Submission to the Consultation on Gas Networks Ireland's Ten-Year Development Plan

Prepared by Codema - Dublin's Energy Agency

March 2022

Background

Codema is Dublin's Energy Agency is a not-for-profit company limited by guarantee and was founded in 1997. We are the energy agency to the four Local Authorities in Dublin, and our mission is to accelerate Dublin's low-carbon transition through innovative, local-level energy and climate change research, planning, engagement and project delivery, in order to mitigate the effects of climate change and improve the lives of citizens. We are the Dublin Local Authority's one-stop-shop for developing pathways and projects to achieve their carbon reduction and climate targets. Examples of Codema's work include energy master-planning, district heating system analysis, energy performance contracting, management of European projects, energy saving behavioural campaigns and detailed energy reviews. Codema is well networked in Europe and has been very successful in bringing European projects to Dublin with a local implementation for the Local Authorities.

Context

Codema welcomes the opportunity to make a submission to this consultation process. Codema's interest in the Gas Networks Ireland Ten Year Development Plan stems from our ongoing analysis of energy use and emissions from heating systems, and the development of cost-optimal heating technology pathways for the Dublin region. Our research and practical experience of developing projects allows us to advise on local level low-carbon policies which aim to reduce energy, fossil fuel use and associated costs & emissions. We have more than 20 years' experience in the climate change and energy sector, specifically in how EU and national legislation will affect the Dublin Local Authorities' activities and the Dublin region as a whole.

Codema's Experience in Heating Technology Pathways and Spatial Energy Planning

Codema are Ireland's leading experts in the area of spatial energy master-planning. As part of our work on the Dublin Region Energy Masterplan[1] (DREM) **we have assessed cost-optimal, technically feasible decarbonisation pathways for the heat, electricity and transport sectors in Dublin to 2030 and 2050**.

The masterplan addresses all energy sectors of electricity, heat and transport, and crucially has been modelled from a spatial perspective as well as from a technology perspective. The analysis is at a

[1] Report to be published Q2 2022.

granular spatial level called the 'small area' level[2]. This project also identifies and supports the use of low-carbon sources indigenous to Dublin, develops and harnesses new local level energy policy practices, and strengthens Ireland's integrated energy system modelling capabilities.

The pathways developed as part of the masterplan are based on detailed local-level, spatially-driven energy scenario modelling, which has not been carried out before for any county in Ireland. This innovative local-level energy planning methodology builds upon leading international-class energy research in the area, and findings from the DREM have already been directly applied and demonstrated by the Dublin Local Authorities.

This work, when published, will present a set of clear, evidence-based pathways, which will enable the Dublin region to create effective, long-term energy policy in areas such as spatial planning, land-use, and public infrastructure. In addition to this the work also presents a geographic analysis of the current situation for energy use, along with additional spatial data layers to facilitate contextual analysis[3].

The results and analysis from the DREM allow Codema to advise on decarbonisation pathways for the energy sector, and will assist local authorities to effectively create evidence-based policies and actions to affect CO_2 emissions county-wide, by using the local authority's powers in spatial planning, land-use, planning policy and public infrastructure.

Codema's Experience in District Heating

Codema is Ireland's leading expert in District Heating research and project implementation. We have built the evidence-base to support the roll-out of DH in Dublin, developing the first heat demand and heat source maps in Ireland, based on European best practice methodologies. We have identified potential projects across Dublin and, working with Local Authority project champions, have **brought projects from idea to reality; from pre-feasibility, techno-economic analysis, business case through to securing funding, procurement, contracting and delivery**. We are the Dublin Local Authority's one-stop-shop for the roll-out of DH projects, and have supported South Dublin County Council in the development of the Tallaght District Heating, and Dublin City Council in the planning for the Dublin District Heating Scheme, centred in Poolbeg.

[2] Small Areas are areas of population generally comprising between 80 and 120 dwellings created by The National Institute of Regional and Spatial Analysis (NIRSA) on behalf of the Ordnance Survey Ireland (OSi) in consultation with CSO.
[3] Preliminary geographic outputs of the current situation for energy use in Dublin, as part of the Dublin Region Energy Masterplan: https://codema-dev.github.io/posts/

Summary of Key Points

- Ireland has a significant opportunity to support climate action through the deployment of district heating for building heat demands. Approximately 87% of heat demand in Dublin could be served by district heating in 2050[4], and up to 50% of building heat demands nationwide could be cost-effectively served by district heating[5].

- No new district heating systems should be primarily fuelled by fossil gas, with an exception for utilisation of waste heat from gas power stations.,

- The most cost-effective, and lowest cumulative emission pathways for decarbonisation of the heat sector involve significant scaling back of the gas distribution network serving the residential, commercial and public sectors on the path to net-zero in 2050.

- Future network development plans could benefit from examination of scenarios where the gas distribution network significantly reduces in scale.

- Future network development plans could benefit from examination of the commercial sector as a separate entity to the industry sector, as they have significantly different characteristics and options for decarbonisation.

- Gas growth assumptions as presented in the network development plan are not in line with carbon budgets.

- Future gas network development plans could benefit from increased ambition for decarbonisation.

- Gas network planning can contribute to a just transition by signposting for gas industry workers the complementary skills required for new low carbon infrastructure such as district heat.

- Policy assumptions for this network development plan do not reflect current climate ambitions, which reduce the scope for fossil gas to contribute to decarbonisation of space heating.

[4] Dublin Region Energy Masterplan, Codema, to be published Q2, 2022.
[5] SEAI National Heat Study, SEAI, 2022

- Codema support the role of GNI in developing a future gas transmission network compatible with green hydrogen, however green hydrogen should be reserved for specific high value use cases.

- Future network development plans could benefit from examination of how to prioritise green hydrogen supply to gas users with the least ability to decarbonise via alternative decarbonisation pathways.

- Codema support the GNI forecast in this report that highlights the limited role of biomethane in decarbonisation of the gas grid (due to sustainability related resource constraints).

Response to Consultation

The District Heating Opportunity

Heating is a hugely important sector in Ireland when it comes to decarbonisation as it represents approximately **40% of energy demand (twice the demand of electricity)** and is the worst performing sector in terms of renewable proportion (currently at 6.3% of total heat production) behind both electricity and transport. **District heating is new technology in Ireland, currently representing less than 1% of the heat market but with potential for this to be between 50% and 60% of building heat demand based on a 2019 study performed by the Heat Roadmap Europe researchers and results from SEAI's National Heat Study**.

Codema's Dublin Regional Energy Masterplan also assessed the potential for district heat in Dublin in comparison with other technology options, considering multiple factors to assess the suitability of heating technologies including spatial constraints, infrastructural costs, building fabric suitability, supply temperature requirements, fugitive emissions etc. One of the key findings from the masterplan is the importance of district heating networks which utilise both waste heat and renewable heat in decarbonising Dublin where **approximately 87% of heat demand in the capital is suitable for district heating** by 2050.

Several pilot schemes for large-scale district heating are in the process of demonstrating how this potential can be delivered[6]. The primary energy sources for heat supply to district heat networks are:

[6] Tallaght District Heating Scheme, Dublin District Heating Scheme

- Waste heat from industry and power generation and transformers
- Heat pumps (water source, air source and ground source)
- Bioenergy
- Deep Geothermal
- Curtailed Renewable Electricity (via electric boilers or heat pumps)
- Waste heat from wastewater treatment and sewage pipes
- Landfill waste heat and landfill biogas

District heating networks potential to enable greater uptake of renewable and waste heat sources is shown in the figure below where there is a strong correlation between DH and renewable heat proportions.

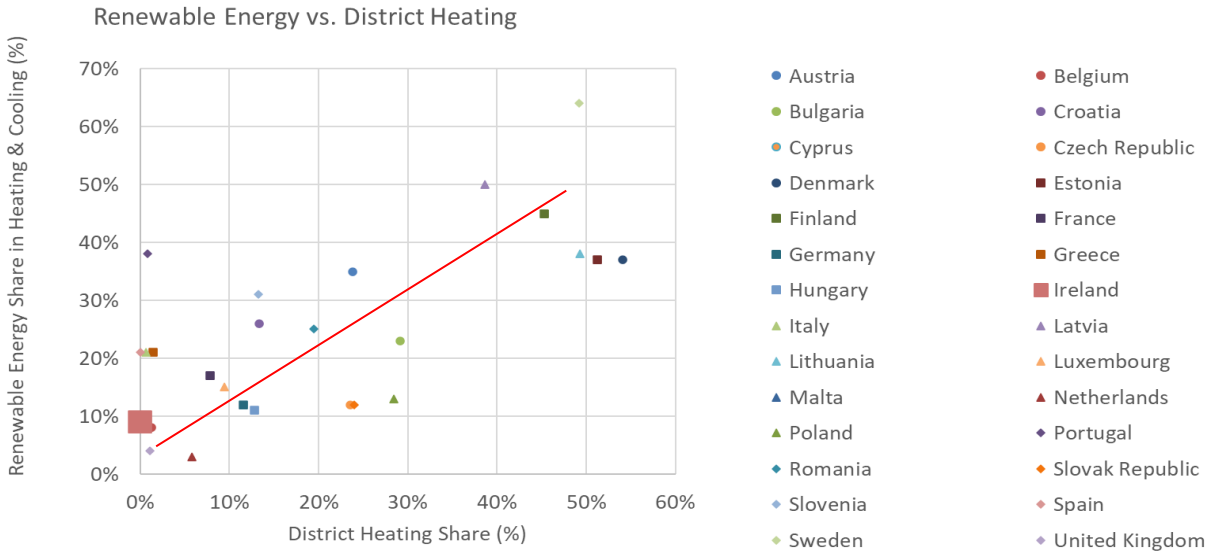

Figure 1: Correlation Between Renewable Heat Share and District Heating Share in Europe (Source: Heat Roadmap Europe)

Apart from being a method for increasing the proportion of low-carbon and renewable heating, DHC provides many additional benefits to an overall integrated energy system, such as:

- **Easier integration of renewable and low-carbon heat sources** without disruption to customers/homeowners as access to each individual dwelling is not required
- **Lower local air pollution** as buildings fossil fuel boilers would no longer be required
- Facilitates **utilisation of indigenous low-carbon resources which would not make sense at a smaller (individual building) scale such as deep geothermal and industrial waste heat**

resources – leading to more efficient operation of both industrial plants and heat production and supporting a more circular economy

- **Provides storage and demand side response for the electricity grid** at a fraction of the cost of battery storage when supplied by large-scale heat pumps, electric boilers etc. This also **facilitates greater production of renewable electricity** (e.g., curtailment of wind turbines can be reduced) due to the flexibility provided by this thermal storage capacity.
- **Potential for reduced demands on the electricity system,** in comparison to a counterfactual of having heat pumps in each building. Buildings served by district heating use centralised heat pumps which can achieve higher efficiencies but also can utilise heat sources such as waste heat, geothermal and bioenergy. In the case where centralised heat pumps are being used the cost of grid upgrades required is reduced when compared with the counterfactual due to these higher efficiencies and the ability to by-pass the lower voltage grid infrastructure in terms of grid reinforcement.
- **Increased customer safety** as there is no risk of gas leaks or carbon monoxide due to on-site combustion of fuels
- **Benefits local economy** by providing low-cost heating to customers (reduced overheads) and residents (**reduced fuel poverty**), potential revenue from waste heat for local industries and providing **new local employment** in the construction, operation and maintenance of the network
- **Providing a just transition for those with complimentary skills** which currently work in the fossil fuel industry (welders, engineers, civils contractors, geotechnical experts, etc.)
- Efficient operation of heat production plants is ensured by **constant monitoring, operation and maintenance being carried out by trained professionals** – this is not possible with solutions located in individual homes where equipment is often not maintained to regularly achieve **high operating efficiencies**

Response to the GNI Network Development plan

No new district heating systems should be primarily fuelled by fossil gas with an exception for utilisation of waste heat from gas power stations.

Codema has conducted detailed analysis as part of the Dublin Regional Energy Masterplan that highlights the significant potential for district heating in Dublin, where **approximately 87% of heat demand in the capital is suitable for district heating** by 2050[7]. This is further supported by work carried out by Heat Roadmap Europe and analysed by IrDEA[8] that highlights that 50 - 60% of heat demands

[7] Dublin Region Energy Masterplan, Codema, to be published Q2, 2022.
[8] Irish Heat Atlas, 2019; and Heat Roadmap Europe, 2018

nationwide could be served by district heat, and analysis by the SEAI[9] that highlights that up to 50% of building heat demand in Ireland could be cost-effectively served by district heat from renewable sources.

The gas network development plan highlights the potential for fossil gas-based district heating to serve large scale apartment blocks. The strong evidence gathered to date shows that district heating has high potential to serve space heating needs, and does not require a fossil fuel primary energy source. The evidence gathered also highlights that renewable and waste energy sources for district heating are cost competitive with current fossil gas options.

The most cost-effective, and lowest cumulative emission pathways for decarbonisation of the heat sector involve significant scaling back of the gas distribution network serving the residential, commercial and public sectors on the path to 2050.

We cannot wait for decarbonisation of the gas network at scale to decarbonise residential, commercial and public sector heat demands when we can act now with proven and currently available technologies and systems such as district heat and heat pumps[10].

Scenarios that rely on gas network decarbonisation do not meet pro-rata carbon budgets applied to the heat sector, have the highest cumulative emissions, and rely on big delayed efforts in the 2040's to approach net zero emissions. Scenarios that come closest to carbon budget limits involve high deployment of district heat networks, and high levels of electrification of heat[11].

Additionally, pathways that rely strongly on decarbonised gas also rely comparatively heavily on carbon capture and storage technologies which are unproven technologies at scale[12]. Late action, combined with unproven technologies significantly increases the risks of missing our legislated for climate targets.

For the most part today's new gas networks are tomorrow's stranded assets when it comes to providing sustainable space heating and hot water. Given the need for a transition to a lower carbon sustainable economy there is a high level of uncertainty regarding whether these assets can recoup their investment costs in the face of decarbonisation targets stated within Irelands Climate Action Plan and the necessary increasing ambition of these targets going forward.

[9] SEAI National Heat Study, SEAI, 2022
[10] Dublin Region Energy Masterplan, Codema, to be published Q2, 2022.
[11] SEAI National Heat Study - Net Zero by 2050, SEAI, 2022
[12] SEAI National Heat Study - Carbon Capture, Storage and Utilisation, SEAI, 2022

Future network development plans could benefit from examination of scenarios where the gas distribution network significantly reduces in scale

Planning must commence for a managed scaling back of the gas distribution network to residential, commercial, and public services sectors, as these sectors migrate to other low carbon options.

As the gas distribution network reduces in scale (while the transmission network is retained for priority green hydrogen uses) there are many aspects that could benefit from detailed scenario planning, such as how to avoid stranded asset costs associated with investment in fossil infrastructure, public timelines for decommissioning to help drive investment decisions towards the lowest carbon options, and how to plan for a decreasing number of gas network users required to pay for similar operational charges.

As this transition occurs, greater engagement with planning authorities on locating and zoning new developments which cannot be served by alternative (non-gas) sources close to green infrastructure could be a beneficial approach that maximises the benefits of existing energy infrastructure.

Another important aspect of network development planning is the inclusion of new district heat ambitions from Government, and the Climate Action Plan 2021 in gas network development scenarios. The roll out of district heat and continued use of gas networks in the same areas has a negative impact on the business case for both.

Gas network planning can contribute to a just transition by signposting for gas industry workers the complementary skills required for new low carbon infrastructure such as district heat.

There is also a huge opportunity for people working in the gas sector to transition into DH. There are a lot of transferable skills and knowledge (district heat network construction, welders, engineers, civil engineering contractors, geotechnical experts, etc.).

Analysis from Codema's Dublin Regional Energy Masterplan calculates that total investment in district heat in Dublin could reach €7.7 billion by 2050, were full district heating potentials to be realised, generating a local heat market estimated at €959 million per year by 2050.

Funds should be reallocated to facilitate this transition rather than expanding gas networks.

Future network development plans could benefit from examination of the commercial sector as a separate entity to the industry sector, as they have significantly different characteristics and options for decarbonisation.

The network development plan analysis amalgamates industry and commercial into one market sector, with power, residential and transport the other sectors.

This amalgamation is not appropriate as the industrial and commercial sectors have very different profiles, and examining them separately could lead to better solutions with reduced emissions.

The industry sector consists largely of heat demand to supply medium and high temperature heat to industrial processes. The commercial and public services sector heat demand is predominantly space heating. In the network development plan gas demand for the industry and commercial sectors are forecast to grow in line with GDP projections, for the commercial sector gas demand could be better modelled by including a decline in customers as they switch to other space heating options.

Gas growth assumptions are not in line with carbon budgets

Forecasting growth in gas demand for a market sector like the commercial and public services sector is a gas growth assumption not in line with our climate ambition and carbon budgets. The commercial and public services sector, like the residential sector as discussed above, has proven, available, and cost-effective technologies such as district heating, heat pumps and biomass options that allow decarbonisation now, and imply reduction in gas demand.

The network development plan highlights 300,000 residential homes with oil heating close to the gas network for inclusion in network growth plans.

Replacing oil fired central heating systems in the residential sector is correctly highlighted as an important policy challenge by this report. However, given the urgency of our climate challenges and the scope of our climate ambition, combined with the latest modelling and analysis from Codema's Dublin Regional Energy Masterplan and SEAI's National Heat Study it can be seen that conversion of these 300,000 properties onto the gas network is not in line with our carbon budgets.

The current network development plan also states '*Gas Networks Ireland continues to actively promote natural gas heating systems, in combination with solar technology, to builders and developers*'. Codema believes that active promotion of natural gas for space heating purposes is not supportive of Ireland's climate ambition.

Future gas network development plans could benefit from increased ambition for decarbonisation

The current network development plan calls for gradually replacing fossil gas with renewable gases. Codema support gas network development planning that contains increased levels of action in support of decarbonisation.

Policy assumptions for this network development plan do not reflect current climate ambitions, which reduce the scope for fossil gas to contribute to decarbonisation of space heating

The network development plan is based on policy documents that have been superseded and are out of date (Ireland's National Energy and Climate Plan (NECP) for 2021 – 2030, and the Interim Climate Actions 2021).

National policy ambition has increased significantly with the finalisation of the Climate Action and Low Carbon Development (Amendment) Act 2021, which legislates for carbon budgets which have been proposed by the Climate Change Advisory Council[13], and also the increased ambition stated in Ireland's Climate Action Plan 2021, which in particular notes high ambition for both district heat and heat pumps.

The implications of these are a potentially significantly reduced role for the gas distribution network which is not reflected in the network development plan. This is also supported, as discussed above, by analysis from Codema's Dublin Regional Energy Masterplan and SEAI's National Heat Study.

Codema support the role of GNI in developing a future gas network compatible with green hydrogen, however green hydrogen should be reserved for specific high value use cases.

Recent analysis from Codema's Dublin Regional Energy Masterplan[14] shows that district heat and heat pumps are the most effective technologies for decarbonisation of heat in Dublin - **approximately 87% of heat demand in the capital is suitable for district heating** by 2050.

Additionally recent research from SEAI[15] highlights that decarbonisation pathways that rely on large scale decarbonised gases are more expensive, involve more cumulative emissions than alternative

[13] Climate Change Advisory Council Carbon Budgets
[14] Dublin Region Energy Masterplan, Codema, to be published Q2, 2022.
[15] SEAI National Heat Study, SEAI, 2022

decarbonisation pathways, are not compatible with carbon budgets applied pro-rata to the heat sector, and see delayed action in comparison with other pathways.

Codema believes that green hydrogen should be primarily supported for use in certain applications where the heat supply cannot already be supplied more efficiently and more cost-effectively through renewable and waste heat sources and technologies currently available such as district heat, heat pumps, waste heat and direct electric technologies.

The use cases where green hydrogen may be supported are likely to include: Industry where it is used as a feedstock, shipping, long-haul aviation, seasonal power storage, and possibly power generation. Figure 1 below shows a perspective on the ranking of the potential use cases for green hydrogen.

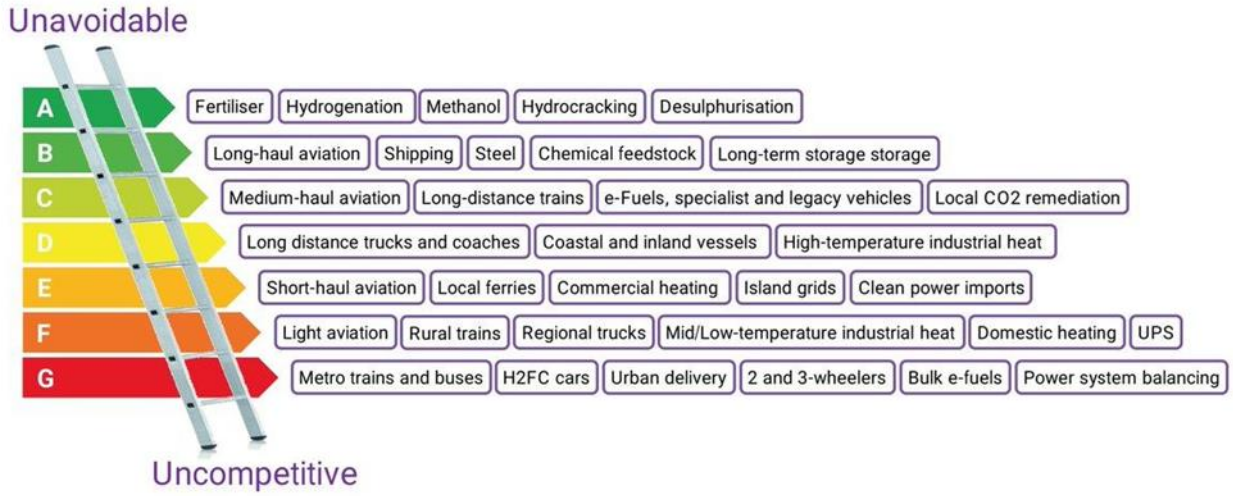

Figure 1: Hydrogen Ladder Ranking Potential Viable Uses of Green Hydrogen (Source: Liebrich Associates)

This is indicative and subject to re-analysis for the specific context in Ireland, however it outlines how green hydrogen is highly unlikely to be an effective option for decarbonisation of domestic or commercial heating. This analysis is supported by the existence of proven, currently available alternative decarbonisation technologies for lower temperature heat (below 120°C) not subject to the slower development and deployment rates of green hydrogen which is unlikely to be available at scale until the 2030's.

Additionally, any use of blended hydrogen with natural gas before full scale roll out of majority hydrogen networks in the 2030's and 2040's implies 93% of the energy needs will be met by methane (hydrogen can currently be blended at 20% by volume which equates to 7% by energy), promoting fossil fuel lock in and delayed climate action.

Future network development plans could benefit from examination of how to prioritise green hydrogen supply to gas users with the least ability to decarbonise via alternative decarbonisation pathways

Codema support the GNI forecast in this report that highlights the limited role of biomethane in decarbonisation of the gas grid (due to sustainability related resource constraints).

Sustainable indigenous biomethane resources are limited as recognised by this network development plan forecast of 1.6 - 3.8 TWh of biomethane per year by 2030. This is in line with the latest evidence from SEAI that shows sustainable biomethane from food waste and farm waste could reach up to 3.7 TWh, equating to approximately 7% of Ireland's current gas supply.

For further enquiries regarding this submission, please contact:

Ciarán Murphy, Research, Development & Innovation Lead ciaran.murphy@codema.ie
John O' Shea, Energy Systems Analyst/Heat & Electricity Lead john.oshea@codema.ie
Donna Gartland, Chief Executive Officer donna.gartland@codema.ie