NI GAS NETWORK PATHWAY TO NET ZERO

BIOMETHANE

NORTHERN IRELAND'S POTENTIAL

Request for Information Results
Autumn 2024

evolve Connecting pipes and people

firmus energy transitioning to net zero carbon

GNI (UK) Ltd.

mutualenergy

Phoenix Energy

Contents

Executive summary

In March 2024, Northern Ireland's ("NI") gas network operators ("GNOs") – Mutual Energy, GNI (UK), Phoenix Energy, firmus energy and Evolve – issued a Request for Information ("RfI") to prospective biomethane producers.

Its purpose was to identify potential biomethane projects, and to assist the NI GNO's, as well as policy and regulatory decision-makers, to prepare for increased biomethane injection to NI's gas network.

A total of 84 prospective biomethane producers responded, summing to production capacity of approximately 3.6 TWh per annum – this is a quantity greater than renewable electricity generated in NI in the twelve months to June 2024.[1] This volume is enough to heat 290,000 homes, or 90% of current industrial & commercial demand, and potential to reduce NI's emissions by c.525,000 tonnes of carbon dioxide equivalent ("tCO2e") per annum.[2] This strongly supports the conclusion that the opportunity to develop a large indigenous biomethane sector, distributed right across the region, is a realistic prospect in the near-to medium-term.

Key findings are presented in Table 1 below.

Table 1: Key RfI results

Potential Production Capacity	**3.6 TWh**
Number of projects	**84**
Median plant size	**27 GWh/annum**

The results show there can be an important role for both large and smaller biomethane plants in maximising NI's biomethane opportunity. Over 50% of projects were less than 40 GWh/annum capacity – with a median of 27 GWh/annum – but the largest plants (greater than 100 GWh/ annum) contribute nearly half of the identified total production capacity, despite being only 13% of plants.

The most advanced projects suggest plausible deployment of 1.6 TWh/annum of production capacity by 2030. Therefore, **the results support the NI GNOs position that the NI Executive set an ambitious target of 1.5 TWh per annum network injection by 2030.**

The ability to rapidly scale such a carbon-neutral solution is crucial, both to meet NI's 2030 emissions reductions target carbon budgets, as well as for local businesses under pressing competitive pressures to decarbonise, with limited other viable near-term options.

The results also show the most advanced **projects will contribute to addressing NI's nutrient surplus issue through effective digestate management, improving our local environment.**

The timing of this report is important, as the NI Executive is at a critical juncture in development of biomethane strategy and its first Climate Action Plan, as well as environmental and economic policy. An indigenous biomethane industry would not only support reducing emissions in the energy and agricultural sectors and enhance security of supply, but also promote significant green growth opportunities and jobs in rural communities, and sustainable circular economies.

In conclusion, **this report demonstrates that biomethane and the gas network can make a substantial contribution to NI's near and long-term energy transition, and delivery of other relevant climate, environmental and economic policy objectives.** The GNOs are committed to collaborating with industry and government Departments to play our role in delivering this.

> *"The GNOs now aim to develop a coordinated gas network plan, to outline how the network may be developed to integrate biomethane in the most strategically advantageous way."*

1 Electricity Consumption and Renewable Generation Statistics (economy-ni.gov.uk).
2 Based on SEAI carbon emissions values in https://www.seai.ie/publications/Low-Carbon-Gases-for-Heat.pdf.

1. Introduction

1.1 Overview of NI's gas network

There are three distribution network operators ("DNO") in NI. These are supplied via high-pressure transmission networks. Figure 1 shows each DNO licence area and the high pressure transmission lines.

The routes of the high-pressure transmission networks owned by GNI (UK) and Mutual Energy are shown in navy and green, respectively.

Figure 2 below shows the share of total demand per consumer sector.[3] Medium and large industrial and commercial **("I&C")** demand[4] represents only 1.3% of over 330k total connections, but approximately 39% of total distribution network demand. Of this, it is mostly (approximately 57%) concentrated in an even smaller number of large 'daily metered' consumers[5].

Fig 1: Map of the NI Gas Network

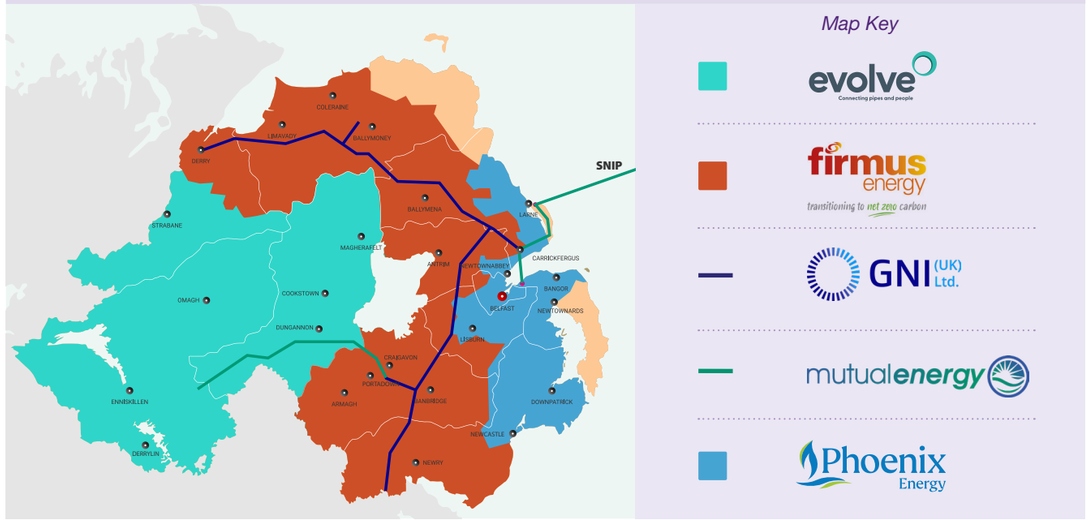
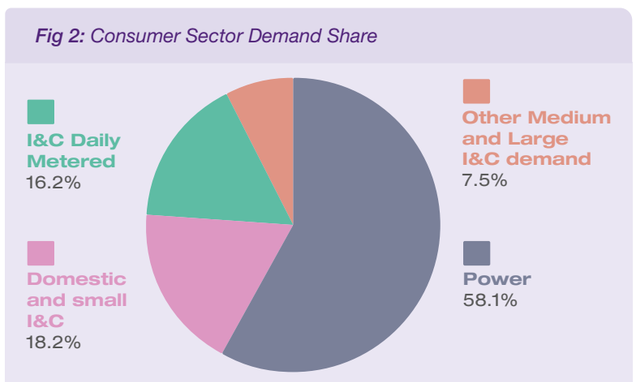


Fig 2: Consumer Sector Demand Share



3 Note, this data relates to both before and after the conversion of Kilroot power station from coal to gas.
4 customers with annual consumption greater than or equal to 73.2 MWh per annum.
5 customers with annual consumption greater than 2,196 MWh per annum.

1.2 Purpose of the RfI

The RfI was published by the GNOs to identify biomethane production projects that are interested in connecting to the NI gas network.

Published in March 2024, and open for just over two months, the RfI enabled gathering of information in a formal, structured manner, to help inform the development of NI's biomethane policy and the regulatory framework.

The purpose of the RfI included:

- the identification of new and feasible biomethane production projects to supply biomethane to the NI gas network, which includes;
  - existing plants who foresee potential, even over the longer-term, to begin supplying the NI gas network (including existing biogas producers who would consider upgrading their facilities for biomethane – for example, those operating Combined Heat and Power **("CHP")** plants under the existing Northern Ireland Renewables Obligation Certificates **("NIROC")** electricity generation scheme);
  - projects in development who plan to inject into the NI gas network, even over the longer-term, both directly (via physical connection / injection) and indirectly (via tanker to an injection hub), including projects in the Republic of Ireland **("RoI")**
  - any project who may wish to inject into the NI gas network via the portion of the NI transmission network located within RoI.[6]
- to support the GNOs, with the assistance of expert consultants, in development of a network infrastructure plan designed to unlock biomethane injection network capacity;
- to provide evidence for the NI Executive's ongoing biomethane policy development;
- to assist with developing a regulatory framework fit for future needs, and;
- to support potential biomethane producers in sourcing potential sources of Anaerobic Digestion **(AD)** feedstock.

The RfI contained questions covering key themes relating to biomethane production in NI, with questions including biomethane production plant details (location and size of the plant), planning permission and feedstock type. The RfI was open to both private and public sector respondents, and a broad range of responses encompassing different sources of feedstock supply was also encouraged.

6 i.e. the portion of GNI (UK)'s 'South North Pipeline' from Gormanston, Co. Meath to the NI/RoI border.

2. RfI Results Analysis

2.1 Plant Sizes

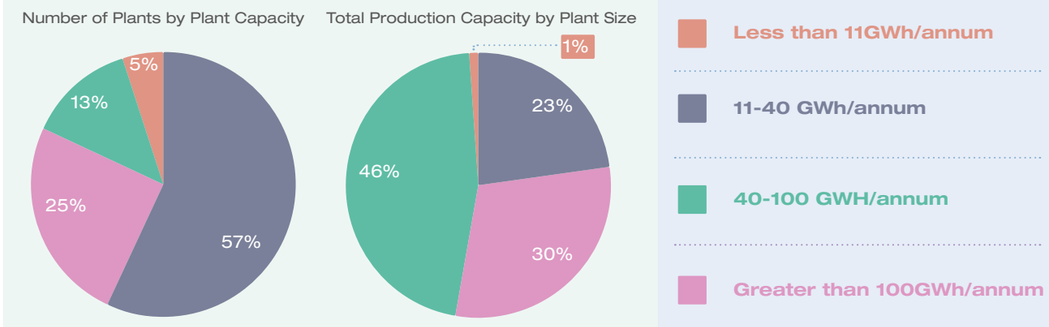
In terms of annual potential production capacity, the median plant size for respondents was 27 GWh per annum.

The European Biogas Association **("EBA")** suggest the average biomethane plant size across Europe is 33 GWh/year,[7] indicating that the nascent NI market is already centering around economic and technical norms.

Figure 3 below shows that the majority (57%) of plants being considered by respondents fell within the 11-40 GWh/annum bracket.

Only around 5% of respondents were contemplating a plant capacity of less than 11 GWh/annum (which is approximately the size of a typical combined 500 kW (electrical) CHP plant accredited under the NIROC scheme). Figure 3 also shows that the largest bracket of potential plant capacity, more than 100 GWh per annum, contribute nearly half (46%) of total potential production capacity, despite representing only 13% of plants.

Fig 3: Proportion of (i) Plants by potential Plant Capacity, and (ii) Total Production Capacity by Plant Size



"Therefore, the RfI results show the important role for both large and smaller biomethane plants in maximising NI's biomethane opportunity."

7 EBA Statistical Report 2023 | European Biogas Association.

2.2 Development Trajectory

The RfI identified 84 potential biomethane production plants, with the total potential production capacity of these plants being 3.6 TWh per year, which represents approximately 20% of total natural gas demand in 'gas year' 2023/24 (i.e. the twelve month period commencing 1st October 2023).

This is more than twice the NI GNOs 2023 'commitment' that, by 2030, 1.5 TWh of biomethane will be injected into the NI gas network annually[8].

It should be noted that 3.6 TWh only represents the potential biomethane identified by this RfI, and it is likely that there are other potential plants in planning, or that could be developed if sufficient policy support is put in place. A 2022 report by the Centre for Advanced Sustainable Energy ("CASE") identified that NI has potential biomethane production capacity through silage and manure feedstocks of 6.1 TWh per annum.[9]

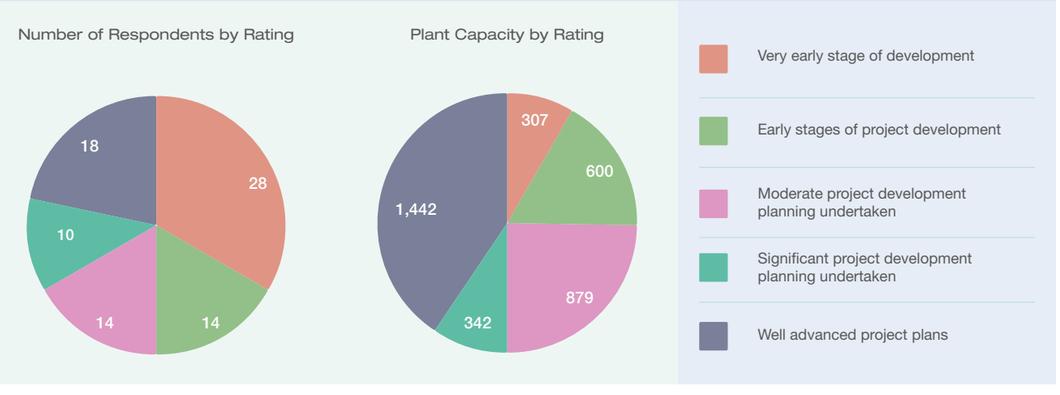
The NI GNOs conducted an analysis of the respondents' projects to estimate their progress and ranked them 1-5, accounting for factors such as:

- projected commissioning date,
- stage of planning and development of a digestate management plan,
- engagement with potential biomethane purchaser/offtaker(s) and
- engagement with relevant GNO regarding network connection.

A rating of 1 or 2 indicates a speculative plant with little to no planning undertaken, and a plant with a rating of 4 or 5 indicates a plant with significant progress underway.

Figure 4 below shows the results of this analysis, with 28 (33%) of plants being rated 4 or 5.

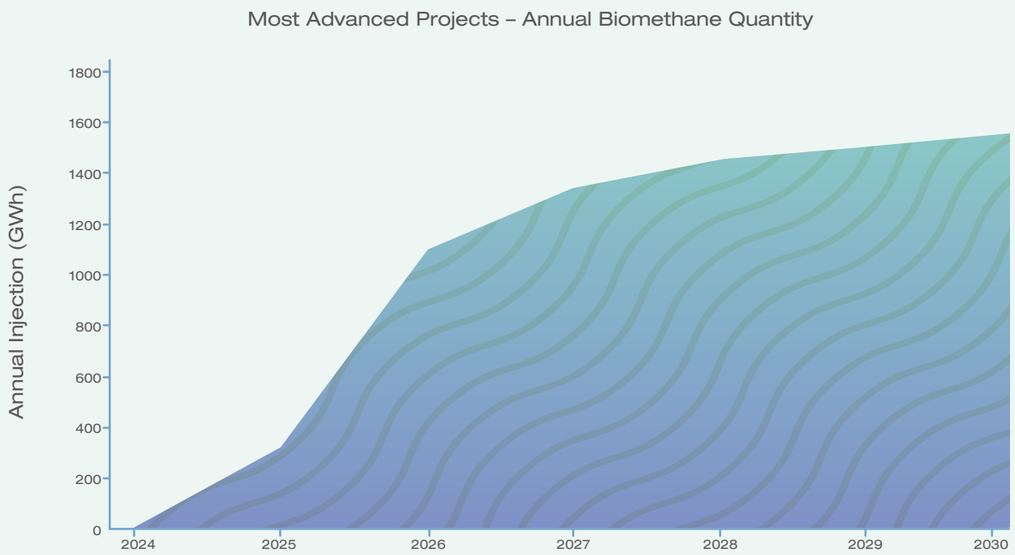
Fig 4: Number of Respondents and Production Capacity by Rating



8 https://phoenixenergyni.com/news/no-regret-actions-today
9 Evaluating the opportunity for utilising anaerobic digestion and pyrolysis of livestock manure and grass silage to decarbonise gas infrastructure: A Northern Ireland case study (qub.ac.uk)

Figure 5 below shows the production / network injection profile of the plants rated 4 and 5. This demonstrates that these plants have the potential to produce in excess of 1.5 TWh per annum by 2030.

Fig 5: Annual Production Trajectory of Plants rated 4 and 5



"This serves to underline that if a suitable supportive policy framework is developed with pace, a 1.5TWh target is credible."

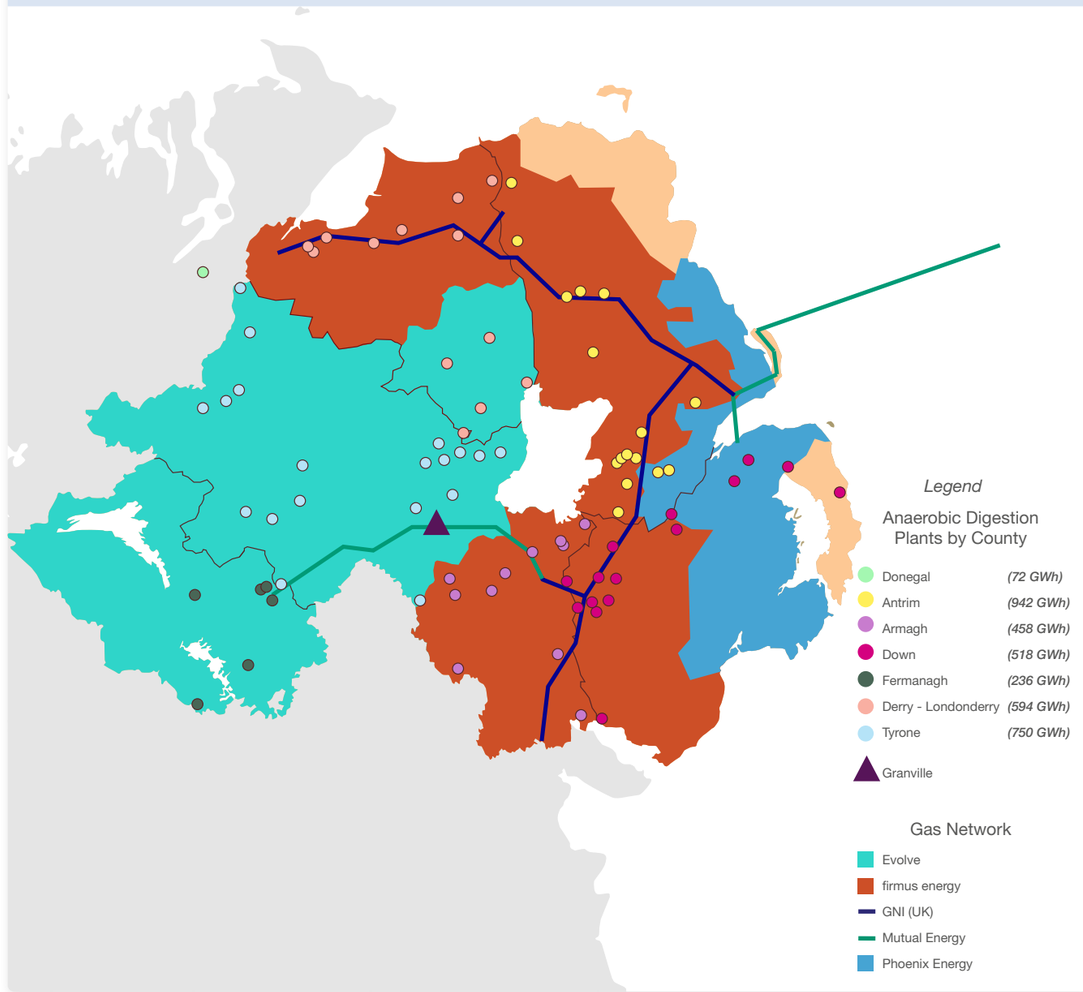
2.3 Geographic analysis

The locations of prospective biomethane plants from the RfI demonstrates clearly that biomethane production projects may be developed in a geographically disperse nature across the region (as illustrated in Figure 6).

However, in some areas, there appears to be clear scope to further expand biomethane production beyond the responses received, further underlining that the overall prospects for biomethane production very likely exceed those detailed within this report.

RfI responses from biomethane producers located in ROI were also welcomed. Only one such response was received (located in Donegal, for which the NI network is its more proximate than the RoI gas network). This plant equated to less than 2% of total production capacity identified through the RfI. It is considered credible to include this plant in the analysis, given its specific location is in relatively close proximity to the NI gas network, and the assessment it would be capable of being transported by road into NI for injection into the NI gas network.

Fig 6: Location of prospective biomethane plants from RfI respondents



2.4 Digestate Management

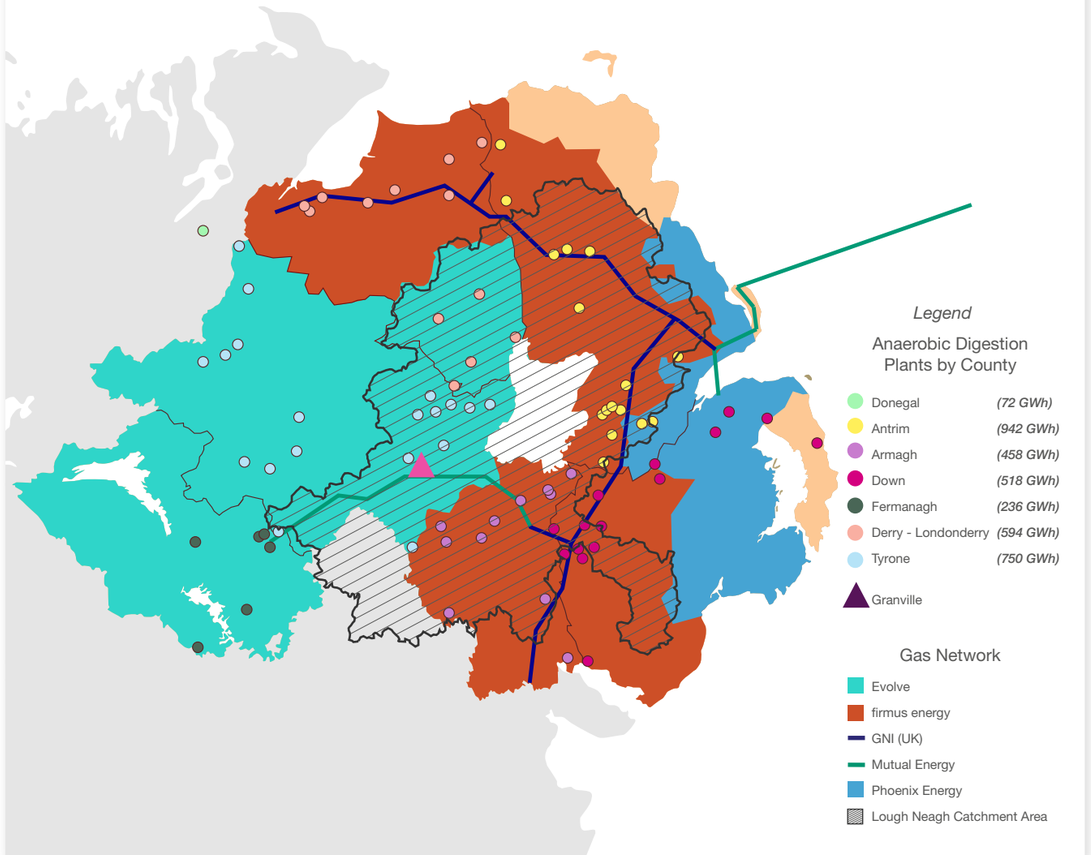
62 respondents provided details on their digestate management plans. 42% of such respondents (26) suggested they were looking to process their digestate before, or instead of, spreading it to land.

Of the plants rated 4 or 5 (i.e., those with well advanced project plans), only 4 of the 28 plants (14%) indicated that they intended to spread digestate solely back to land without nutrient processing.

The RfI results therefore suggest that **the most advanced projects in NI are already proposing approaches which will contribute to addressing NI's nutrient surplus issue through sustainable digestate management, improving our local environment.**

As shown in Figure 7 below, 1.6 TWh, or approximately 45%, of potential production capacity identified through the RfI is located within the Lough Neagh catchment area. This demonstrates the potential for biomethane production in this locale, in conjunction with nutrient stripping technologies, to play a significant role in improving our local water quality, and contributing to addressing the matters raised in the 'The Lough Neagh Report'.[10]

Fig 7: RfI Projects within Lough Neagh Catchment Area



10 The Lough Neagh Report (daera-ni.gov.uk)

2.5 Challenges to Project Development

Respondents were asked what the key barrier to their projects was. Three main themes emerged.

- the absence of a NI-specific financial support scheme which provides suitable revenue certainty to meet project finance needs,
- the costs of network connection under the 'producer pays' connection policy, without any degree of socialisation or strategic investment in deep network reinforcement / capacity solution and
- obtaining planning permission, in particular delays and other certain conditions being challenging to meet.

Producers highlighted the need for certainty in the policy and regulatory framework, highlighting the need for pace in developing this.

We will continue to engage with producers, to understand their views and to take account of them in our own planning and engagement.

3. Next Steps

3.1 Biomethane Connection Infrastructure Study

Under the current connections guides for biomethane connections, the guides contributes the full cost (capital and operational) of any connection assets (including any 'deep' network investments required).

This is in line with current economic regulatory policy in NI. This incentivises connecting parties to the 'least cost' solution for their individual needs, but not necessarily the least cost or otherwise strategically optimal solution for the NI gas network or biomethane industry.

One of the key purposes of the RfI was to support the assessment of the options for future infrastructure requirements for biomethane integration into the gas network by comparing the current gas infrastructure to the mapping of biomethane production potential and future demand projections. This mapping of biomethane production from the RfI can then be used for future planning, by anticipating potential needs for network development, and possible connection policy options.

It is important to consider the location of the prospective biomethane plants, where gas demand in NI exists, and how the NI gas network operates. As previously outlined, NI has three defined gas distribution areas with two larger transmission networks connecting them. The networks operate at different pressure levels, and currently operate primarily in a single direction of flow – from the transmission network into the distribution network and onwards to end users.

Table 2 shows the annual demand of the different network areas alongside the RfI results and also the potential biomethane production through silage and manure feedstocks identified by CASE (as referred to previously). This shows that demand is highest in the Phoenix Energy network area, but biomethane potential is lowest, whereas biomethane potential in the Connection Guide area is significantly higher than demand.

As NI's electricity system decarbonises and diversifies (for example, via hydrogen), power sector natural gas demand is forecast to fall. Additionally, solutions such as hybrid heating systems and improving energy efficiency have potential to reduce distribution network demand. Given this, NI's biomethane potential can make up a greater proportion of NI's gas demand than at present, with the possibility to ultimately displace all imported natural gas over the long-term.

Table 2: Network Demands, Biomethane Resource Potentials and Injection Capacities

	Annual Demand (GWh)	Biomethane Production Potential per DNO Licence Area		
		GNO RfI Results		CASE Report (GWh per annum)
		GWh per annum	% of Annual Demand	
Evolve	807	1,071	133%	1,840
firmus energy [11]	1,958	1,967	100%	3,028
Phoenix Energy	4,313	531	12%	1,257
Total Distribution	7,078			
Power [12]	10,424			
Total NI Network	17,501	3,570	20%	6,124

11 RfI resource potential for firmus energy's network includes the respondent project located in Co. Donegal.
12 Based on 'minimum' instantaneous demand across all power stations, rather the sum of respective minimums for each.

In reality, however, the capacity of each distribution area to accept biomethane is, to a significant extent, determined by its 'baseload', or minimum demand, rather than annual demand. This is driven predominantly by a combination of consumption at a small number of large 'anchor' industrial and commercial premises, and domestic and small I&C demand (the latter of which is highly temperature-driven, meaning it varies markedly across seasons and diurnally).

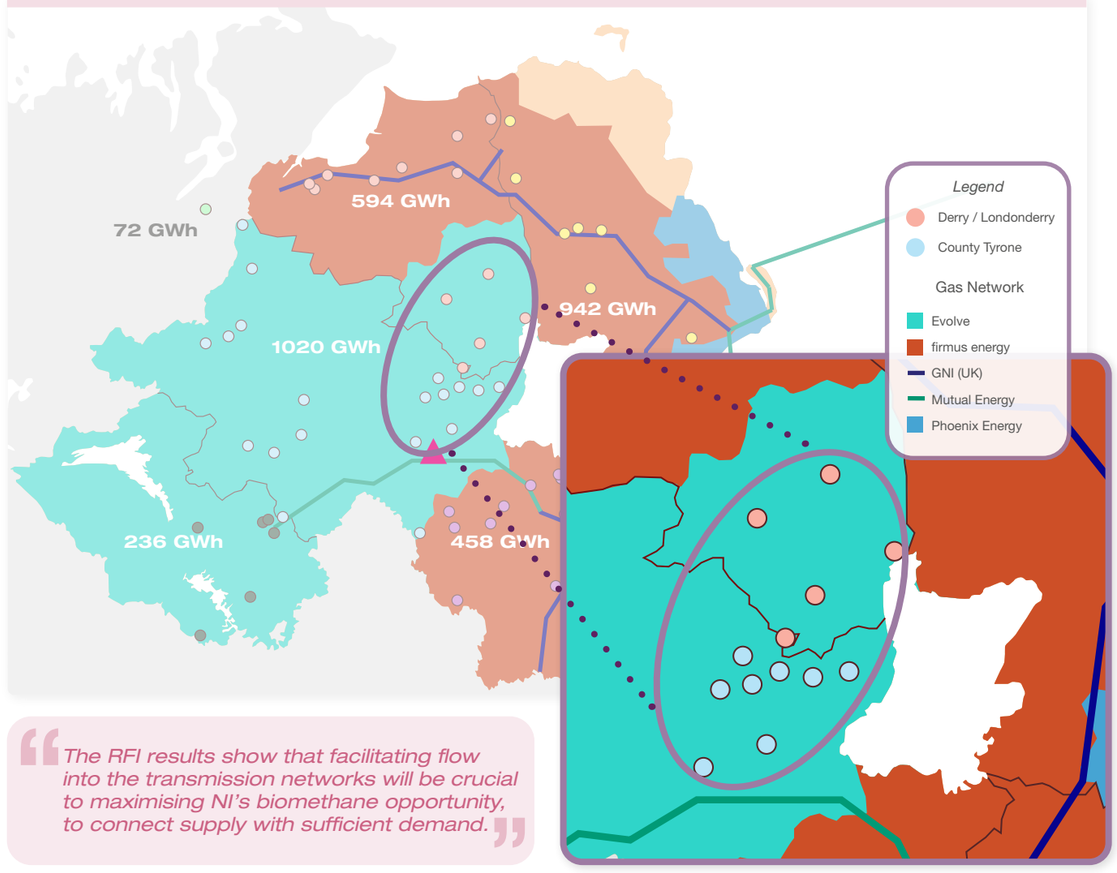
Furthermore, it is important to recognise that, while there are three distribution network operators, there are actually fourteen discrete networks, connected only to the transmission system rather than to one another. This lowers the minimum demand, and so injection capacity, on each such physical distribution network.

To overcome this mismatch between biomethane production and gas demand / injection capacity, it is important that capacity is enhanced through technical solutions. This could include:

- reverse compression, which would allow excess supply of biomethane on a distribution network to flow into the transmission network
- centralised injection hubs on parts of the network with higher levels of capacity.

By way of example only, Figure 8 shows that the potential production capacity of 14 potential projects in the vicinity of Evolve's Mid-Ulster distribution network comprising chiefly of Dungannon, Coalisland, Cookstown and Magherafelt) was 669% (i.e. nearly seven times) current annual demand levels.

Fig 8: Mid-Ulster RfI production capacity relative to current annual demand



"The RFI results show that facilitating flow into the transmission networks will be crucial to maximising NI's biomethane opportunity, to connect supply with sufficient demand."

The GNOs have commissioned a consultancy-led project to:

- undertake a review of the technical benefits/challenges of the potential to facilitate suitable network injection capacity for potential biomethane supply;
- develop an optimal infrastructure plan for such, and;
- undertake review of the regulatory implications of the potential options and development of a regulatory workplan to enable the proposed optimal infrastructure plan.

It is anticipated this will be delivered by Q2 2025. Options to be considered include, but are not limited to, direct connection of plants to transmission and distribution networks, central grid injection **("CGI")** facilities, 'reverse compression' (to enable transfer of flow from distribution to transmission networks) and distribution network reinforcement.

3.2 Strategic Integrated Energy System Planning

The TSOs are currently engaging with SONI, the Utility Regulator and Department for the Economy to develop a framework for strategic 'whole energy system' planning.

This would involve regular deliverables produced through integrated planning across the gas and electricity sector to inform credible future energy scenarios and strategic infrastructural needs assessments.

This is strategically important, to plan for optimising NI's decarbonisation pathway, ensuring costs of the transition are assessed and minimised and that security of supply risks are considered and mitigated.

Stakeholder engagement will be a crucial component of such strategic planning activity.

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