jonathan.cawley@westcoastenergy.co.uk	REA+DNHE	26/11/2012	email 26112012 SF to JC copy of Powys REA.pdf	Sent email	

04/12/2012 (reminder sent 21/01/2013)	email 04122012 SF to JC_ REA Consultation.pdf	Sent email		
	West Coast Energy\1379 20130123 Response to REA_cover letter.pdf		28/01/2013	West Coast Energy\1379 20130123 Res

													pons e to REA .pdf
Andy Bull	Head of Regional Strategy and Development	Severn Wye Energy Agency Ltd	Entrance A, Royal Welsh Showground, Llanelwedd, Builth	01982 551006		andy@swea.co.uk	REA+ DNHE	04/12/2012	email 04122012 SF to AB_REA Consultation.pdf	Sent email	11/12/2012	Concern over expense of DHNs. Suggestion of use	email 11122012 AB to SF Comments on REA .pdf

Wells, Powys, LD2 3NJ	of Allowable Solutions contributions from houses being built in one

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somewhere else. Details missing for AD-offered to provide

		detailed report for us at no cost.	
Meeting	10/01/2013	see notes in paper on involv	Paper on Involvement for Renewa

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email received	18/04/2013	policy ideas sent to advisory group.	Severn Wye Energy Agency\email 18042013 Policy Ideas for Powys LDP.pdf	
email received	24/07/2013	Final amended policy	Severn Wye Energy Agency\Powys LDP suggested	

				cy sug ges tion s. policies revised 2.docx
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										Tanya had mtg with Steven Edwards 30/04/13 - will send REA again in case they did have any comments
Rachel Furlong	Policy Manager (Environment)	ScottishPower Renewables	Cathcart Business Park, Spean Street,	0141 5 684412	rfurlong@scottishpower.com	REA+DNHE	04/12/2012 (reminder sent 21/01/2013 +	email 04122012 FAO Rachel Furlong_REA.pdf		Sent to general email 'renewables@scottishpower.com' unable to contact directly. Saved copy.

			Glasgow, G44 4BE		to Steven Edwards)		
Matthew Williams	Policy & Research Officer	Renewables Uk Cymru			Renewables UK Cymru \email 25012013 Renewable UK Cymru Comments	25/01/2013	RenewablesUK Cymru\130124 PowysEAresponseFINAL.docx

							on REA.pdf	
Matt Bangay	Savills	Wimbourne, Dorset	01202 856942	mbangay@savills.com	REA+ DNHE	25/01/2013	Savills \email 25012013 SF to MB copy of REA.pdf	Posted copy of report
						13/03/2013		Spoke to Matt. No comments yet still working their way

through so will
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shortly.

Appendix B – Severn Wye Energy Agency Article

Smaller Scale, On-farm Anaerobic Digesters in Brittany

There is growing interest in the UK in smaller-scale, on-farm anaerobic digestion (AD) plants but, as yet, very few have actually materialised. Most modern AD plants in the UK have an installed capacity for the electrical output of the CHP engine of at least 250 kW, with it being apparently difficult to make them financially viable below that scale. A study tour, organised by Severn Wye Energy Agency under the auspices of the "Intelligent Energy Europe" (EU) funded "Bio-methane Regions" project, recently visited four on-farm AD plants in Brittany, north-west France, all of which were rated at between 100 and 150 kW. The tour group of 12 were keen to discover why these plants are able to succeed in France, when it appears to be so difficult in the UK. The party of enquiring minds were looking at the issue from different perspectives. Some wanted to install on their own farm, while others were professional advice providers. The Welsh Government's Agricultural Division was represented in order to learn any salient lessons for the principality, and Evergreen Gas attended, because the company was relatively recently established specifically to operate in this on-farm market.

Before describing the plants in Brittany, it is important to discuss why it is that the smaller-scale plants have been slower to materialise in the UK – even since the welcome introduction of the Feed-in-Tariff (FiT) support. There are quite a number of elements in a standard (currently, typically German-built) AD plant that come in at approximately the same cost for smaller plant as they do for plant two or three times as large in nominal capacity terms. Thus, as with many clean energy technologies, there is a significant "economies of scale" argument relating to the capital costs of AD. The subsidies available through the FiT and now the Renewable Heat Incentive (RHI) do reflect this to some extent, but the economics of smaller-scale AD has still been seen to be difficult – largely because the high capital cost of the equipment remains an entry barrier. There are emerging UK companies such as Evergreen Gas who understand that the capital cost of such small-scale plant must be

proportionate to the income that it can generate in order for an attractive return to be obtained. Given the support mechanism in place for the beneficial use of heat in the form of the RHI, smaller AD plants using allof the available heat stand to generate significantly increased revenue. The above is clearly a huge over-simplification of a more complex formula, but some of the other issues will emerge later as the situation in Brittany is discussed.

The four plant that were visited were all within 40 minutes drive of the centre of Rennes, the capital of Brittany, and all had been supported by Association d'Initiatives Locales pour l'Energie et l'Environnement (AILE), one of the partners in the Bio-methane Regions project. The on-farm plants had all benefited from between 20 and 26% capital grants from either the regional Breton or national French governments, and in all cases were also receiving Feed-in-Tariff payments. This apparent ability and preparedness of the authorities in France to provide capital support without it being deemed to automatically conflict with feed-in-tariff payments – as far as State-Aid rules are concerned – is perhaps the one big contrast with the situation in the UK.

However, the reader is urged to resist the temptation of giving up on this article at this point, as this grant funding does *not* explain the whole story – and certainly is not a “show-stopper” as far as applying the smaller-scale AD technology to the UK is concerned.

The plant also had in common a base feedstock of animal manures. Two of the plants were fed by the slurry from indoor-housed veal units – a livestock category not seen in the UK – one from pigs and another from dairy cows. Three of the farms had chicken-rearing units. Only two of the three with chicken units used the high-nitrogen litter in the AD plant. All four plants grew “break crops” to supplement the low energy content slurries. These crops are grown in the gap between the harvesting of autumn-sown cereals such as wheat and the sowing of the next crop such as maize. Such crops are very much encouraged to provide “continuous cover”, but usually do not have time to mature. Without an AD plant available to take the substrate, these break

crops would usually be ploughed back into the field. The digestate derived from the digestion of these plants contains all of the nutrients in the plant material, so when it is spread to land, nutrients are retained.

All of the farms sought out additional feedstocks from surrounding food processing and animal feed manufacturing operations, but only one of them had established a pasteurisation unit that enabled the input of particular material containing animal by-products. Several of the units were taking a by-product from the processing of maize for human consumption (sweet corn); one was taking apple pomace (a by-product of the local cider-making industry); and all would accept fruit and vegetable wastes whenever they could source them. Interestingly two of the plant visited fed flotation fats from a local abattoir without having to pasteurise. This would not be allowed under UK ABP regulations. This waste product is high in fat, and thus associated with elevated methane content in the biogas. Grass clippings from public spaces, including highway verges, was another material that was taken on occasion into at least two of the plants. Some of these feedstocks came free and some attracted a gate fee. Small payments had sometimes been made for the higher-energy materials. In all cases the farmers or operators reported that searching for feedstocks and dealing with the necessary regulatory paperwork was more time-consuming than actually operating the AD plant (which took only between 45 and 90 minutes per day).

All of the AD plant visited used slurry as a base feedstock which would also be feasible on UK farm AD plant. The reason for digesting additional materials is to enhance the gas production and therefor the economics of slurry digestion. Of the additional imported feedstocks being digested in Brittany, some of them would have been categorised as “wastes” in the UK requiring specific permiting. In the UK, many on-farm AD plants co-digest manures, slurries and crop feedstocks and in several cases all of these are sourced from the farm. AD plant can digest crops and other materials without the addition of slurries, but the advantage of using slurry or manure as a feedstock is that it is usually free and requires containment/management.

One of the farmers told us that his neighbouring farmers viewed the AD plant with some suspicion and they were concerned that the price of maize might be driven up by hungry digesters, leaving them out of pocket when it comes to feeding their cows. In France there is a definite desire not to allow a situation to emerge like that which can be observed in Germany.

It was not coincidental that the plants visited in Brittany had taken the non-energy crops model. The subsidy structure in France pushes developments in this direction and, on this occasion the British and French regulatory regimes appear to be in fairly close agreement.

Another aspect of commonality amongst the Breton plants was the deployment of the heat from their CHP systems. All of the farms used CHP heat to warm their own farmhouses and livestock housing, three used it to heat their poultry units, one to heat a farrowing/weaner unit, and finally one site exploited it to dry firewood. A farmer told us that he had taken the unprecedented step of disinfecting his shed between crops by turning the temperature up to 50 degrees C, previously impossible with fossil fuel heating. On this issue, the French government appears to be rather ahead of its UK counterpart in its unequivocal support for efficiency of operation – which implies making effective use of the heat. The way that heat use is incentivised is certainly different between the two countries. In the UK the RHI is used to reward the metered heat productively used – but currently only in units with thermal output below 200 kW capacity. In France the heat use is encouraged via bonuses to the feed-in tariff price paid for the electricity. There is a base FiT for the electricity from an AD plant applicable to its size category, but this is enhanced through a bonus system. A similar incentive structure is also used in highly-developed AD markets such as Austria. In France, part of the bonus system relates to heat utilisation, with a bonus of zero if less than 30% of the heat is productively utilised (the sacrificial heat load of the plant does not count). The maximum bonus is paid at 70% heat utilisation or above, and there is a linear sliding scale between these two points on the graph. Because the bonus payments relate to the proportion of

the available heat used, the smaller plants have a much higher chance of receiving the maximum FiT heat bonus, and a smaller heat output is more likely to be used up in a farm setting.

The bonus system in France is also designed to incentivise the use of wastes as feedstocks, and this had very clearly influenced the way in which the plants visited on the tour were being operated. The French system does appear to have been generally well thought-through, and is delivering good results. There is something of a boom underway in the construction of on-farm AD plants in Brittany: indeed, all four of the sites visited have started up since 2010. The only piece of quirkiness (if not, perhaps, barking madness) that was discovered, related to the actual definition of "useful heat". It is apparently very good to displace LPG or oil-fired heating systems within a pig rearing unit, for example; but if the CHP-derived heat displaces an *electric* system then this is not deemed as useful, and does not confer the bonus eligibility. A cynic might suggest that the fact that the FiT is paid by EDF – France's dominant and nuclear-led power operator – would explain this apparent anomaly; conversely, perhaps supporters of the nuclear power industry might suggest that it is because the EDF electricity has so little carbon attached to it?

The question that has to be asked is whether the mixed tour party generally came home encouraged, or alternatively convinced that the French system was so much better than ours that similar-sized AD plants were still not be viable in the UK. The answer is not entirely straightforward, but there was certainly no cloud of despondency. Another point that all four Breton farms had in common was that they had utilised German technology (three were even the same company). We had been given the capital costs incurred by the plant developers, and there was a feeling that some of the new ideas being developed in the UK would bring about more cost efficient solutions. The lack of grants to assist in the direct cost of building AD plants in the UK could quite easily, at least in part, be off-set through payments to assist with peripheral but vital infrastructure such as grid upgrade costs and digestate

stores. Although the energy generation support mechanisms are different – with the French system probably currently ahead in terms of incentivising the best practice – there was not so much difference in final outcomes to render an appropriately-designed system much better supported in France than in the UK.

Andrew Bull is the Coordinator of the 3 year Bio-methane Regions project, which includes 15 partners from across the EU. He works for sustainable energy charity Severn Wye Energy Agency, based in its mid-Wales office.
www.bio-methaneregions.eu