GREEN GAS GRIDS

Sustainability of Biomethane

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Sustainability Working Group

Aims of Working Group:

1. Understand how the latest EC sustainability criteria for biomass and biogas can be integrated into the European biomethane market
2. Analyse the different national sustainability criteria approaches by Member States
3. Identify the key issues, from a sustainability perspective, assessing the biomethane life cycle
4. Give recommendations on the sustainability criteria implementation for biomethane
5. Help ensure Member States will be able to meet EC's sustainability criteria for biomethane

1 & 2. Sustainability Criteria Integration and Approaches Adopted

Key Points: The Criteria

- Renewable Energy Directive (RED) sets out sustainability criteria
  - Mandatory for biofuels and bioliquids ✓
  - Non-binding for solid and gaseous biomass ✗
    - For electricity, heating and cooling

RED Criteria

- **Greenhouse Gas Reduction Targets**
- Biodiversity
  - Raw material cannot be obtained from land that is;
  - Primary forest/woodland area, nature protection area, biodiverse grassland
- Land Use
  - Raw material cannot be sourced from land of high carbon stock (wetlands/forested areas) or land previously classed as peatland

1 & 2. Sustainability Criteria Integration and Approaches Adopted

The Criteria in detail:

- RED Directive address EU target of 2009;
- 20% of energy from renewable technologies by 2020

	Sustainability Criteria – Solid & Gaseous Biomass	Sustainability Criteria – Biofuels & Bioliquids
	Heating, cooling and electricity	Transport
	No – series of non-binding recommendations were published in February 2010	Yes
	Same as biofuels but can be more stringent.	At present = 35% From 2017 = 50% From 2018 = 60%
	Not included	Not included

1 & 2. Sustainability Criteria Integration and Approaches Adopted

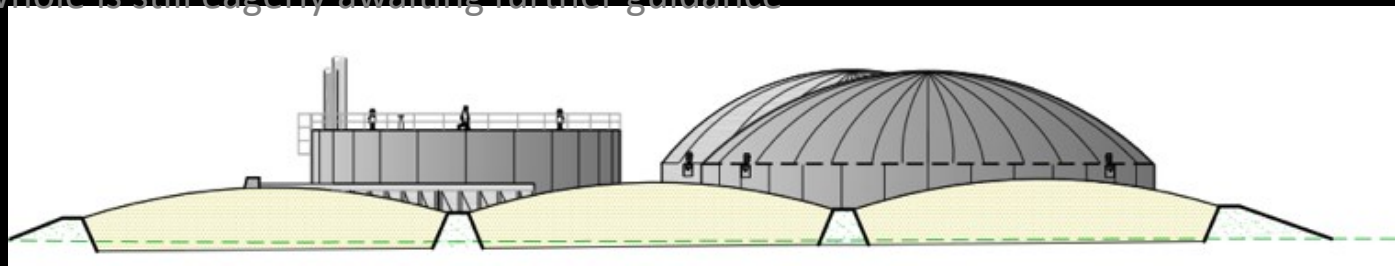
What we did:

- Reviewed existing sustainability criteria within Member States
- Analysed how regulations have been adopted and their impact on the biomethane market

Key findings:

Details found in: *Discussion Paper on Biomethane Focus Issues: Sustainability, Technical Standards, Trade and country Targets, January 2012*

- As sustainability criteria is not mandatory for solid and gaseous biomass, few member states have adopted this:
  - *Germany, UK, The Netherlands*
- Sustainability measures are still relatively new to Members
- Industry as a whole is still eagerly awaiting further guidance

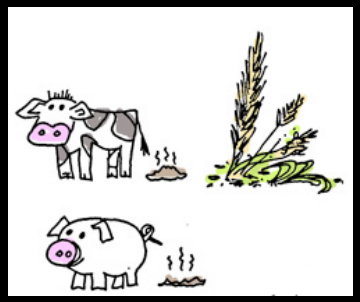


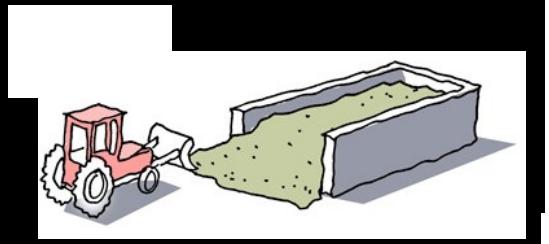
3. Sustainability Issues in Biomethane Lifecycle

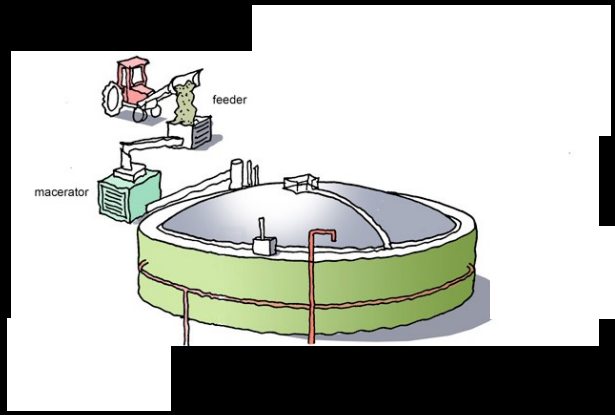
What we did:

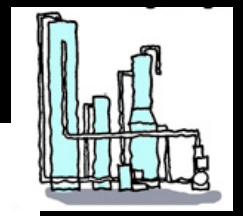
- Assessed the lifecycle of the biomethane production chain
- Using RED methodology analysed areas of the production chain with greatest impact on GHG emissions
- Suggested recommendations on reducing GHG emissions for each stage of the chain

Feedstock → **Transport** → **Storage** → **AD Process** → **Biomethane**









3 & 4. Sustainability Issues in Biomethane Lifecycle and Recommendations

Key recommendations:

Details found in: *Greening Your Biomethane Production Chain, April 2013*

- Utilisation of Digestate ✓
  - Replacement for artificial fertiliser, reduced odour, organic

- Nitrogen Inhibitors ✓
  - Reduce the process of nitrification, increasing proportion of nitrogen in the soil
- Transportation of Feedstock ✓
  - Minimise distances where possible

- Methane slip from biogas production or biomethane upgrade ✓
  - Methane slip detection systems, detection cameras used annually

- Digestate storage ✓
  - Covered liquid digestate storage, helps reduce fugitive methane emissions
- Heat Use ✓
  - Through local heating or remote heating via district networks, or ORC installation.

3 & 4. Sustainability Issues in Biomethane Lifecycle and Recommendations

Comparison – Existing Criteria and Leaked Directive

	Existing Solid & Gaseous Sustainability Criteria	Leaked Document (August 2013)
	No – non-binding criteria outlined in the RED	Yes – would supersede criteria of the RED
	At present = 35% From 2017 = 50% From 2018 = 60%	Immediate target = 60%
	Electricity = 198gCO_2/MJ Heating = 87gCO_2/MJ Grid Gas Injection = Not available	Electricity = 184gCO_2/MJ Heating = 77 gCO_2/MJ Grid Gas Injection = 69gCO_2/MJ
	Not included	Not included – However ILUC default figures proposed for biofuels

3 & 4. Sustainability Issues in Biomethane Lifecycle and Recommendations

GHG Comparators

Biogas Fuel (assume 25gCO2/MJ)	Conversion description		End Fuel emissions	Target GHG reduction	GHG reduction against fossil comparator
100 units of biogas for Electricity	Generator (40% conversion) = 40MJ$_{elec}$		63gCO2/MJ (Target is 60% lower than 188gCO2/MJ)	75.2 gCO2/MJ	66% GHG reduction
100MJ of biogas for Heat	Boiler (90% conversion) = 90MJ$_{heat}$		27.7 gCO2/MJ (Target is 60% lower than 77gCO2/MJ)	31 gCO2/MJ	64% GHG reduction
100MJ of biogas for grid injection	Grid Injection (99% conversion) = 99MJ$_{biom}$		32gCO2/MJ (Target is 60% lower than 69gCO2/MJ)	27.6 gCO2/MJ	54%GHG reduction
100MJ of biogas for transport	Transport (99% conversion) = 99MJ$_{biom}$		32gCO2/MJ (Target is 60% lower than 83.6gCO2/MJ)	34 gCO2/MJ	62% GHG reduction

3 & 4. Sustainability Issues in Biomethane Lifecycle and Recommendations

Key concerns:

- GHG Comparator
  - More stringent target, specific comparator for biomethane (27.6gCO_2/MJ)
  - Using natural gas as a biomethane comparator
    - Comparing to natural gas “an energy carrier” to “an end use energy”
    - Natural gas is one of the lowest carbon energy forms
      - *Is this a fair comparison?*
    - Biomethane is perhaps the most efficient form of biogas
- Biomethane injected into the grid is not being treated equally to biomethane used as a transport fuel.

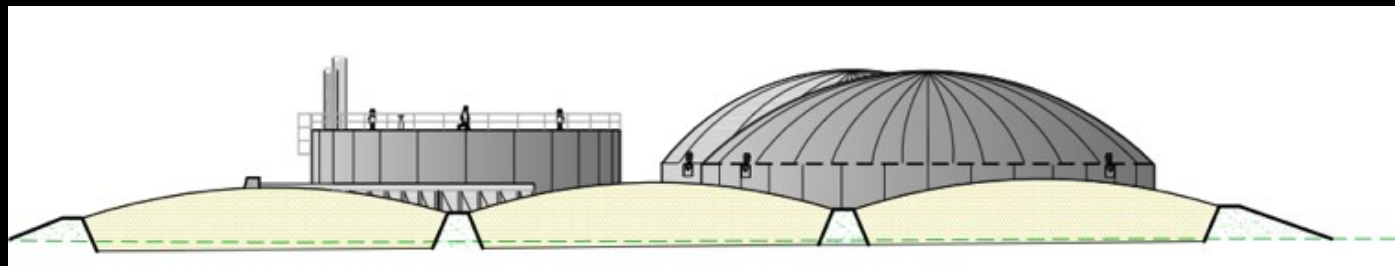
Solution proposed:

- Biomethane should be compared against the end-user, fossil fuel derived energy which it ultimately displaces.

5. Can we meet EC Sustainability Requirements

What we did:

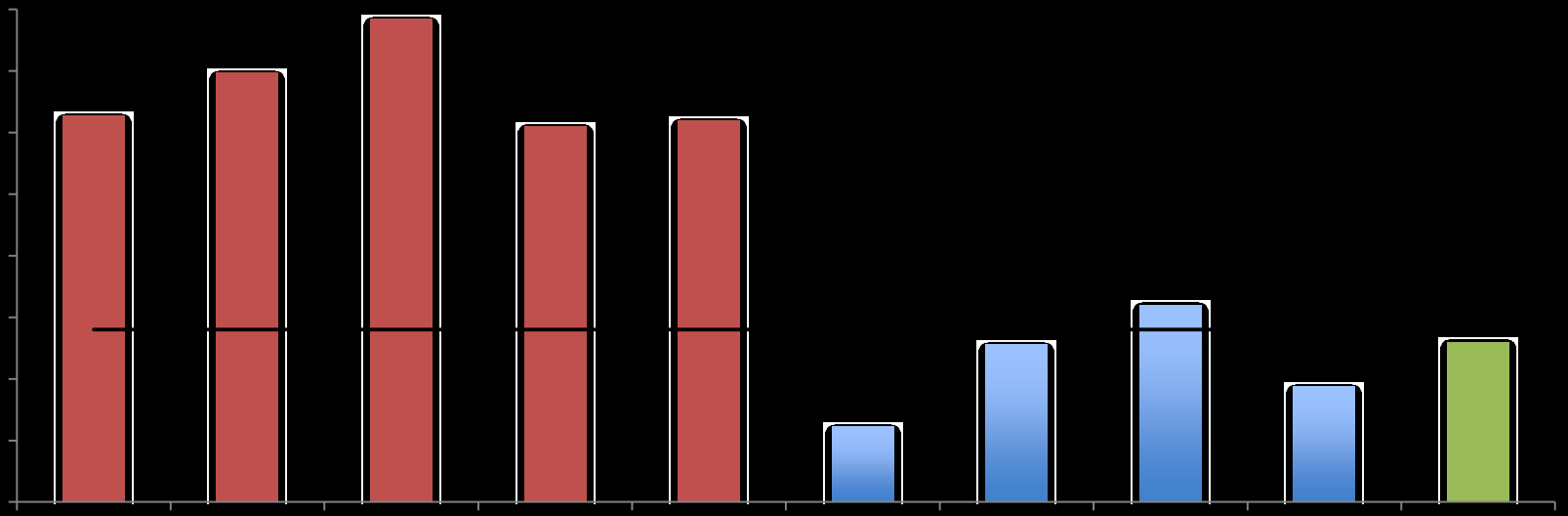
- Literature review considering reports from industry and academia.
- Modelling of best practice and worst case scenarios of GHG production chain.
- Further details can be found in the report, *Literature Review of the Lifecycle Greenhouse Gas Emissions of Biomethane Production: Supplementary Report* and *Sustainability: Greening Your Biomethane Production Chain, April 2013.*
- Comparison between existing sustainability criteria and the "Leaked Directive"
  - What will this mean for biomethane?



5. Can we meet EC Sustainability Requirements

Review of existing GHG lifecycle assessments:

- Reports considered from both **industry** and **academia**.
  - Findings showed that biomethane emissions from the production chain vary from 12.2gCO_2/MJ to 78.5gCO_2/MJ
- Further details can be found in the report, *Literature Review of the Lifecycle Greenhouse Gas Emissions of Biomethane Production: Supplementary Report*



Sustainability Working Group Outcomes

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