Renewable Gas Forum Ireland



Biomethane – Embracing Innovation to Achieve

Competitiveness & Sustainability.

PJ McCarthy – Chair 12th April 2018

Renewable Gas Forum Ireland (RGFI)



RGFI Board			Wyeth Nutrition	DIAGEO	Fingleton
Producer Sector	Delivery Sector	Customer Sector		GREEN Generation	ARUP
Renewable Gas Producer	Renewable Gas Transporter	Heat & Power		CALOR	Contraction Marine and
	Shipper/Supplier	Transport			Renewable Energy
Academic & Technology Centres			A Member of The Linde Group		
6			BORD NA MONA	ENVIRONMENTAL RESEARCH INSTITUTE UNIVERSITY COLLEGE CORK	
Match Demand with Supply - Demand driven (pull, not push)			BALLYHOURA DEVELOPMENT CLG		\$\$
Technical Committees:					Virtualis
Developing Guidelines & Best Practices					,,
Facilitate adoption of common standards and controls			CLAREMORRIS & WESTERN DISTRICT ENERGY CO-OP		2

Renewable Gas Growth Forecast

- Ireland has the highest potential for biogas production per capita within the EU by 2030.
 - European Commission Report: "Optimal use of biogas from waste streams, An assessment of the potential of biogas from digestion in the EU beyond 2020"
 - <u>https://ec.europa.eu/energy/sites/ener/files/documents/ce_delft_3g84_biogas_beyond_2020_final_report.pdf</u>



- Economic Assessment of Biogas and Biomethane in Ireland
 - 28% Renewable Gas within direct access of Gas Grid
 - <u>https://ee.ricardo.com/downloads/energy/assessment-of-cost-and-benefits-of-biogas-and-biom</u>



GHG Emissions Inventory

EPA 2017 GHG Emission Projections Report





The Challenge & Resource

Agriculture

- Many sustainable resources for biogas
- Manufacturing & Industry
 - Dominated by Agri Food & Beverage
 - Source of waste resources
 - >85% energy used is Heat
 - Key customer base
 - Decarbonising Heat
 - Corporate & Social Responsibility
- Transport
 - Another key customer base;
 - Decarbonising Transport

Sustainable Agricultural Resources

- Pig Slurry, and Cattle **Slurry** (beef finishing, dairy, etc.)
 - Typically 33% to 50% of AD feedstock
- Crop Residues.
- Break Crops: Tillage farmers need to use break crops, such as beet, to improve soil structure as well as for pest and disease control
- Catch Crops: Tillage farmers are now being encouraged to grow "catch crops" to protect soil from erosion during winter and nutrient depletion and run off from exposed soils
- Additional Grass Silage Ref: Teagasc Grange guidelines for improving below average grassland with current yields <6 tonne DMT / ha
- Cultivated Marine Algae: Utilisation of marine algae (seaweed farming) as a measure to protect against environmental damage from fish farming
- Abattoir Wastes: Subject to strict guidelines from DAFM *Type 1 AD only*
- Agri and Marine Food (& beverage) Industry waste streams Type 1 AD only

- Free
- Revenue / Cost
- Gate Fee



Analysis of Manure & Grass Resources



Additional Grass in excess of projected fodder demand post CAP 2020

 Teagasc study by McEniry et al., 2011 examined Ireland's potential to grow additional grass in excess of livestock fodder requirements.

 R. O'Shea et al. 2017 combined the Teagasc methodology with CSO data to identify areas with the largest potential to grow additional grass for biogas

□ Significant potential for additional grass in addition to requirements for increased milk and beef production

Cattle Manure

Source: UCC ERI, MaREI, Teagasc. Funded by SFI & GNI Researchers: Richard O'Shea, Prof' Jerry Murphy

Bioenergy economics for the grassland farr

- Rent Land or Plant Willow or manage Grassland for biogas?
 - Average gross earnings on Willow: €310 / Hectare,
 - Despite State supports = €492 / Hectare
 - 44 MWh / Hectare (average over 15 years)
 - Captive to a limited market 1 or more Customers for biomass
 - Gross earning supplying **Grass** to AD: €376 to €450 / Hectare
 - 21% to 45% greater than Willow
 - 33% to 60% greater than rental
 - 68 MWh gas/ Hectare (55% more than Willow)
 - Free supply of bio-fertilizer (digestate) –
 - Firm price contract (~ €25 / T ~ € 1,000 / Hectare)
 - No permanent change to the family farm holding
 - 680,000 Customers for renewable gas



Central Electricity Generation – Solid V Gaseous Fuel



- < 50% delivered as useful energy.
 - > 50% transformation and own use losses.
 - Solid Fuel ~35% Efficient
 - Gaseous Fuel CCGT 55%- 60% Efficient
 - More from Less
 - Less land use
 - Less taxpayer and energy consumer cost

Gas Entry Hub – supporting catchments of Farm AD's



3 – Gas Processing and Transport

Fundamental Priority: QUALITY & SAFETY

GNI & RGFI promote best practice guidelines

- · Gas industry expertise and competency
 - · Opportunity for competent vendors / service providers
- · Biogas processing co-located with AD
 - Processed biogas = Renewable Natural Gas
 - >97.8% Methane
 - 2 technologies currently approved by GNI
 - Membrane
 - Amine
- Gas compressed on-site into Gas Transportation Trailers (CBG Trailers)
 - ADR licensed driver and tractor unit required
 - Produces useful heat for AD (parasitic load)
- By-product gas Green CO2
 - Additional revenue stream high value industrial gas









Energy transport capacity / efficiency Composite CBG trailers



- **1 Composite CBG trailer = 2.75 Woodchip trailers** of the same size
 - 80% of filling energy recoverable as useful heat for AD process
 - Compact and secure
 - Combined storage and transport unit (no double or triple handling)
 - Utilises existing road infrastructure
 - Enables Renewable Gas Nationwide





Energy transport capacity / efficiency Composite CBG trailers



&

No

ash

No

water







Bioenergy Resource & Supply Efficiency – Solid fuel v' Gas



Bioenergy Resource & Supply Efficiency – Solid fuel v' Gas



Bioenergy Resource & Supply Efficiency – Solid fuel v' Gas



Decarbonising Power Generation – Biomethane is Lowest Cost



- Re-powering of existing high efficiency CCGT
- Sustainable Energy Centres for Industry
- Increasing efficiency with latest CCGT technologies
- RNG as an Indigenous Clean & Secure fuel supply.

Market sectors for RNG

DIAGEO

Diageo reaffirms commitment to tackling climate change as it joins global business declaration

Ahead of the One Planet Summit on climate change in Paris, Diageo is one of 54 global corporates to sign a declaration to the leaders of the G20 to prompt bold action on climate change.



Apple is doubling down on alternative energy at its new headquarters. In a updated environmental report, the company says the site will run entirely on **solar energy and biogas** fuel cells.

- Manufacturing & other Industry
 - Growth market volume & scale
 - >85% energy used is Heat
 - On-site CHP demand growing
 - Critical to Irish Economy & Balance of Trade
 - Sustainable Energy requirement is mandatory
 - Corporate & Social Responsibility
 - Legally & financially binding commitments
 - Now a critical factor in FDI decision making

Renewable Gas available for markets: Green Gas Certification Scheme for Ireland





Clean Transportation: in California, charging an EV produces 38.9 gCO2e per megajoule while operating on BioCNG produces 8.6 to -25.5!



Bar Graph- Data provided by Gladstein, Neandross & Associates''Game Changer' Report, May 2016. For more information, please go to www.gladstein.org.



Hub & AD Catchment Showcase Project

- Circular economy integration
 - Farming clusters (feedstock supply)
 - Farmer & Community owned AD's
 - High capacity Gas Entry Hub
 - Large catchment area
 - Integrated with Agri-Food Manufacturing
- Establishment Phase, partners include:
 - Ballyhoura Development
 - 14+ Farmers (Dairy, Pig, & Arable)
 - Renewable Gas Forum (RGFI)
 - GNI







Gas

Networks

Ireland



Agri-Gas-Grid Showcase Project

- Circular economy integration
 - Farming clusters (feedstock supply)
 - Farmer or Community owned AD's
 - High capacity Gas Entry Hub
 - Large catchment area
 - Integrated with Agri-Food Manufacturing
- Establishment Phase:
 - Collaboration partners include;
 - Ballyhoura Development
 - Renewable Gas Forum (RGFI)
 - GNI
- Seeking
 - Farmer Developers





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Gas Entry Hubs Wider Deployment

- Phased Deployment *illustrative*
- Rapid growth in Renewable Gas Volumes
 - Gas Entry Hub enables development and growth by catchment area
- Target: 20% Renewable Gas by 2030





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Concluding on the Benefits

- **Opportunity for small scale Farmers** feedstock supplier
 - Higher income, larger & more secure market
- **Opportunity for Farm based AD** developments
 - Diversify income
 - Displace imported fertilizers
 - Improve soil, water and air quality
- **Opportunity for the Energy Consumer** Domestic to Industrial
 - Lowest cost for decarbonising Heat, CHP, Public & Commercial Transport
 - Competitive & efficient fuel for Combustion Power Gen
 - On demand / dispatchable energy, clean & secure
- Environment / National
 - Security of supply resilience



SECURE & SUSTAINABLE

- Environmentally
- Economically
- Competitively



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