Ireland's renewable gas potential

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Gas Networks Ireland

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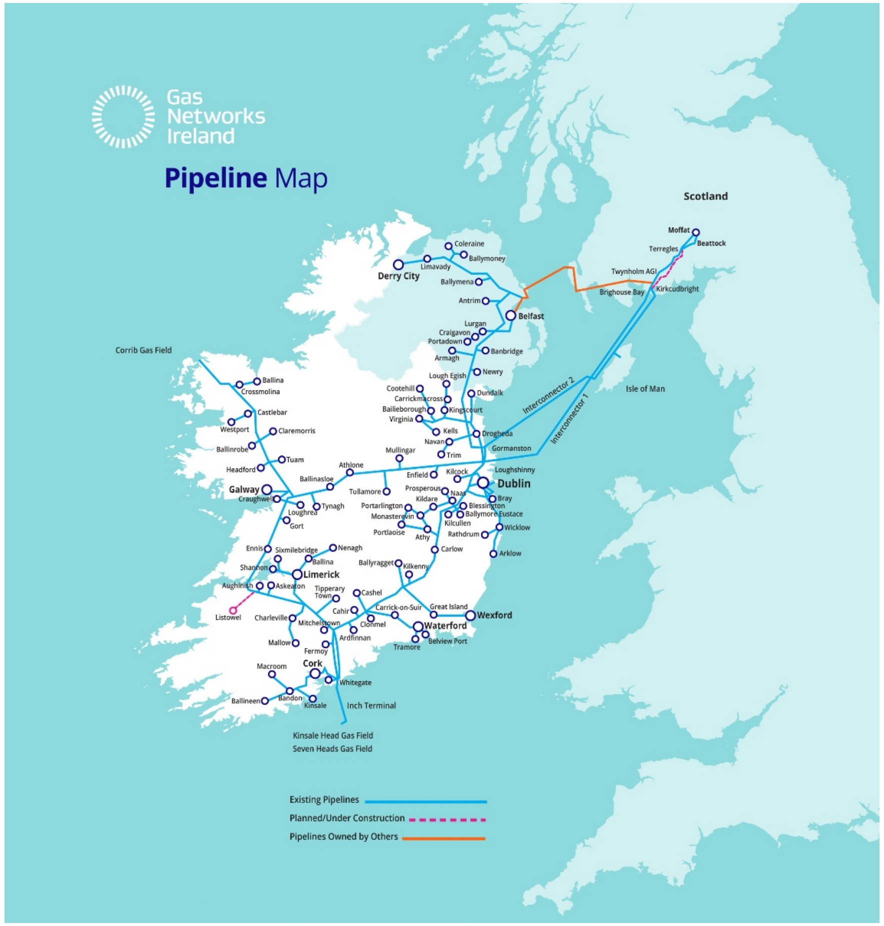
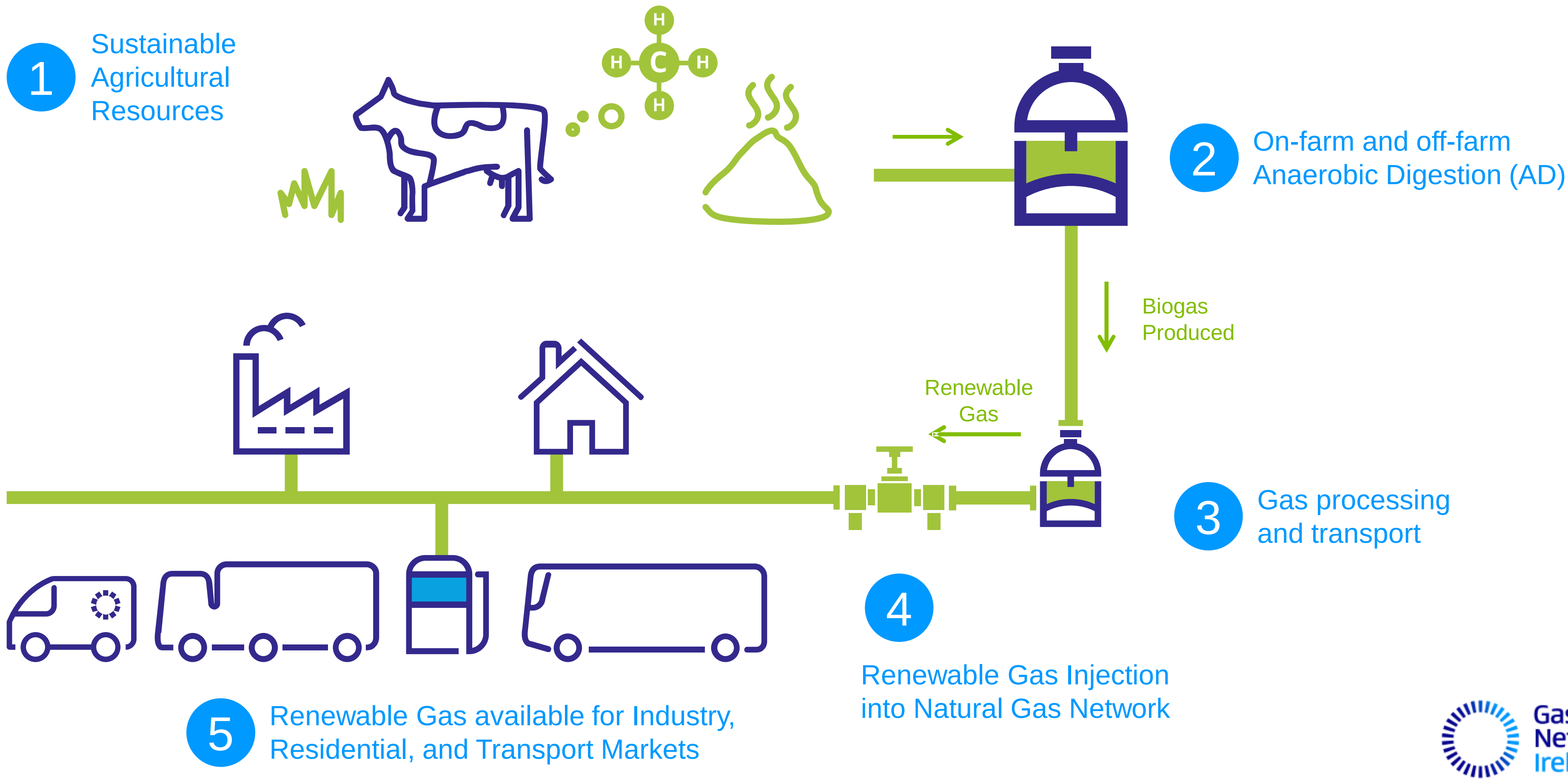


- Gas Networks Ireland owns, operates, develops and maintains the natural gas network in Ireland.
- World-class, modern gas network
- Over 13,954km:
  - 2,427km Transmission Network
  - 11,527km Distribution Network
- More than 680,000 gas consumers
- Over 160 population centres
- 20 counties

Renewable Gas to Grid



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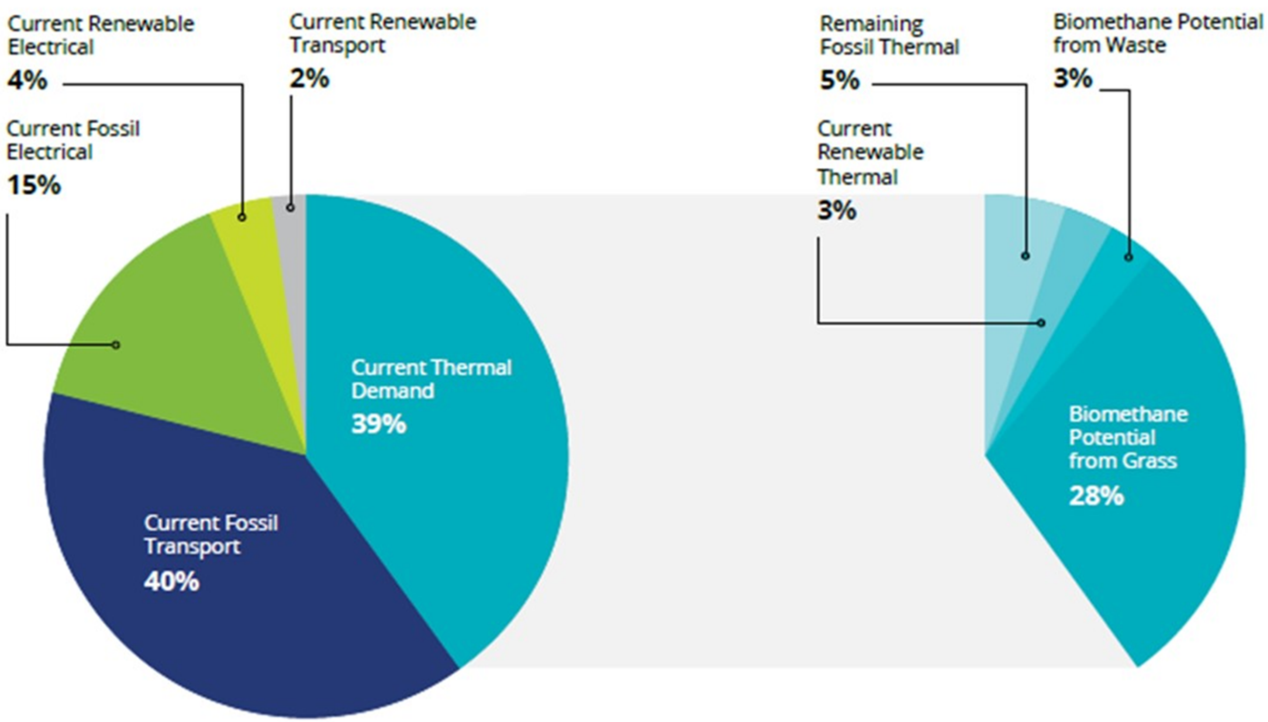
Agri-Food Industry Stakeholders

- Agri-Food companies are "going green"
- Increasing demand for Renewable Gas
- Many large natural gas users and now want to procure "green gas" in the same manner as they buy "green" electricity

Ireland’s Renewable Gas Potential



- Ireland’s final energy consumption ~130 TWh/annum
- Ireland’s natural gas demand in 2016 ~ 50 TWh
- Ireland has significant bioresources which could theoretically produce ~ 40 TWh/annum of biomethane from wastes, residues and additional grass in excess of livestock requirements
- Potential additional resource of 10 TWh from emerging renewable gas technologies such as gasification and power to gas

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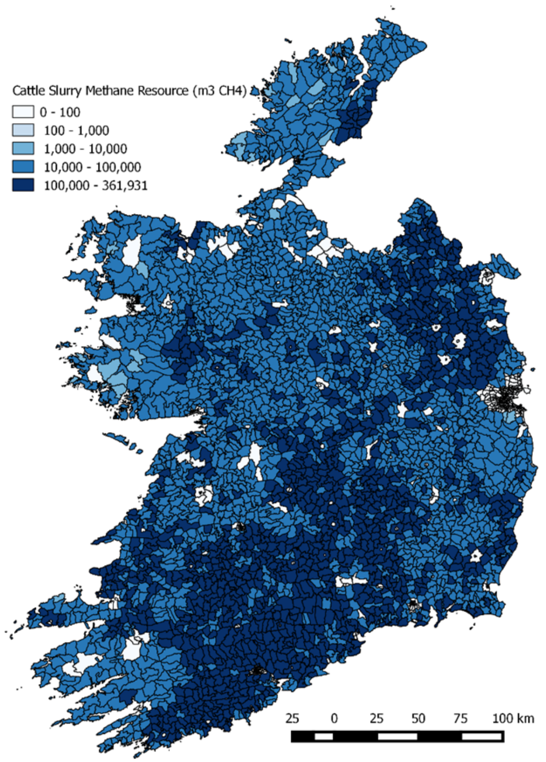
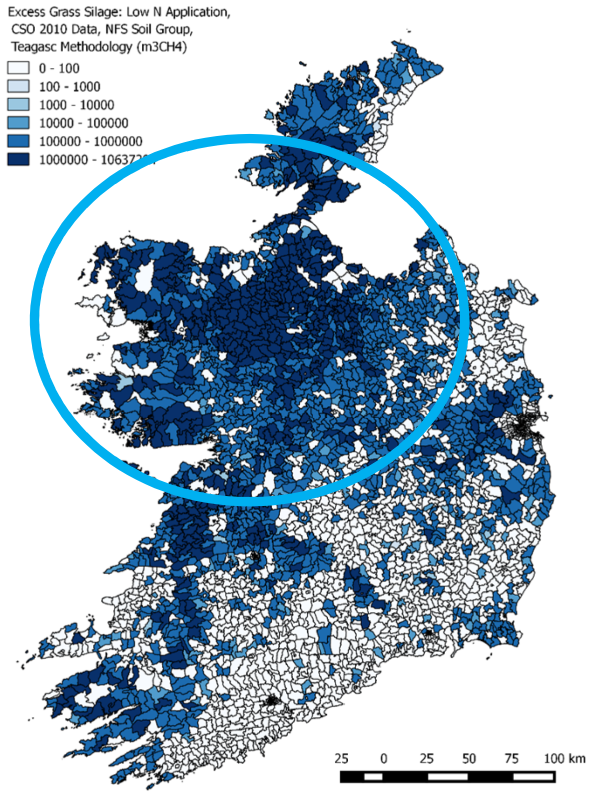
Analysis of Grass & Manure Resources



Cattle Manure



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

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

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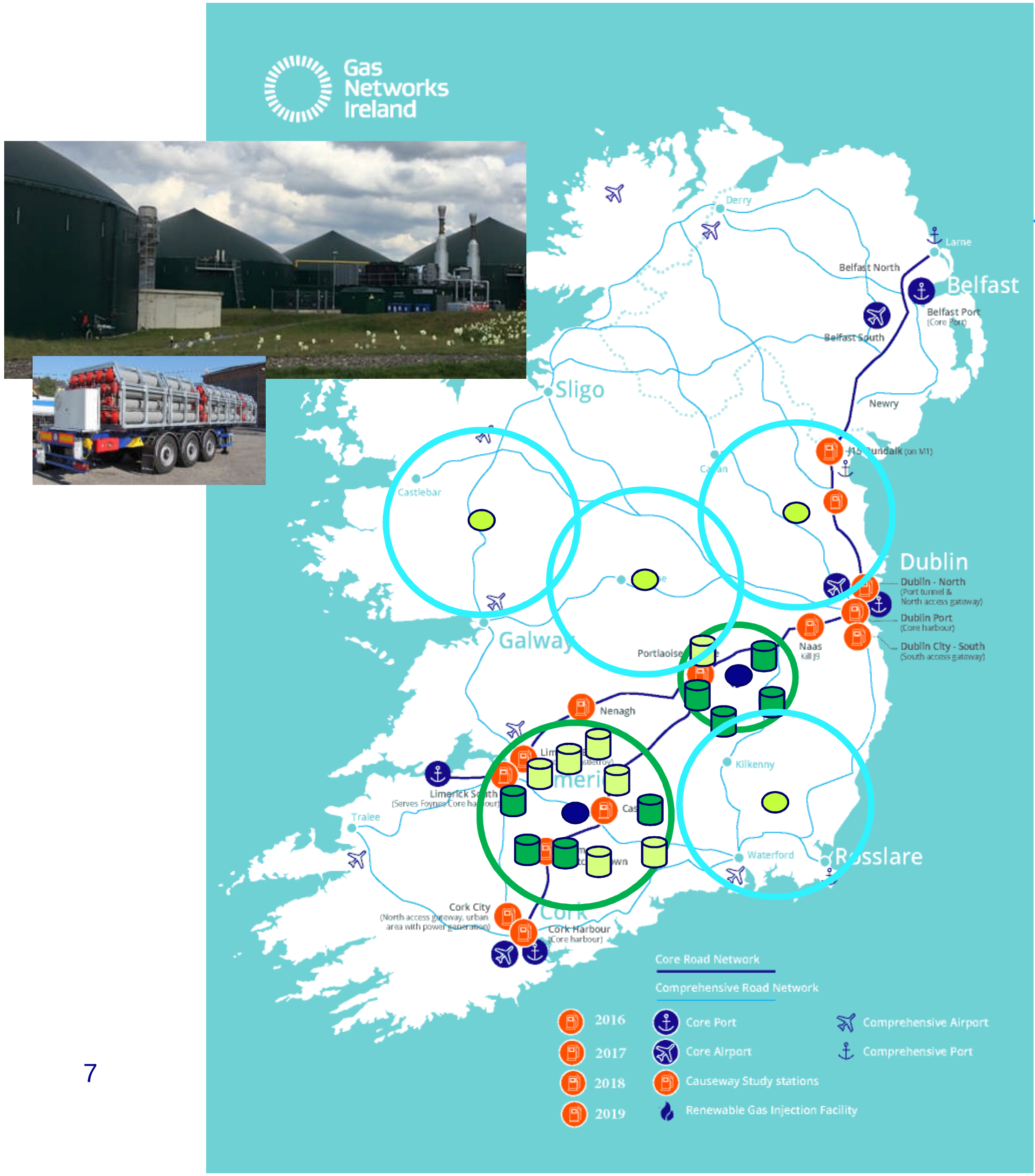
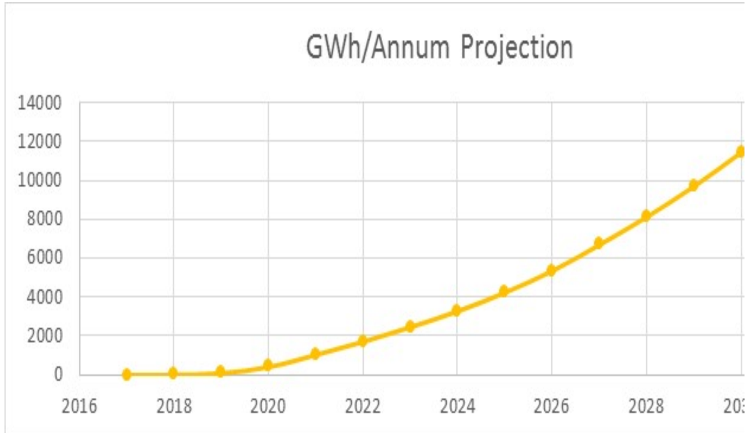


Gas Entry Hubs
Wider Deployment

- 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



Renewable Gas Forum Irish Green Gas Ltd

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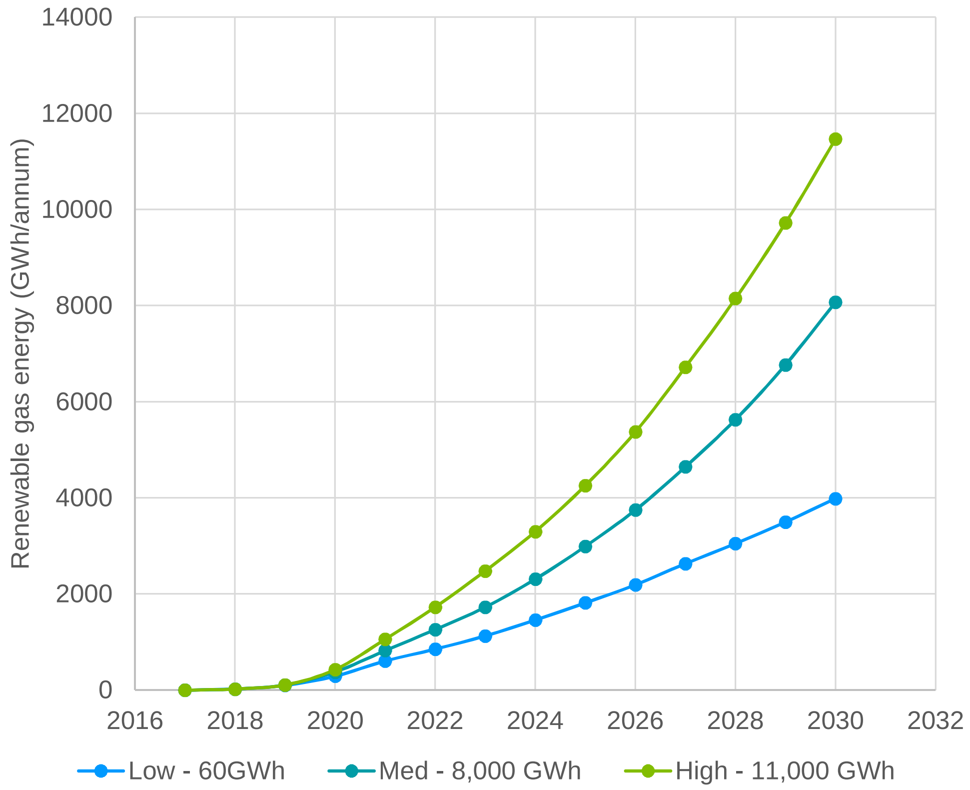
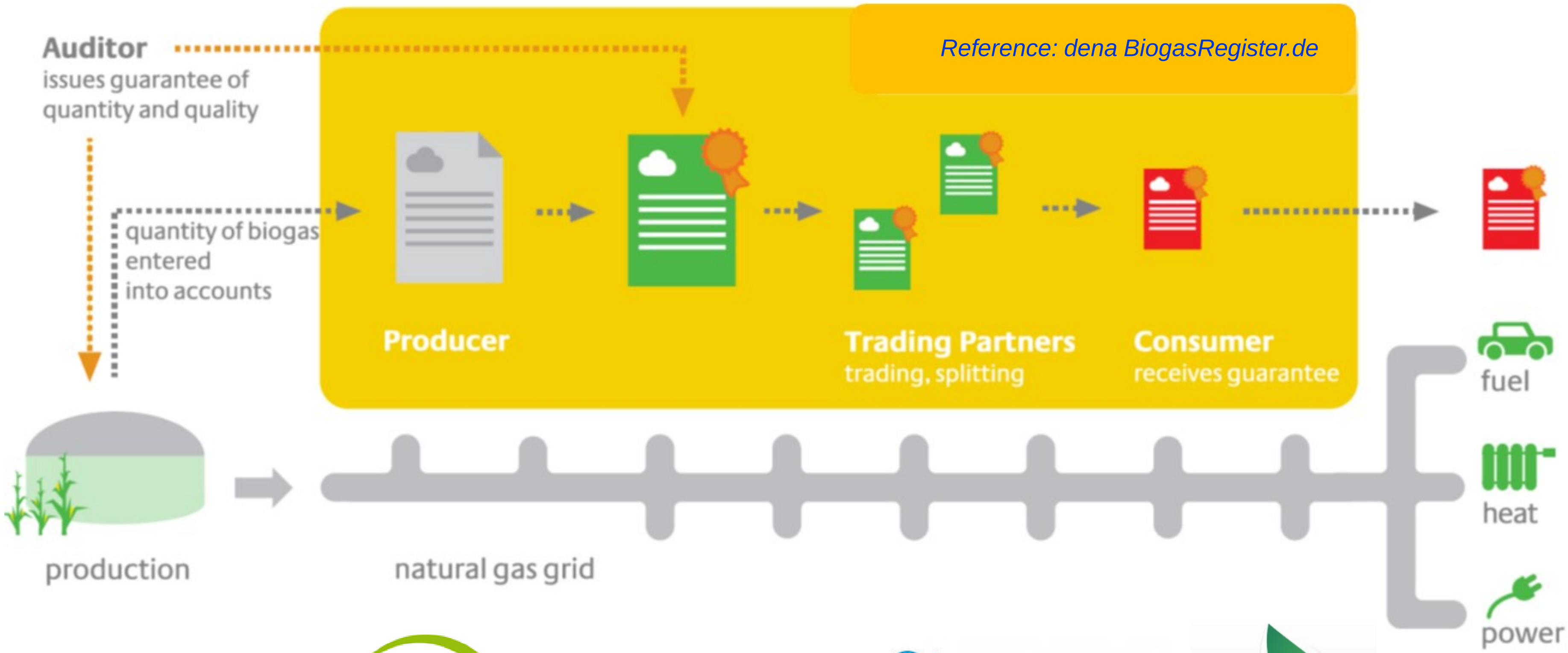
Breakdown of GNI’s 20% target & scenarios

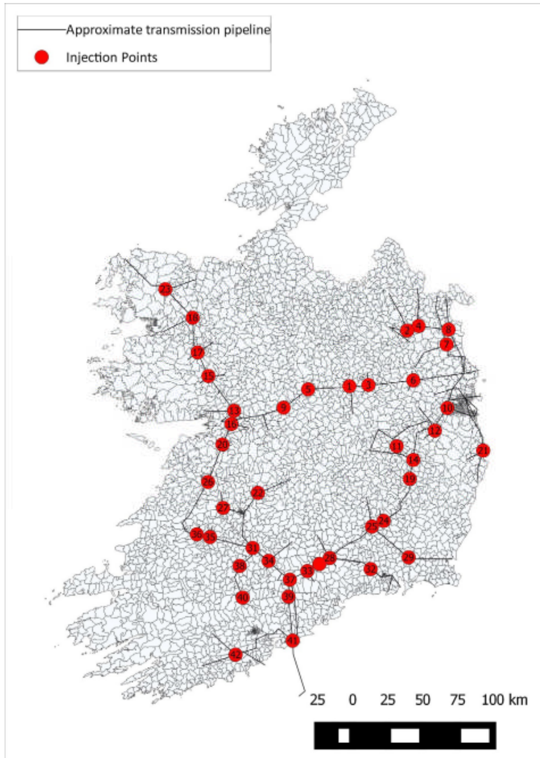


- GNI estimate that the initial 12 biomethane injection facilities could deliver approximately 1,000 GWh/annum
- Assuming ongoing biomethane policy supports, the growth rate of biomethane injection facilities is expected to grow with up to 40 centralised Hubs in place by 2030, with an average of 8 biomethane production Pods supplying each hub (i.e. over 300 on-farm AD Pods nationwide).
- This scenario would see 11,500 GWh/annum of biomethane supplied to energy customers which would be approximately 20% of predicted natural gas demand in 2030

Green Gas Certification Scheme for Ireland



Overview of GNI Stakeholders



Gas Customers	Government	RGFI	Research
Agri-Food & Beverage	DCCAE	Biogas Developers	UCC
Public Transport	DAFM	Technology providers	MaREI
		Gas Shippers	NUIG
		Transporters	DCU

What's needed to enable Renewable Gas?

<u>GNI</u>

- Connections Policy for Renewable Gas
- Connected Systems Agreement
- Gas Regulatory changes
- Systemisation of Renewable Gas entry points
- Development of appropriate entry tariff for renewable gas

<u>Government Policy</u>

- Renewable supports
  - Renewable Heat Incentive
  - Biofuel Obligation
- Rural Development Funding
  - Agri-gas co-ops
- Public Transport
  - Renewable Gas buses

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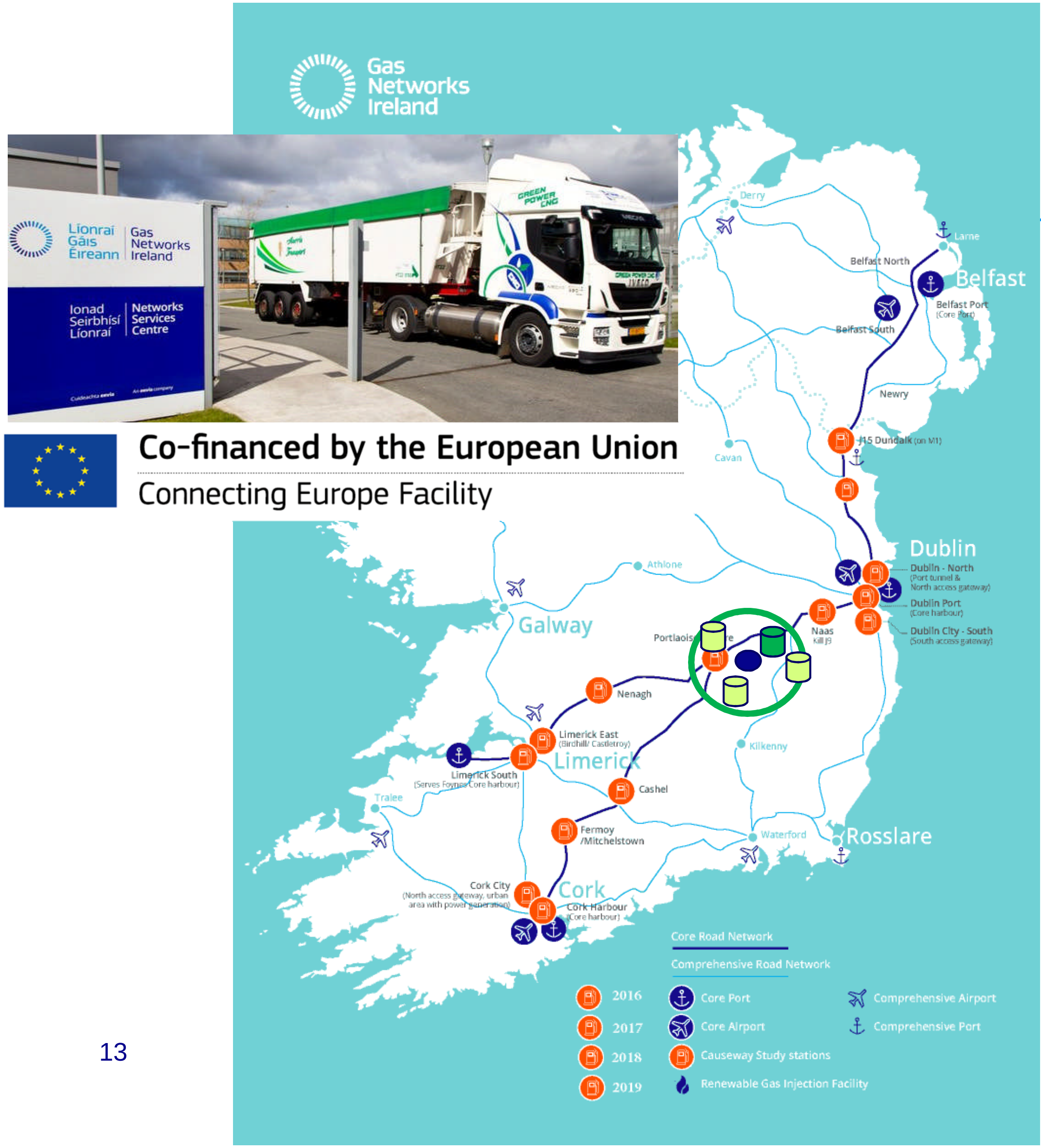
Causeway project



Co-financed by the European Union
Connecting Europe Facility

Causeway Project
Prove & Demonstrate

- Dublin Port CNG Filling Station TOPAZ
- 13 additional Public Access CNG Filling Stations
- Gas Entry Hub – Green Gas Generations
  - *2% Gas Residential Heat, or*
  - *600 CNG Buses*
- AD @ Green Generation, Nurney, Co. Kildare
- 3 additional AD's within Catchment area

Renewable Gas Forum

GREEN Generation

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Causeway Project – GREEN Generation

- **1st AD Site; Green Generation , Nurney, Co. Kildare**
  - EPA license to take in 25,000 t/annum of biodegradable waste plus 25,000 t/annum of pig slurry from farm
    - Type 1, Category 2 & 3 feedstock
  - Biogas Purification Unit - Membrane
    - Methane concentration > 97.8%
  - Compressor Station & Disperser
  - Transportation Trailers - ADR Regulations

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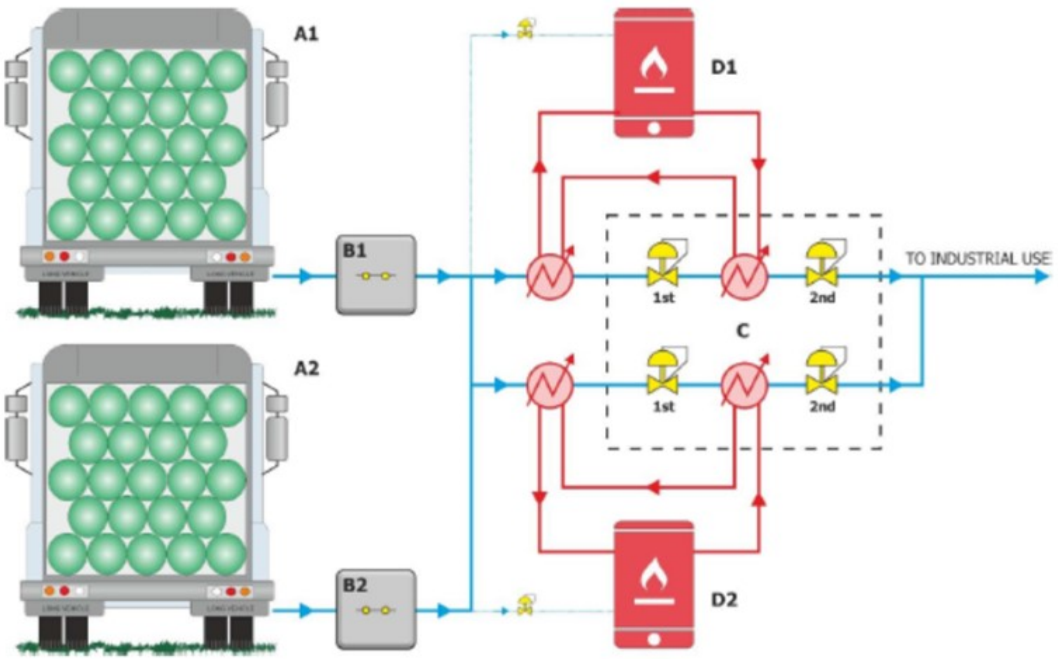
Causeway Project – Grid Entry Hub



Note: The picture is illustrative; it could not reflect the scope of supply.

LEGENDA
A - TRAILER
B – AUTOMATIC DISCHARGE MANIFOLD
C – DOUBLE STAGE PRESSURE REDUCER
D – GAS BOILER PRODUCING HOT WATER

- The Network Entry Facility will contain;
  - Fiscal and Operational Metering
  - Propane Infusion (if CV of gas needs to be increased)
  - Gas Analysers
  - Divert valves
  - Pressure regulators
  - Fiscal Flow Meter
  - Odorant plant

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GREEN Generation

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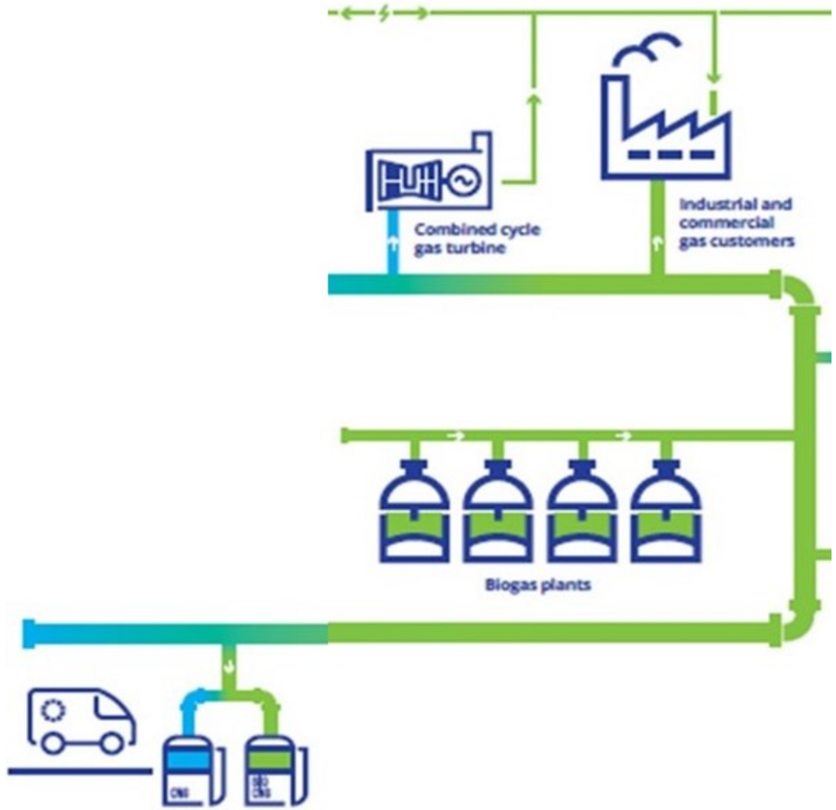
Summary of benefits – Agricultural sector

- Opportunity to diversify income for farmers.
- Mitigation of Greenhouse Gases from Agriculture.
- Rural development.
- Bioeconomy.



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