



Gas
Networks
Ireland

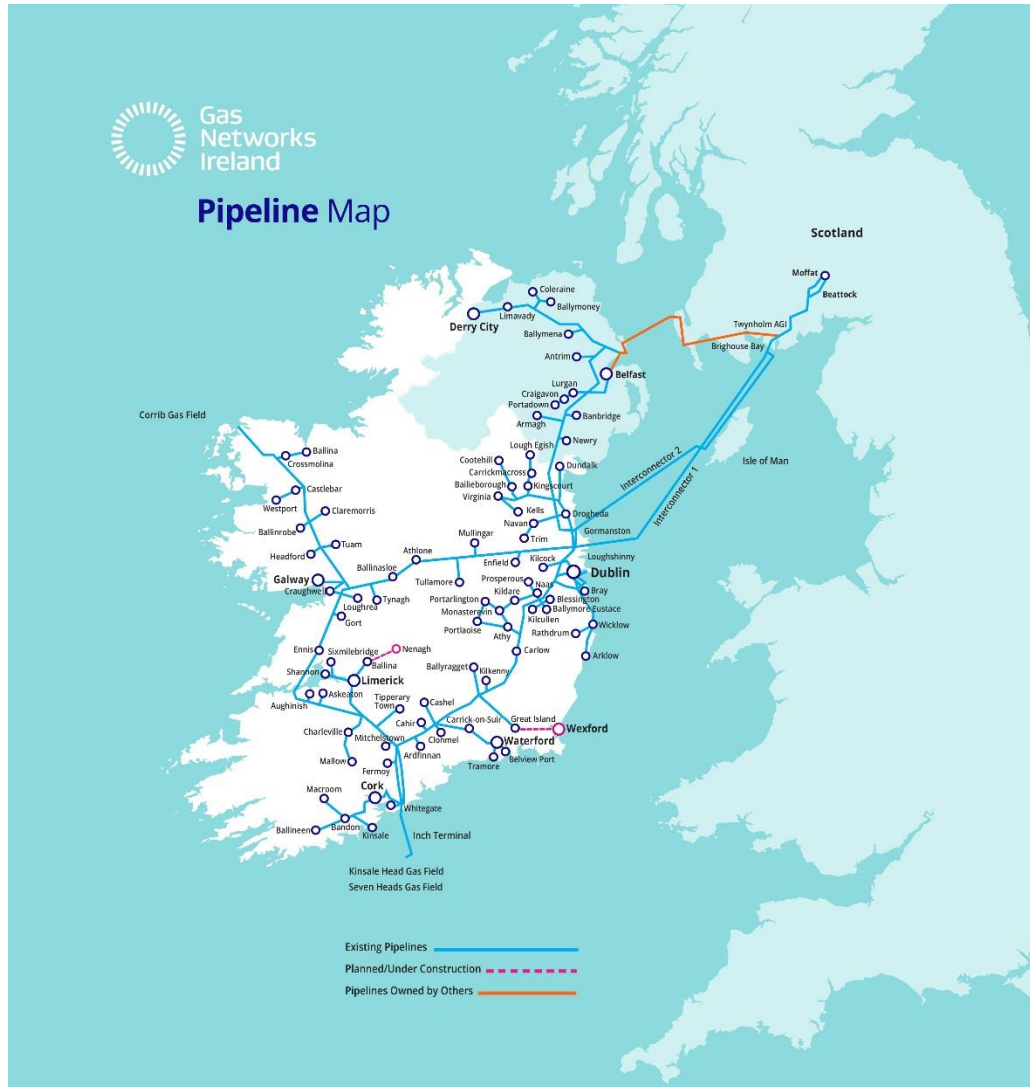
Potential of farm scale biogas to grid in Ireland

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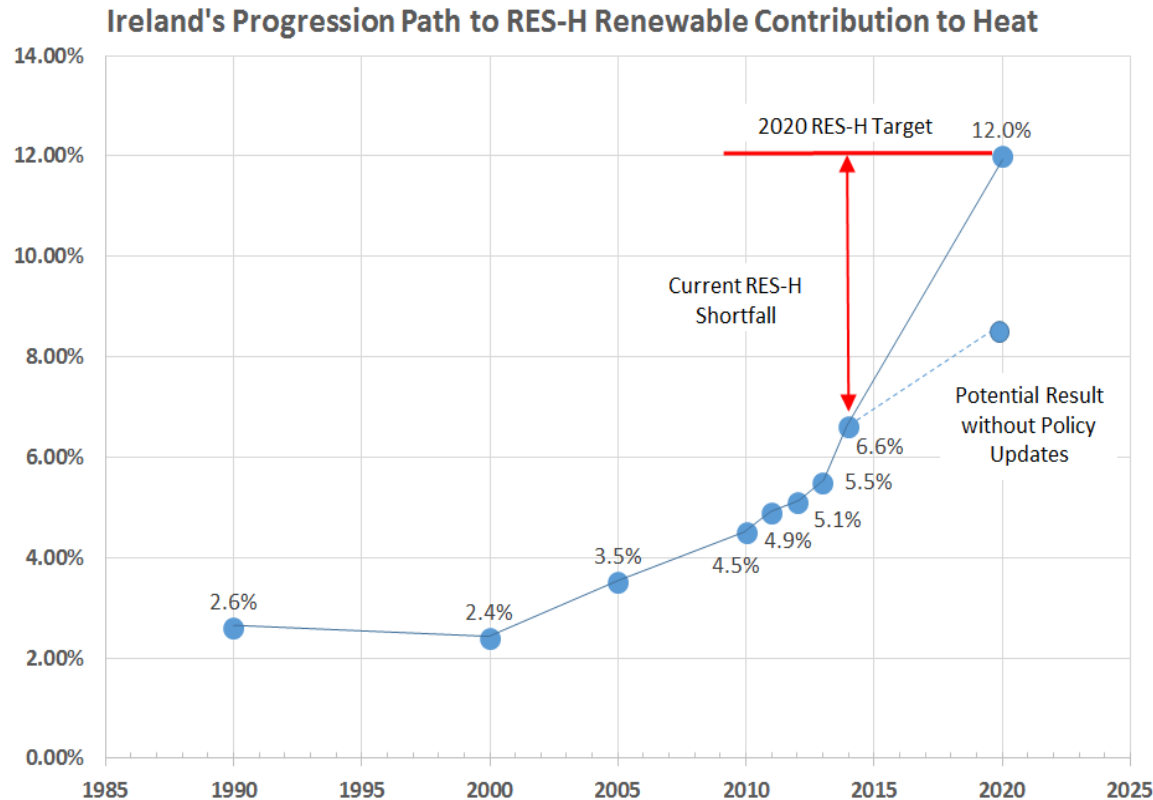
28/03/2017

Gas Networks Ireland



- Gas Networks Ireland owns, operates, develops and maintains the natural gas network in Ireland.
- Over 13,500 km of gas pipelines
 - 2,422Km Transmission Network
 - 11,288Km Distribution Network
- More than 675,000 gas consumers
 - 650,000 homes and 25,000 businesses
- Over 160 population centres present in 19 counties
- Gas Network with Abundant Capacity, Secure and Reliable supply of energy

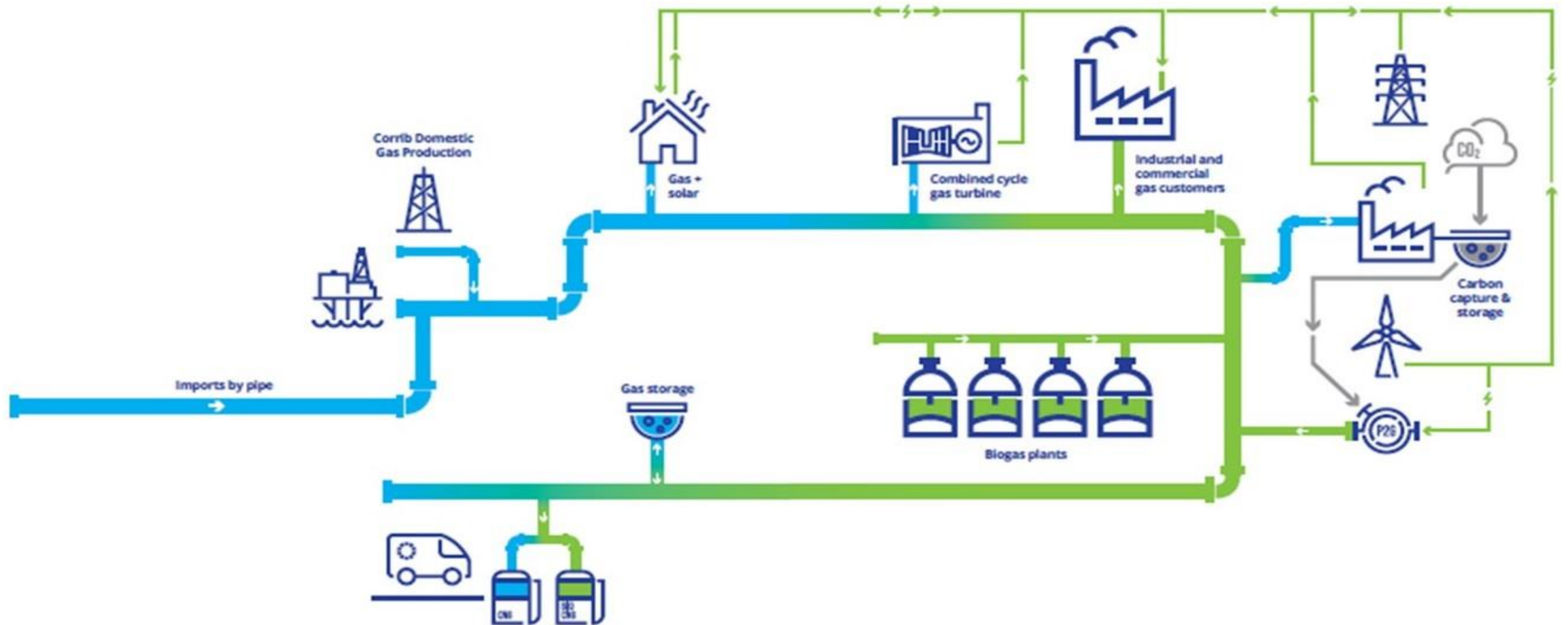
Ireland's Renewable Energy 2020 Commitments



Data sourced from SEAI, 2015 "Renewable Heat in Ireland to 2020"

- 16% overall renewable energy by 2020
- 40% electricity; 12% heat; 10% transport
- Most progress to date has been in electricity sector
- Least progress has been in the transport sector
- The heat sector may have to make up the short fall from transport according to O'Gallahóir et al. 2016
- Renewable Gas will enable Industry to achieve renewable targets, without the need to re-invest in alternative infrastructure,
- Industry can help Ireland meet its renewable heat (RES-H) targets of 12% by 2020 by using renewable gas.

The transition to decarbonisation



Agri-Food Industry Commitments

- Agri-Food companies are “going green” for commercial reasons and corporate social responsibility
- There is increasing demand for renewable gas from food and drinks processors
- Carbery, Kerry, Dairygold, Wyeth, Diageo, ABP et al. are all large natural gas users and now want to procure “green gas” in the same manner as they buy “green” electricity
- Carbon footprint calculators are now being developed feeding into Origin Green Programme



DIAGEO



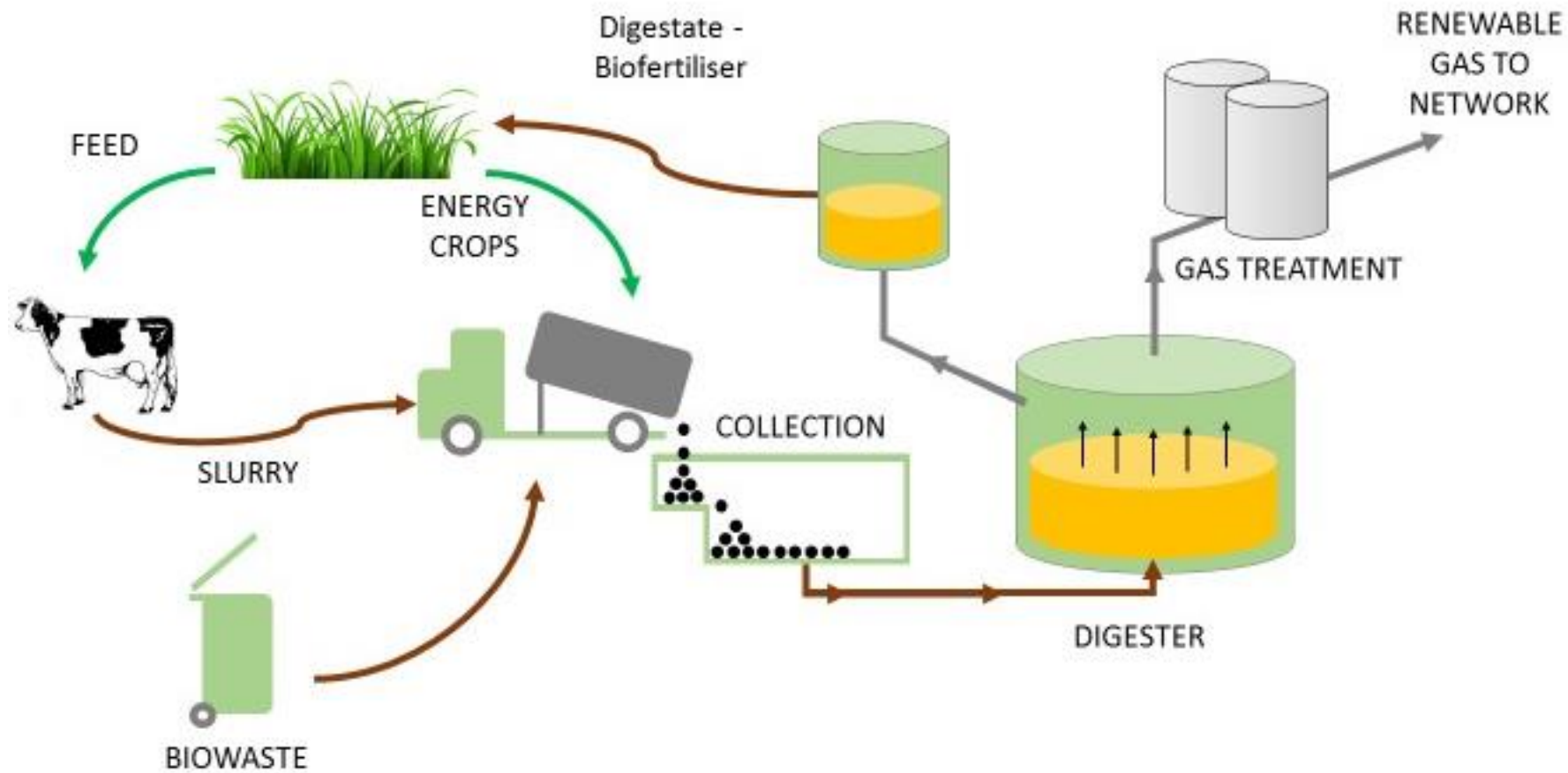
Wyeth | Nutrition



**Working
with nature**

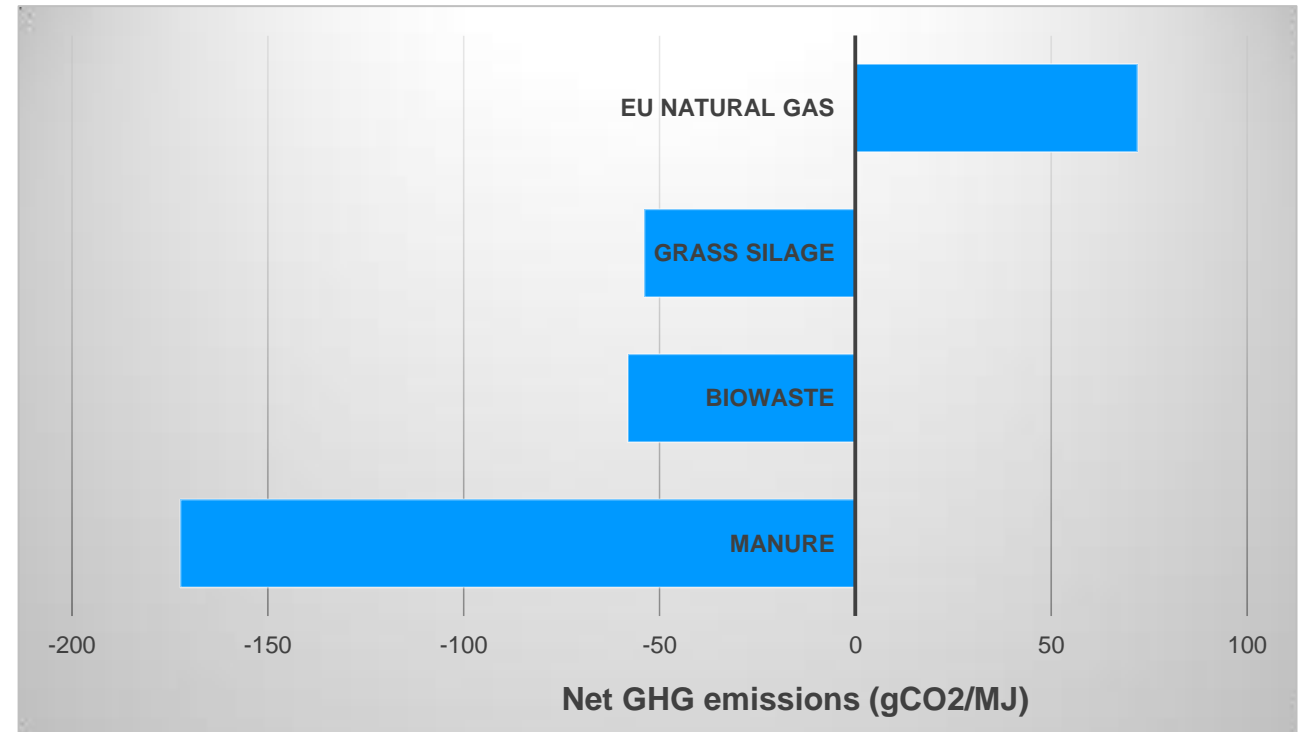


Biogas Supply Chain



Typical GHG emissions from different biomethane sources

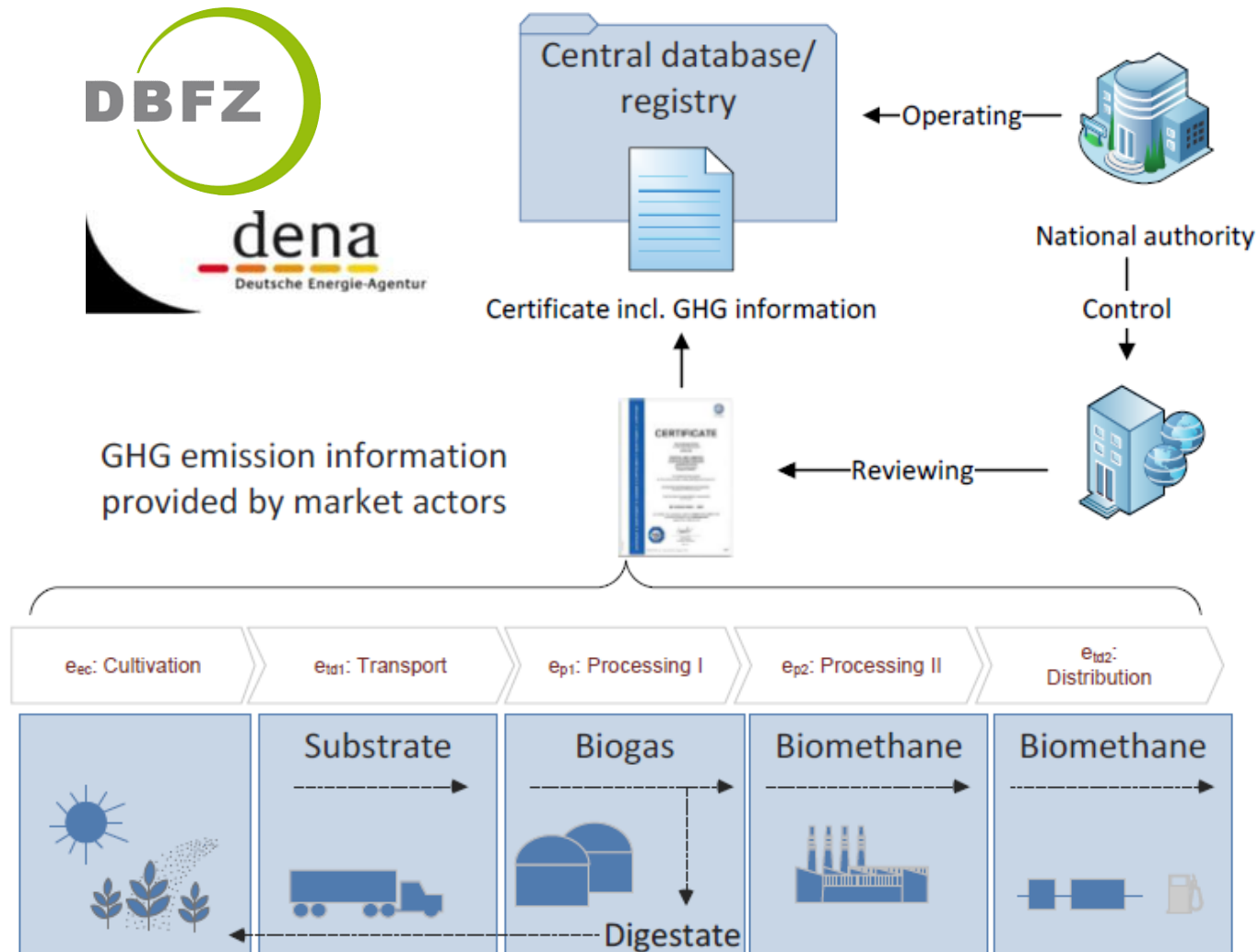
- Net Greenhouse gas (GHG) savings from manure biomethane ~140% relative to natural gas (i.e. carbon negative)
- This includes carbon saving from avoided GHG emissions from conventional manure storage as per IPCC guidelines
- Net GHG savings from biowaste biomethane (including agri-food processing residues) ~80% relative to natural gas
- Net GHG savings from grass biomethane ~ 75% relative to natural gas



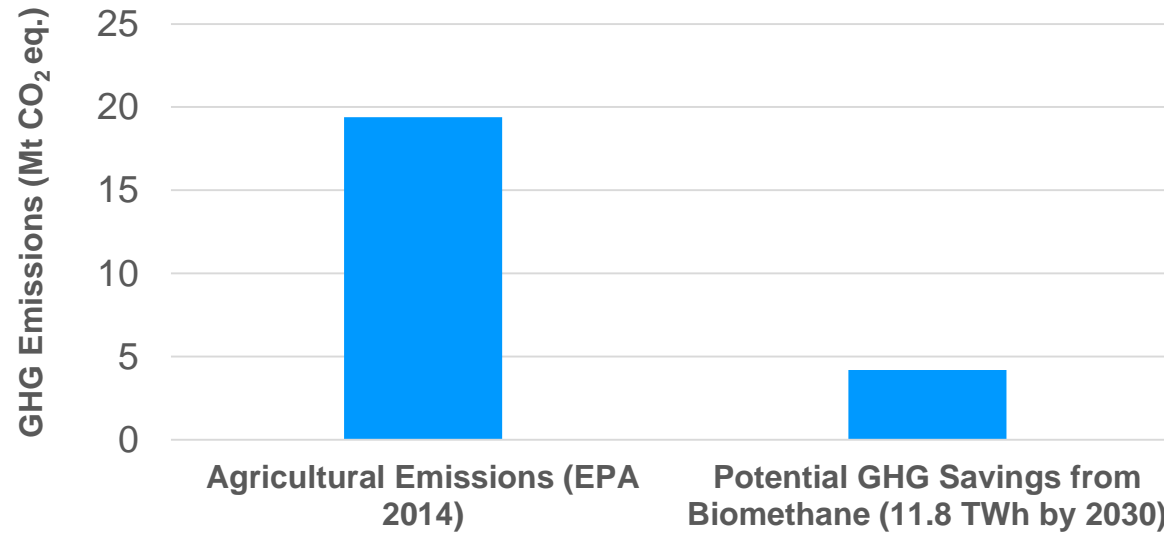
Data sources for biowaste and manure taken from "Solid and Gaseous bioenergy pathways: input values and GHG emissions" JRC. p.162. Available at: <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/solid-and-gaseous-bioenergy-pathways-input-values-and-ghg-emissions>

Data for grass biomethane emissions savings taken from Korres et al., 2010, "Is grass biomethane a sustainable transport fuel? Biofuels Bioprod, & Bioref. Vol. 4. pp. 310-325

Green Gas Certification - GHG Accounting



Potential Irish GHG savings from biomethane

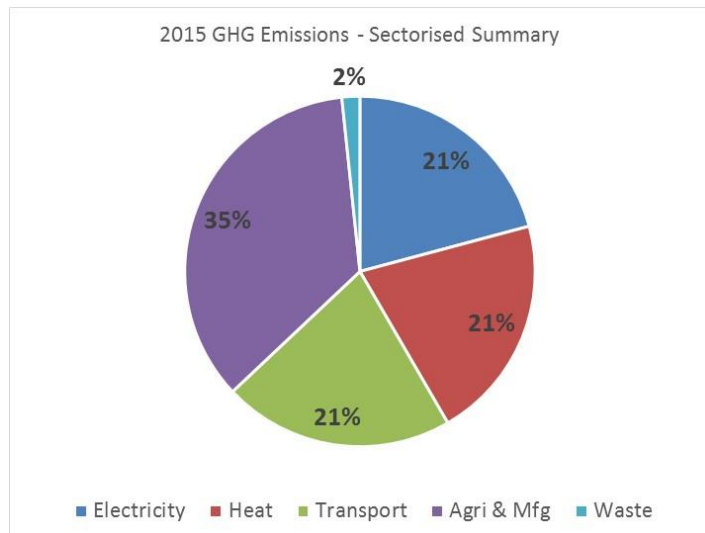


Agricultural emissions are composed of

- Enteric fermentation (49%)
- Nitrogen fertilisers (36%)
- Manure Storage (12%)
- Energy (3%)

Estimated biomethane resources by 2030

- Additional grass (above livestock demand)
- Agricultural manures
- Organic wastes and residues
- Additional sources (e.g. P2G)

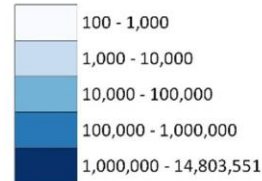


Grass silage biomethane resource in Ireland

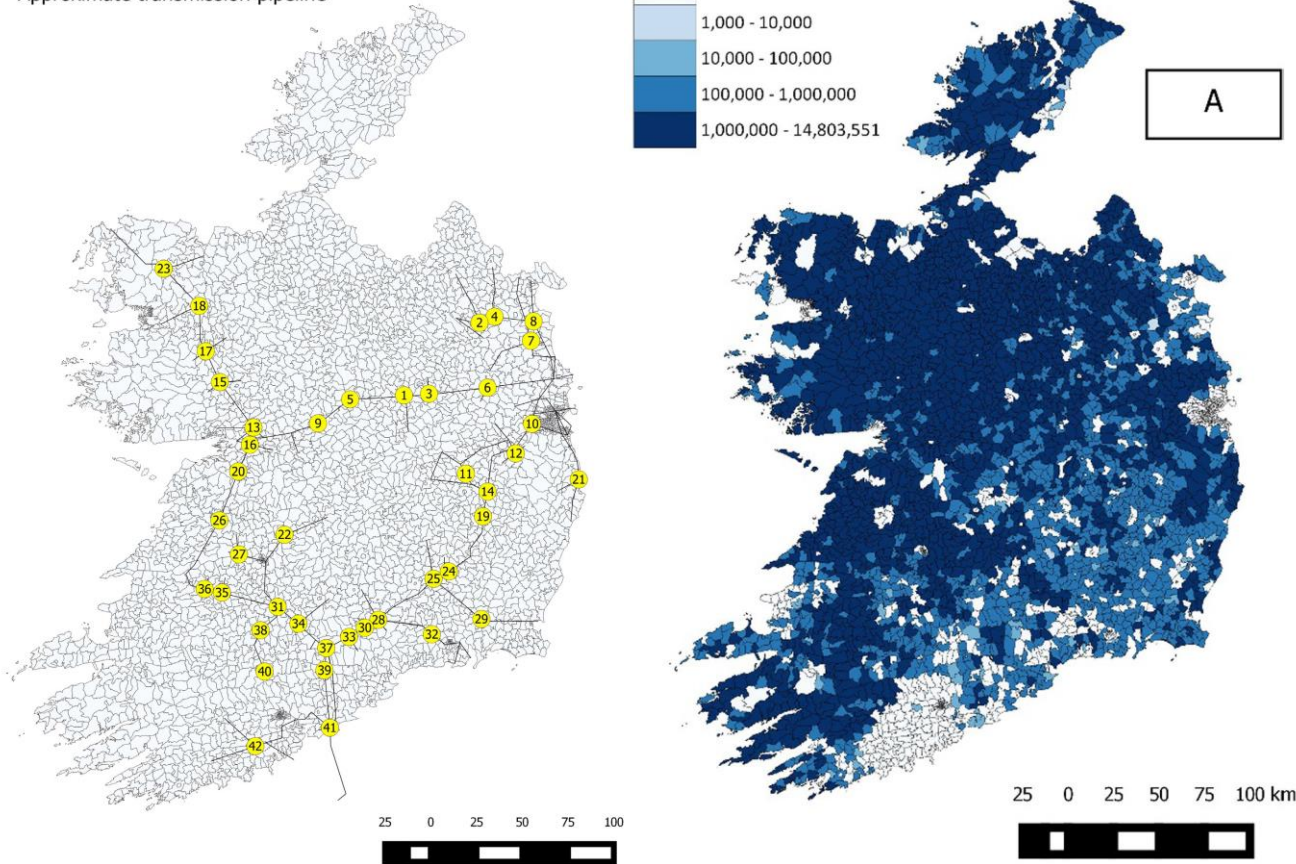
Legend

- Injection Points
- Approximate transmission pipeline

Grass silage biomethane resource (m3)



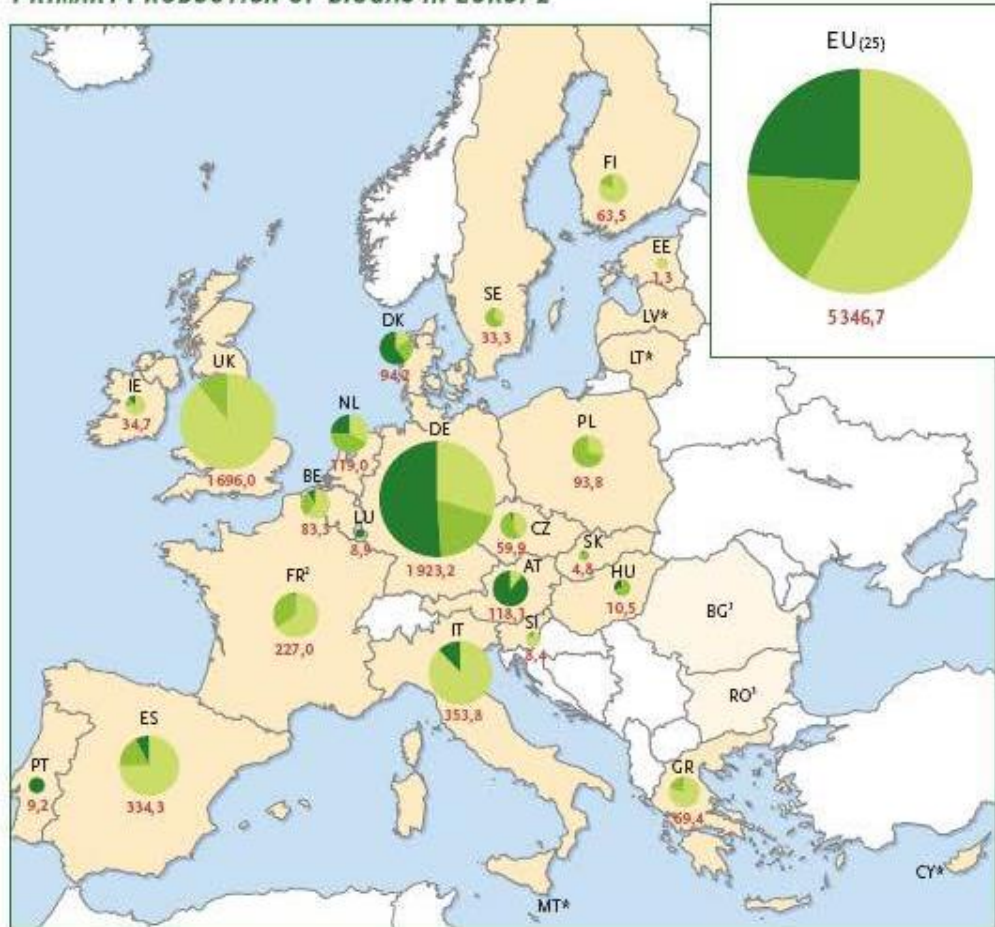
A



- ❑ 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. combined the Teagasc methodology with CSO data to identify areas with the largest potential to grow additional grass for biogas
- ❑ Other sustainable energy crops such as energy beet also have significant potential in Ireland

Biogas in Europe

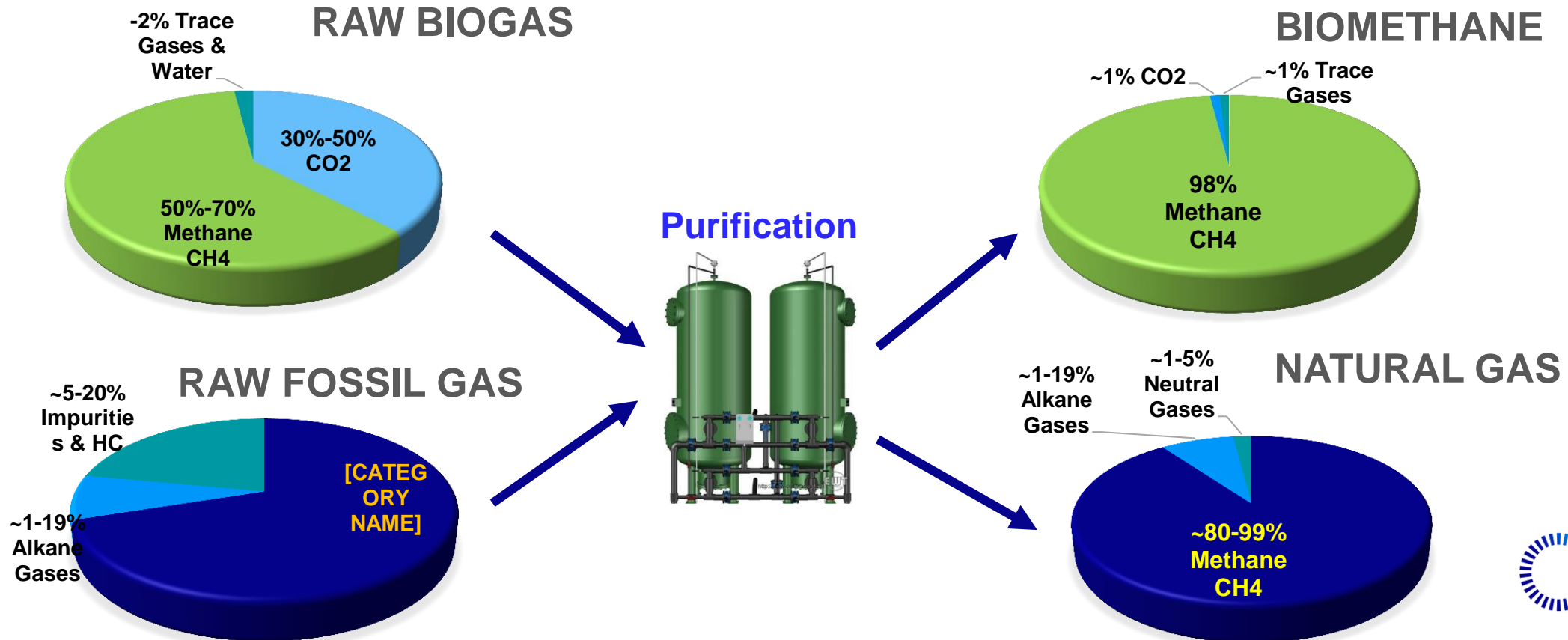
PRODUCTION PRIMAIRE DE BIOGAZ EN EUROPE
PRIMARY PRODUCTION OF BIOGAZ IN EUROPE



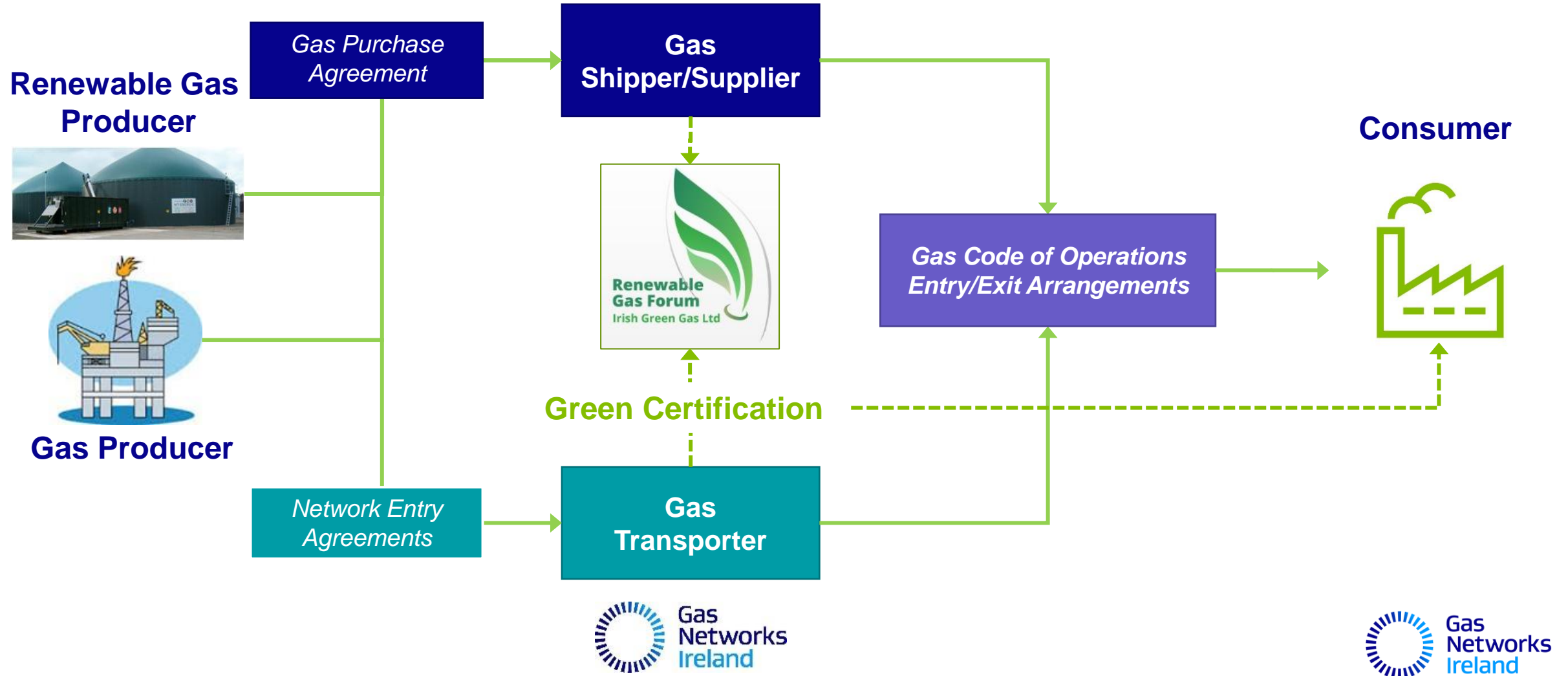
- Mature and proven technologies – over 17,000 anaerobic digesters have been built in EU (2014)
- Transitioning from small remote electricity generation to larger gas grid injection facilities
- State policies/prioritisation and incentives transitioning to renewable gas for heat and transport

The Benefits of Biomethane

- Requires **NO CHANGE** to existing equipment for natural gas boilers and CHP
- Compatible with Natural Gas Network



Business Principals of Irish Gas Market



Case studies of successful agricultural biogas projects

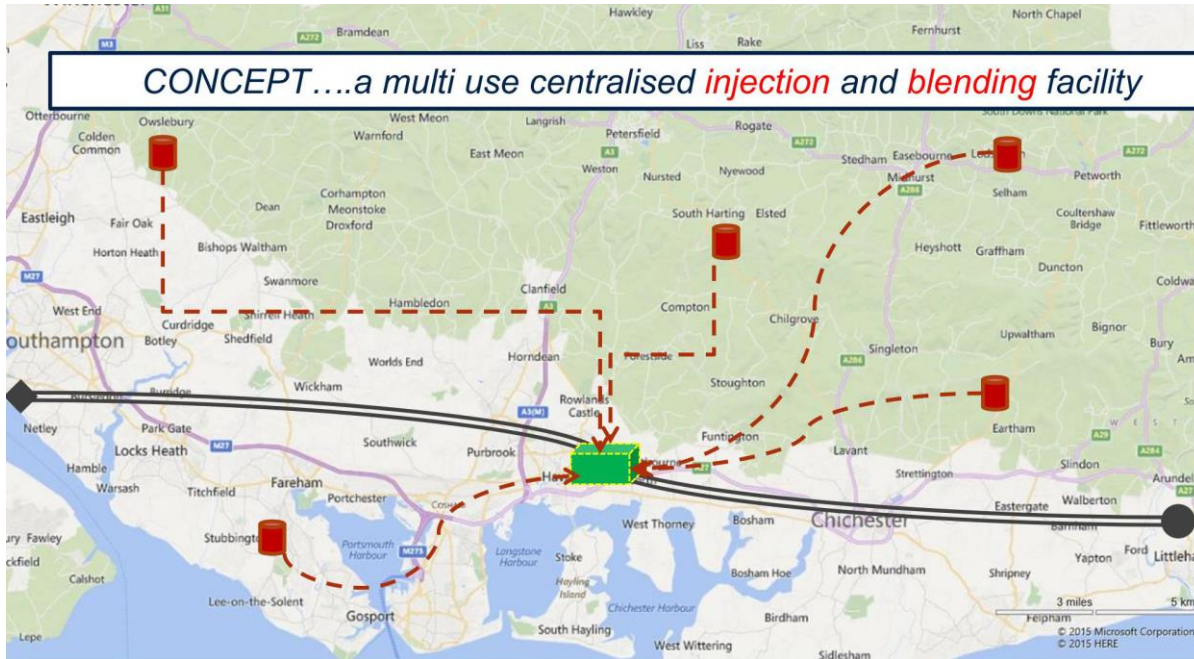
- Agricultural biogas pipeline network (19 km) in western Sweden
- 4 farm scale biogas plants integrated their supply in a biogas pipeline which delivers biogas for centralised gas purification and injection into the natural gas grid.
- Biomethane supplied to Slaughter House Facility & CNG filling station
- Farmers in Sweden get an extra payment for manure digestion due to it's addition greenhouse gas savings
- Funding received from EU rural development fund and Swedish EPA



Brålanda agricultural biogas network in Western Sweden

Source: <http://www.biogasbralanda.se/>

Virtual Pipeline – Portsdown Hill Centralised Grid Entry Facility

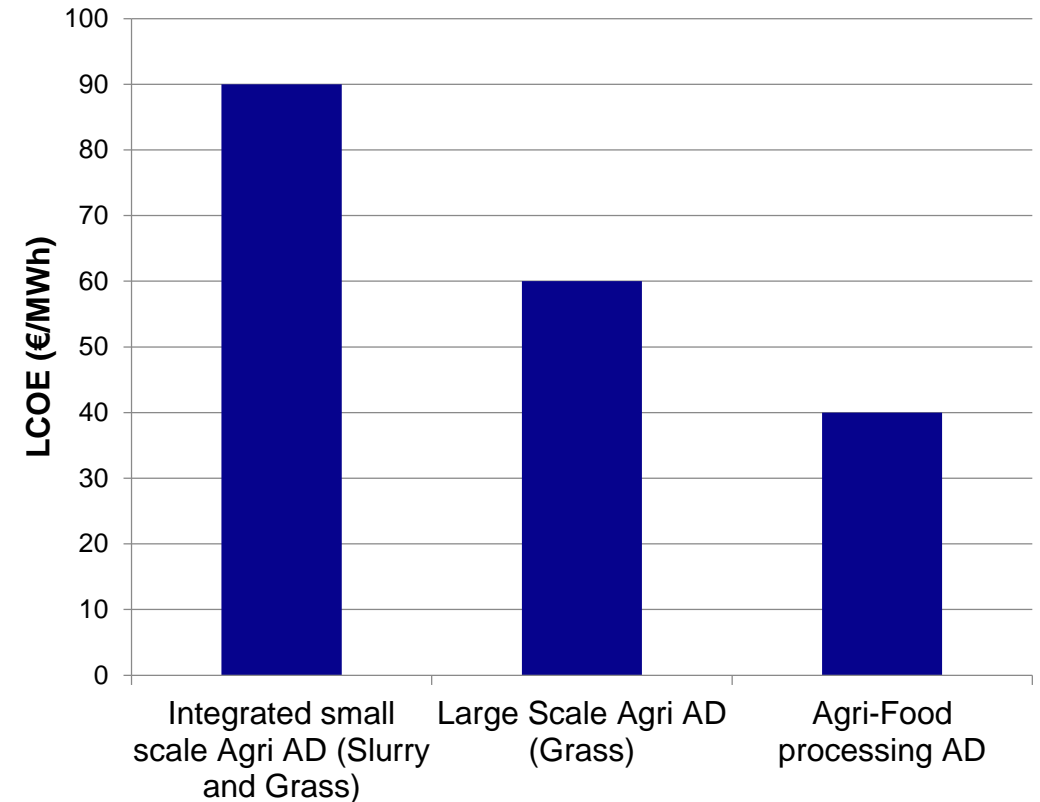


- Central Biogas to Grid Injection Facility
- 5 bays – 1,200 m³/hr each
- CNG trailer road haulage
- Download time of 5 hours
- Blending ratio of 5:1 (no propane required)
- Allows regional biogas potential to reach energy market

Portsmouth Hill “Virtual Pipeline” in South of England - SGN

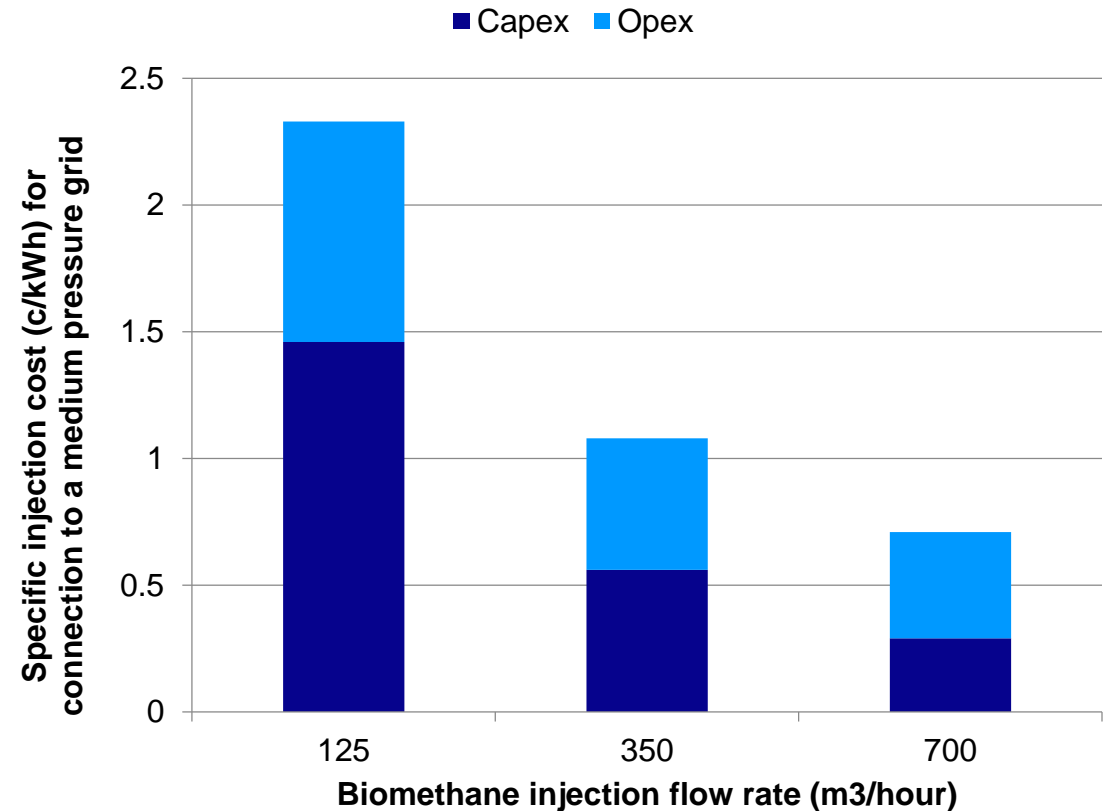
Agricultural Biogas Scenarios for Ireland

- The levelled cost of energy (LCOE) for biomethane production can range from €40-€90/MWh depending on the scenario
- Integration of small scale agri biogas is more expensive but has many benefits
- A guaranteed payment for the biomethane produced is required for investor confidence



What's the cost of gas grid injection?

- Capital costs for network entry do not greatly increase with flow rate
- High pressure transmission connections are more expensive than low pressure (4 bar) distribution connections
- Operating costs dominated by gas upgrading and electricity to run compressor



Source: W. Urban, 2013. "Biogas Handbook".
IEA Task 37.

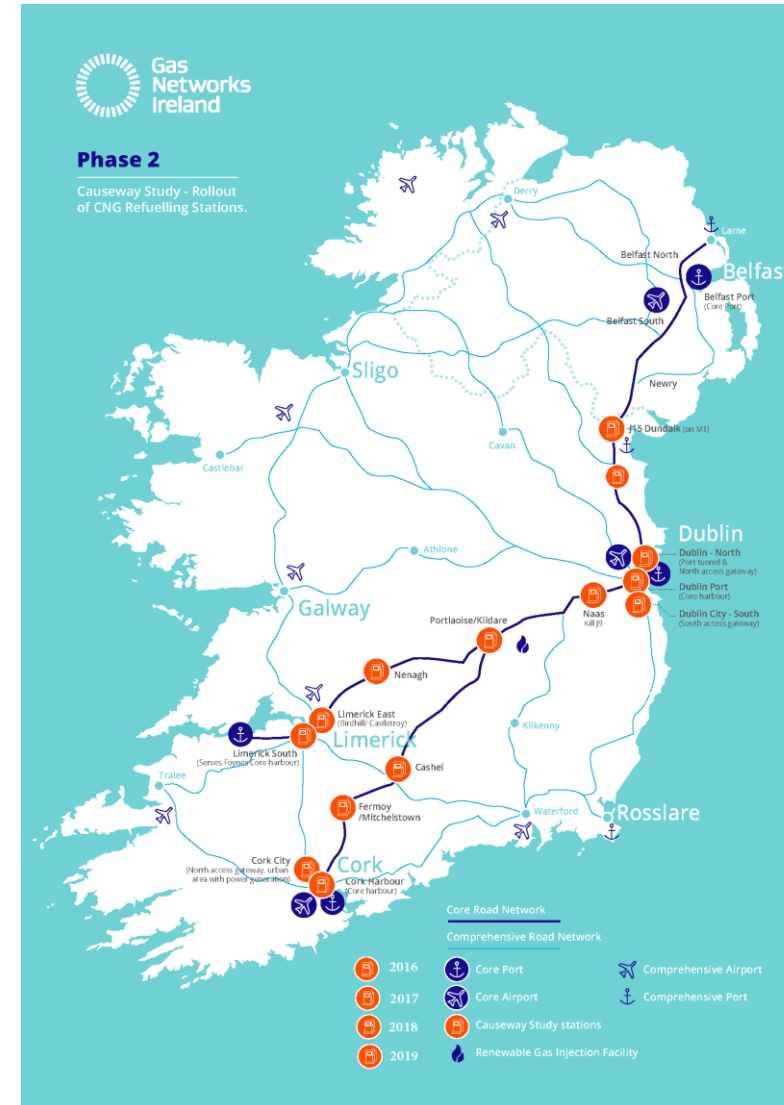
The Causeway Project

The project aims to examine the impact of increased levels of CNG fast refill stations and renewable gas injection on the operation of the gas network in Ireland.

- ❑ 14 Fast Fill CNG stations installed;
- ❑ Vehicle fund established to support CNG vehicle acquisition;
- ❑ Renewable gas injection facility; and
- ❑ System operation & behaviour data analysis.



Co-financed by the European Union
Trans-European Transport Network (TEN-T)



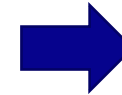
Ireland's first Biogas to Grid Project – Preliminary design



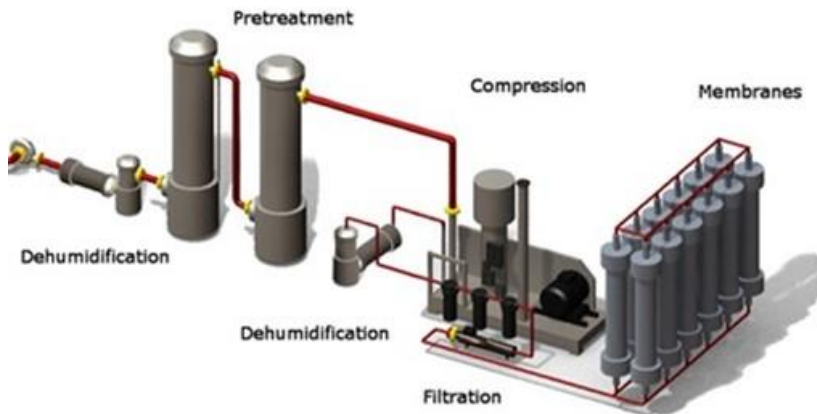
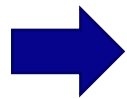
Feedstock
“Soup” = Pig
slurry + food
waste



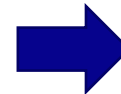
Biogas Production & Purification



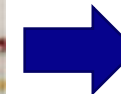
~ 5 km low pressure biogas pipeline



Biogas Upgrading



Biomethane Network
Entry Facility



Summary



- Biomethane can deliver major environmental and economic benefits to the agricultural and agri-food processing industry
- Biomethane from grass and manure is highly sustainable and can even be carbon negative
- GNI is committed to facilitating renewable gas on our network