Is there a Role for LNG Importation in Ireland's "Fair Share" of Global Climate Action?

A submission to the Oireachtas Joint Committee on Climate Action

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Introduction

I thank the Joint Committee for the opportunity to contribute to its deliberations on this important topic. I will first discuss the overarching climate action context, then the general role of natural gas in the Irish energy system, and finally the specific question of importation of *liquefied* natural gas (LNG).

"Fair share" Climate Action

Any deployment of new energy infrastructure must be considered in the context of the urgent need for energy system decarbonisation, as a central element of effective climate change mitigation. The best scientific understanding is that, to hold global temperature rise to any specified limit, the total cumulative release of carbon dioxide (CO_2) in particular must be capped; beyond that point, nett further emissions of CO_2 must be zero. This finite amount of allowable further CO_2 emissions is called the **global CO_2 budget** (GCB).

In recent work at DCU, in collaboration with TCD, we have attempted to assess the equitable **share** of the remaining global CO_2 budget that is available for Ireland, aligned with the temperature goals of the Paris Agreement – a so-called national CO_2 quota (NCQ). Such an assessment cannot be precise, because of physical uncertainties in the climate system, uncertainty in mitigation action on non-CO_2 greenhouse gases, differing ethical frameworks for interpreting equity both in relation to contemporary global humanity and intergenerationally over time, and differing value judgements in relation to prudential risk management. Nonetheless, making explicit assumptions on all these dimensions, and based on the most recent physical science assessment of the UN Intergovernmental Panel on Climate Change (IPCC) we arrived at a prudent, minimally equitable, Paris-aligned national quota of just under 400 $MtCO_2$, as from 2015[1]. This is consistent with the lower (more equitable/prudent) end of a range of estimates independently arrived at by researchers in UCC[2]. Given current CO_2 emissions projections, this will be exhausted within about four more years (by about 2024): that is, climate action consistent with this quota would require the achievement of cumulative nett-zero CO_2 emissions from 2025 onwards. This may be contrasted with even the most ambitious mitigation action envisaged in the 2019 Irish Climate Action Plan, which targets nett-zero annual CO_2 emissions no earlier than 2050 (and potentially significantly later).

The large discrepancy between these measures of the urgency of climate action may be accounted for by a combination of: procrastination of effective action to date, recent significant hardening of scientific understanding of the risks of higher temperature rise, inadequate allowance for the equity dimensions of action, both globally and intergenerationally, and tacit reliance on future very large scale deployment of speculative "negative emissions technologies". While there is scope for some limited debate over exactly how severe the challenge now is, it is clear that, for relatively wealthy nations, with high per-capita CO_2 emissions, **nett-zero annual CO_2 must be achieved much earlier than 2050** if the temperature and equity objectives of the Paris Agreement are to be respected.

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1 McMullin B, Price P, Jones MB, McGeever AH (2019) *Assessing negative carbon dioxide emissions from the perspective of a national "fair share" of the remaining global carbon budget.* Mitigation and Adaptation Strategies for Global Change https://tinyurl.com/y6tkw383

2 Glynn J, Gargiulo M, Chiodi A, et al (2018) *Zero carbon energy system pathways for Ireland consistent with the Paris Agreement.* Climate Policy 19.1:30–42. https://doi.org/10.1080/14693062.2018.1464893

Natural Gas in the Irish Energy System

Natural gas currently plays a central role in the Irish energy system. It is used extensively for low temperature space and water heating, and higher temperature heat for industrial processes. It is also a critical fuel in current electricity generation.

It is frequently asserted that natural gas has significantly lower CO_2 emissions intensity than other fossil fuels; and that, therefore, it can usefully function as a "bridge" or "transitional" fuel in overall energy system decarbonisation. The basic idea is that, in the short term, more emissions intensive fuels such as coal, oil and peat, might be substituted with natural gas to yield significant emissions reduction, with minimal collateral disruption of the energy system as a whole. In the longer term, of course, as even deeper emissions reduction are required, then natural gas also will either have to be eliminated from use, or its emissions must be effectively mitigated in some other way – the most common proposal being so-called carbon capture and storage (CCS). In the case of Ireland, it has been argued on this basis that, even under plans for deep decarbonisation, natural gas can and should continue to be used at significant scale to at least 2050 and perhaps beyond[3]; and, in particular, that even with the most rapid possible roll-out of wind and solar electricity generation capacity, natural gas will still be "essential" as the "fuel of last resort" to cover periods when those intermittent sources are not available[4].

However, there are two key difficulties with this approach. First, it assumes a relatively late nett-zero date of 2050 or beyond. If, as argued above, nett-zero must be achieved much earlier, then the window for a "temporary" transition to a somewhat lower emissions intensity fossil fuel becomes much shorter, and the case for investment in shorter-lifetime infrastructure becomes correspondingly weaker. Secondly, the assessment of lower CO_2 emissions intensity is strictly correct *only at the point of combustion*. If "upstream" emissions in extraction, processing and transport are accounted for, then the case is much more complex to assess. The principal component of natural gas is methane (CH_4), which is itself an extremely potent greenhouse gas. While it has a much shorter atmospheric lifetime than CO_2, ongoing release of methane will directly affect the level at which global temperature ultimately peaks. It is therefore critical in determining the risks of triggering "tipping points" in the global climate system. Given that such releases of methane are a specific attribute of natural gas use in particular, a "substitution" of other fossil fuels by natural gas does not necessarily yield nearly the degree of climate mitigation that is claimed on the narrow basis of combustion emissions. Further, carbon capture and storage does nothing whatever to mitigate upstream emissions. While it is true, in the case of Ireland, that the majority of such upstream emissions take place outside the national territory – and therefore are excluded from current territorial emissions reporting – they nonetheless have perfectly real physical effects which must be adequately considered in properly evidence-based policy making, particularly if climate action is to pay due regard to climate justice[5].

As to whether use of natural gas is "essential" to reliable electricity generation, even under conditions of large scale deployment of wind and solar generation, there are in fact multiple alternatives. In the Irish case it is likely that a combination of hydroelectricity, interconnection,

3 GNI (2019) *Vision 2050: A Net Zero Carbon Gas Network for Ireland.* Gas Networks Ireland. 3 Oct 2019. https://tinyurl.com/yygr6nhb

4 IAE (2018) *Natural Gas: Essential for Ireland's Future Energy Security.* Irish Academy of Engineering. Jul 2018. https://tinyurl.com/y5fxwz6p

5 Kartha, S. et al., 2018. Whose carbon is burnable? Equity considerations in the allocation of a "right to extract." Climatic Change, 13(1), pp.203–13. https://tinyurl.com/Kartha-2017-WhoseCIsBurnable

bioenergy (with high sustainability criteria) and "power to hydrogen" use (for large scale energy storage) can address most if not all requirements, at feasible costs[6] [7]. By contrast, cost effectiveness analysis of *any* new fossil fuel infrastructure should now allow for very early asset stranding and/or for active removal from atmosphere of CO_2 emissions in excess of the remaining fair share national quota, both of which are likely to give rise to excessive costs.

LNG Importation

The case generally made for importation of liquefied natural gas (LNG) is that it can diversify supplies, thus potentially giving access to a lower emissions intensity fuel (compared to oil or coal), and enhancing security of supply in case of any disruption of existing pipeline connections to the UK. However, both of these arguments are fundamentally flawed.

The **general** case for natural gas as a transitional, lower intensity, fossil fuel has already been shown to be very weak. But in the specific case of LNG, it is undermined by two further, critical, factors. First, liquefaction and liquefied transport are themselves energy intensive processes (requiring continuous refrigeration to −162°C) which reduces the nett energy yield and thus generally increases the emissions intensity compared to conventional purely gaseous supply chains[8]. Secondly, it is widely understood that the primary source of LNG for importation to Ireland is likely to be of gas extracted by way of hydraulic fracturing or fracking. There are strong indications that such extraction is significantly more vulnerable to methane release even than conventional extraction[9]. Again, it must be emphasised that such upstream emissions cannot be mitigated *in any way* by downstream interventions such as carbon capture and storage. In relation to security, the first, overriding, requirement is to secure a liveable environment through commensurate climate action which a natural gas "bridge" simply cannot deliver[10]; and secondly the best way to address *security of energy supply* specifically is through maximising use of indigenous, very low emissions energy sources. Ireland is almost uniquely well placed for such an energy security strategy to be cost-effective, based primarily on wind energy (onshore and offshore), combined with very large scale energy storage via power-to-hydrogen and related technologies.

Conclusion

As with all industrialised countries, Ireland now faces an acute challenge in rapidly decarbonising its energy system, the scale and urgency of which is not yet widely appreciated. There are no simple or easy solutions. However, it appears clear that deployment, and potential lock-in, of *additional* fossil fuel infrastructure will not help, and will most likely hinder, an effective response. I commend the Joint Committee for its careful and reflective deliberations, and will be happy to elaborate further on any of the points raised.

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6 McMullin B, Price P, Carton J, Anderson K (2018) Is Natural Gas "Essential for Ireland's Future Energy Security"? Research commissioned by Stop Climate Chaos (Ireland). 12 Nov 2018. http://tinyurl.com/y99ftz65

7 Connolly D, Mathiesen BV (2014) *A technical and economic analysis of one potential pathway to a 100% renewable energy system.* International Journal of Sustainable Energy Planning and Management. 6 May 2014. https://journals.aau.dk/index.php/sepm/article/view/497

8 Anderson K, Broderick J (2017) Natural gas and climate change. Tyndall Centre for Climate Change Research. Report commissioned by Friends of the Earth Europe. Nov 2017. http://tinyurl.com/ycbn5onh

9 Howarth RW (2019) *Ideas and perspectives: is shale gas a major driver of recent increase in global atmospheric methane?* Biogeosciences 16:3033–3046. https://doi.org/10.5194/bg-16-3033-2019

10 McGlade C, Pye S, Ekins P, et al (2018) The future role of natural gas in the UK: A bridge to nowhere? Energy Policy 113:454–465. https://doi.org/10.1016/j.enpol.2017.11.022