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RHI Sustainability – Biogas Combustion

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Introduction

Biogas combustion covers both combustion in a biogas boiler and combustion in an internal combustion engine to generate electricity and heat – Combined Heat and Power (CHP). Biogas is defined as any gas derived from plant or animal matter, it can be made by anaerobic digestion – by far the most common method, gasification or pyrolysis.

For biogas sustainability it is important we differentiate between the fuel - the actual biogas, and the feedstocks – the raw materials put into the digester, gasifier or pyroliser. The RHI sustainability requirements often mention fuel, where in the context of biogas they are referring to the feedstock supplied to the digester, but generally most sustainability requirements apply to the biogas fuel produced by the digester.

It is important to make sure that everything in the supply chain fits the RHI sustainability criteria, and probably more importantly there is suitable evidence to prove it. This applies to both those who are just now applying for the RHI and those already long registered.

In order to claim the RHI for any fuelled installation, you have to prove that your "fuel" meets the RHI "Sustainability Criteria". In reality these are in fact two basic criteria known as the "Greenhouse Gas (GHG) Criteria" – a minimum carbon footprint and the "Land Criteria" - the land criteria are aimed to ensure that all biomass based fuels are socially and environmentally sustainable.

GHG Criteria

The GHG criteria for solid biomass is set at a minimum 60% GHG emission saving relative to EU fossil fuel heat average = **34.8g CO^2eq/MJ of heat**. There are two available methodologies for calculating the GHG depending on the size of the installation and fuel used;

- Default Value Method – Very simple, as the GHG values of certain fuels are given in the regulations. If your fuel is not listed (including the feedstock it was derived from) then you can't use this method. Supposedly it gives higher values than the actual value method. Not an option for systems over 1MW with process heat.
- Actual Value Method – Need to calculate the GHG values for your feedstocks based, cultivation systems (if appropriate), transport distances, processing systems etc. There is a free, rather complex, software tool available to do this; https://www.ofgem.gov.uk/publications-and-updates/uk-solid-and-gaseous-biomass-carbon-calculator

Unfortunately, the "Default Values" provided in the regulations only cover biogas derived from whole crop maize – based on "organic" agriculture and biogas from whole crop wheat. Therefore most producers in the UK will have to use the actual value method for most of their feedstocks.

Land Criteria

On a broad level they are the same whether it is grass silage from the UK or palm oil from far less regulated regions of the world.

For non-woody biomass (and woody energy crops), the sustainability criteria are set against those in the *Renewable Energy Directive (RED)* regulations. You need to evidence the land the raw material came from is none of the following;

- land which at any time during or after January 2008 was primary forest (The UK has no primary forest so not an issue)
- land which at any time during or after January 2008 was land designated for nature protection purposes.
- highly biodiverse grassland, unless the harvesting is necessary to preserve the grassland status.
- land which at any time during January 2008 was peatland (unless the cultivation and harvesting of biomaterial did not involve the drainage of previously undrained soil)
- a former continuously forested area
- a former wetland area

This is the wording taken from the RHI guidance, worryingly it puts no timeframe on the "former continuously forested area" and "former wetland area". For the UK much of it was forested at one point or another, as for wetland, then again could be a big issue. However the guidance in the Renewable Energy Directive this is based on does give the same January 2008 date for these as well as the others. So we have assumed this so far with no contradiction from Ofgem, yet.

Energy crops - including Short Rotation Coppice and Short Rotation Forestry, that received payments under the "*Energy Crops Scheme*" are deemed to have met the land criteria.

Complying with the regulations

For biogas combustion there is only one route RHI users have to prove the fuel meets the RHI requirements; Report directly to Ofgem, you need to calculate the fuels GHG every quarter using a rather complex piece of software. Also have access to the required evidence that it meets the land criteria.

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Feedstock classification

Not all feedstocks are considered equal. Basically you have 3 categories;

• Products and co-products	-	Need full GHG and land criteria
• Residues	-	Need partial GHG and most need land criteria
• Wastes	-	No evidence required

Each category has different requirements for evidencing sustainability. For reporting purposes each category must be reported separately.

Products and Co-products - such as crops, molasses, category 3 tallow etc. You need to calculate the GHG for the whole production process (seed to delivery at plant). You will also need to evidence land criteria.

Residues – straws. Only the GHG from the point it is collected needs to be calculated. You will need to evidence land criteria for MOST residues.

Wastes (definition does not necessarily tie in with SEPA). e.g. slurry, dry manure, poultry litter, food waste, Category 1 Tallow. NO evidence for GHG or land criteria is required.

Evidence

Evidence and paperwork for the GHG criteria for non-woody biomass (and woody energy crops) are generally more burdensome than most woody biomass, conversely land criteria are typically less so for UK grown feedstocks. It should be pointed out that evidence is only required if/when you are audited, however it is critical that all the evidence is in place at all times, as failure to produce evidence could result in a compliance notice.

GHG Criteria

Unless you are very fortunate and are only using the two biogas fuels with default GHG values in the regulations, you will be required to carry out an actual value method using the Biomass and Biogas Carbon Calculator (B2C2). Whilst the software is not the most user friendly to use, it does come with 7 default feedstock supply chains for biogas;

- Dry manures
- Wet manures (Slurries)
- Silage grass
- Sugar beet
- Whole crop maize
- Whole crop wheat
- Whole crop rye

These default supply chains can be loaded and used pretty much as is with minor changes to the transport distances. They will generally give a high figure for the GHG of the feedstock but if it is below the required target then there is little reason to alter it as this will require evidencing.

Also if your feedstock is not covered by the defaults these can be used as a starting point for adapting it to suit your own feedstock.

It should be pointed out that the figure outputted by default from the software is the GHG of the feedstock up to the point it enters the plant. This is not the figure which needs to be reported to Ofgem, they require the GHG of the heat produced which factors in the inefficiencies of the system and heat losses.

Therefore a further calculation is needed to convert the feedstock GHG to the heat GHG. In the case where only heat is produced (boilers) the overall efficiency of the system is calculated based on the heat produced and the amount of biogas supplied to the boiler (as measured on a gas flow meter), the feedstock GHG is then divided by this efficiency to give the heat GHG figure (always higher than the feedstock GHG).

For cases where electricity and heat is produced (CHP systems) not all the carbon of the feedstock goes into the heat, about half goes into the electricity. There is a rather complex calculation to apportion the GHG between the electricity and the heat, but suffice to say that in CHPs the heat GHG is lower than the feedstock GHG.

No evidence of any of the inputs is required during the application, it is only required at audit.

Proof required	Suggested evidence
Distance from field to plant	IACS records showing field numbers and crop
Inorganic fertiliser, herbicide and pesticide input (only required if the B2C2 default values in the template supply chains are not used)	Copies of the mandatory farm records covering these. Agronomist recommendations.
Moisture content of crop at various stages and dried product (only required if the B2C2 default values in the template supply chains are not used)	A log book recording the results of your own moisture tests; any in vehicle test (IR scanners etc.), any lab test results.
Crop yields (only required if the B2C2 default values in the template supply chains are not used)	Any weigh tickets or records of harvester in built measurement devices.
Machinery fuel usage (only required if the B2C2 default values in the template supply chains are not used)	Can possibly use Farm Handbook values if different, otherwise paper records from fuel bowser

Land Criteria

For all crops and residues it is simply a case of proving the land the crop was grown on (the crop which produced the residue in the case of residues) was farm land sometime around Jan 2008, IACs records for the years 2007 and 2008 will cover this, or alternatively aerial photos

Buying in feedstocks

Unless they are wastes, bear in mind that you will need to prove that the land the crop was grown on was agricultural land in Jan 2008. For neighbours and people you know this may not be a big issue as the required records can probably be easily obtained. However if buying from a large national merchant this may be more difficult. In some cases it may be sufficient to get a signed declaration from the supplier stating that the land was agricultural, but this should be cleared with Ofgem in advance.

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