Submission on the Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems Consultation

Not Here Not Anywhere
www.notherenotanywhere.com

Wholesale Electricity and Gas Policy Division,
Department of Environment, Climate and Communications,
29-31 Adelaide Rd,
Dublin 2,
D02 X285

28th October 2022

Not Here Not Anywhere is a nationwide, grassroots, volunteer group campaigning to end fossil fuel exploration and the development of new fossil fuel infrastructure in Ireland. We advocate for a just transition to publicly-owned renewable energy systems and a society-wide reduction in energy demand both here and around the world. We are a non-partisan group and are not affiliated with any political party.

We are motivated in our work by the scientific consensus that human-induced climate change will lead to catastrophic consequences and requires urgent phasing out of fossil fuels, such as natural gas, and other greenhouse gases, such as methane, towards renewable energy (IPCC, 2022). Acknowledging the urgency of the climate crisis, Ireland has committed to large-scale reductions in greenhouse gas emissions. For example, in its Climate Action Plan 2021 the government provided a detailed plan for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and setting us on a path to reach net-zero emissions by no later than 2050 (Department of the Environment, Climate and Communications, 2021).

In light of this, we welcome the rejection of commercially operated LNG terminals in Ireland. However, we are concerned at the suggestion of "commercially owned" LNG terminals leased by the state in CEPA's "Technical Analysis of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems" (p. 83; hereafter CEPA Technical Report) - as this would require huge costs from an economic and emissions perspective. We are also concerned to see that the public consultation document

attempts to contradict the CEPA Technical Report by leaving the door open to commercial LNG by stating “An alternative option could be to have an FSRU which is operated on a commercial basis but with a mandated level of strategic storage held at all times so that in the event of a supply shock a level of gas supply would be available immediately for the purpose of mitigating the supply shock." (p. 43). Our submission will outline why further expansion of fossil fuel infrastructure in the midst of a climate crisis presents short term and long term risks to Ireland’s energy security that are not sufficiently modelled in the CEPA Technical Report.

Executive summary

- Any options which involve new natural gas infrastructure must be ruled out as a mitigation option as they will lock us into additional use of this fossil fuel

- We are concerned at the contradiction between the public consultation document and CEPA Report and the fact the former appears to leave the door open for commercial LNG terminals without evidence

- We are concerned at the use of the term “State-owned” in relation to FRSU terminals as the described arrangement would be “State-Leased” which entails considerable financial and feasibility concerns

- The option supported by NHNA is a demand management response, similar to the gas mitigation package but going further than that considered in the CEPA Report, as this is the only option that seeks to reduce gas usage and emissions as a response to energy insecurity due to our reliance on foreign sourced fossil fuels

- LNG has no climate benefit over coal or oil, whether from conventional and currently there is no scientific method to determine whether LNG supply is coming from fracked sources, which violates the Programme for Government

- Increased availability of gas would starkly contradict Ireland’s national policy as well as its international commitments to climate action, such as the Beyond Oil and Gas Alliance which Ireland joined as part of COP26 thereby damaging Ireland’s international reputation

- The underlying assumption of increases in gas usage must be rejected and opportunities for demand reduction should be prioritised and developed further to stay within our climate obligations

- Due to the unforeseen nature of geopolitical shocks known domestic energy security risks such as data centres should be prioritised and mitigated against

- Additionally, lessons should be taken from the Russian invasion by not prioritising a mitigation strategy depending on another fossil gas that is supply chain dependent and thus prone to geopolitical shocks

- CEPA Technical Report is not clear on who protected customers of electricity are:
    - These groups should be clearly outlined in order to make informed decisions regarding the prioritisation of energy security

- The volatility of the fossil fuel market is not sufficiently factored into the CEPA reports risk assessments and recommendations:
    - The inherent risks associated with 'State-leased' FRSU terminals make this option both practically and economically unfeasible
    - In light of this, Investment in fossil fuel infrastructure is counterproductive for energy security and indigenious renewable supply and in addition to energy demand reduction should be prioritised
    - A moratorium on data centre construction and connections should be introduced until a cap on data centre electricity usage, both overall and real-time usage, is put into place

- Additional security supply risks include:
    - Oversaturation of the LNG market
    - The ongoing climate crisis caused by fossil gas emissions

- Notably, the energy security risks associated with continuing climate breakdown, through fossil gas emissions, have not been sufficiently factored into the CEPA report

- The democratisation and decentralisation of energy production has not been sufficiently factored into the CEPA report as contributing factor in attaining energy security
    - In addition, a society-wide reduction in energy demand has not been adequately factored into the report as a pathway forward

- We agree with the recommendation to not progress with additional conventional generation capacity due to the risks associated with the unavailability of gas supplies but also stress the emissions risks associated

- We suggest an additional recommendation is added that calls for direct investment into new green hydrogen generation, completely separate from any new fossil fuel infrastructure development as a promised upgrade down the line that is currently unfeasible

- It should be emphasised that the risks posed to Ireland's energy security, as outlined in Eirgrid's All-Island Generation Capacity Statement, are largely a result of an enterprise strategy that allows for unsustainable data centre demand growth
    - Reports have shown that only about 14% of data stored is business critical with the remaining 86% being redundant
    - Regulation and oversight is needed to provide clarity that data centres in Ireland are practising data hygiene and storing information that provides value to the people of Ireland consummate to the energy demand

- Overall demand should be reduced by:
    - Requiring existing large energy consumers, including data centres, to reduce their overall demand, to time-shift their demand to times when renewables are available, including through requiring them to fund energy storage projects as a condition of operation
    - Ensuring large energy consumers face full costs of energy through high prices, and do not enjoy any direct or indirect subsidy to their energy costs or through their access to reliability
    - Accelerated program of retrofits and solar PV for all households and community buildings, on a Government run "install now, pay as you go" basis, so that having cash up-front is not a barrier
    - Electrification of and improvement to frequency and accessibility of public transport (rail and buses), promotion of active travel, promotion of car sharing, and reduction in use of private cars particularly with single occupancy

- Not Here Not Anywhere is broadly supportive of joint planning and of regular energy security reviews, with a few important caveats:
    - Joint plans should not lead to increased gas usage or supply
    - Regular reviews should always focus on phasing down fossil fuels

1. Are there any other security of supply risks that you can identify in addition to those set out in section 6?

Section Summary

- Additional security supply risks include:
    - Oversaturation of the LNG market
    - The ongoing climate crisis caused by fossil gas emissions
- Notably, the energy security risks associated with continuing climate breakdown, through fossil gas emissions, have not been sufficiently factored into the CEPA report

The invasion of Ukraine by Russia has swiftly altered the energy security debate, leading many countries to bolster their LNG capacity, however little consideration is given to the potential risks associated with our energy security being tied to LNG importation. Geopolitics by its interwoven and intricate nature is difficult to predict and prone to quickly change. Therefore, LNG supply from countries such as the US, Qatar, Australia, etc. could drastically change based on unforeseen geopolitical or commercial events. This can already be seen in a recent report (Bloomberg, 2022) wherein tight LNG supply is expected until 2026 due to the unexpected increase in demand and China's decision to halt LNG sales to Europe this Winter (Tayeb, 2022).

In addition to market volatility, the underlying climate risks of investing heavily in fossil infrastructure remain ever present. Methane, the primary component of natural gas, is a potent greenhouse gas (GHG) with 86 times more Global Warming Potential (GWP) than CO2 over a 20 year period (Myhre et al, 2013; p. 714, Table 8.7). Gas, and particularly LNG, emits high levels of methane at all stages of the supply chain (Alvarez et al, 2018). Methane leakage and the additional energy required to process LNG specifically make it 20% more GHG emissions intensive than short-distance gas (Anderson and Broderick, 2017). This highlights that LNG is even worse than short-distance conventional gas from an emissions perspective.

A 2014 study from the US Department of Energy calculated that, even using conservative methane leakage estimates, the methane leaks and energy used in the process of liquefying and transporting LNG from the US to China would have a greater climate impact than simply building a new coal plant in China and burning the coal there (US Department of Energy, 2014). Analysis by Oil Change International shows that the combined lifecycle emissions of 19 LNG export terminals would equal the annual emissions of 250 coal plants (Global Energy Monitor, 2022). While gas may be included in the EU Green Taxonomy, as the applicant mentions, this has been heavily criticised,

including by the Institutional Investors Group on Climate Change (IIGCC; Taylor, 2022a) and hundreds of MEPs (Simon and Taylor, 2022). As outlined in the review, we are legally bound to emissions-reduction targets under the Climate Act, 2021, which is fundamentally incompatible with increasing investment in new fossil fuel infrastructure. Therefore, the best energy security remains a rapid transition to indigenous renewable energy and a society-wide reduction in energy demand.

Globally, the impacts of anthropogenic climate change are becoming more and more apparent, for example, increased storms in usually temperate climates, such as Ireland. Based on current climate model projections, researchers at NASA concluded that extreme storms may increase 60 percent by the year 2100 (Buis, 2020). This will also increase the risk of damage to offshore energy infrastructure in particular, as seen recently (Buljan, 2022). In the near future, increasing numbers of people may become climate migrants, needing to flee regions affected by intense flooding, such as Pakistan and island nations, or regions destroyed by fires such as North America and Australia. Regardless of economic context, in the next decades it is predicted that many highly populated regions of the world will become unlivable and this cannot be overlooked as we plan for the future (Biba, 2022; IPCC, 2022).

It is our view that CEPA's "Technical Analysis of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems Non-Technical Report" (hereafter CEPA Report) has not sufficiently factored in the security of supply risks associated with oversaturation within the LNG market and the ever increasing volatility that the climate crisis poses.

2. If there are other risks that you have identified, could you outline some mitigation options to address the risk(s)?

Section Summary

- CEPA Technical Report is not clear on who protected customers of electricity are:
    - These groups should be clearly outlined in order to make informed decisions regarding the prioritisation of energy security
- The volatility of the fossil fuel market is not sufficiently factored into the CEPA reports risk assessments and recommendations:
    - The inherent risks associated with 'State-leased' FRSU terminals make this option both practically and economically unfeasible
    - In light of this, Investment in fossil fuel infrastructure is counterproductive for energy security and indigenious renewable supply and in addition to energy demand reduction should be prioritised

- A moratorium on data centre construction and connections should be introduced until a cap on data centre electricity usage, both overall and real-time usage, is put into place

When reviewing security of supply, it is important to reflect on exactly what demand we are ensuring we meet with security of supply. The CEPA Technical Report does examine the effects on “Protected customers of gas” who are defined as “all residential gas customers, small and medium enterprises, hospitals, nursing homes, high-security prisons, district heating schemes and other essential social services” (p. 25). It models the effects of different “shocks” on meeting protected gas customer demand on the one hand, and on meeting all gas demand (including the gas required by the electricity sector to meet unlimited projected electricity demand) on the other hand. However, the CEPA Technical Report is not clear on who protected customers of electricity would be. We are not aware of any official public document which clearly states which electricity customers will be cut off in what order in the event of a shock.

In order to make clear decisions on energy security mitigation options, it should be clearly specified who would be cut off from electricity in the event of a shock in what order, and to analyse the various mitigation options in terms of who would benefit from that mitigation. In other words, if mitigation option A is sufficient to meet the electricity demand of group 1 but not group 2, and mitigation option B is sufficient to meet the electricity demand both groups 1 and 2, then it is clear that the mitigation option B is chiefly for the benefit of avoiding cutting off group 2 during a shock.

The energy security review does not give sufficient consideration to the unpredictability of the fossil fuel market. Oil and gas supplies are vulnerable to unpredictable societal and geopolitical factors and experience extreme price volatility, as evidenced in particular by the Russian invasion of Ukraine. Natural gas prices plunged in response to lower demand during COVID-19 and soared in response to shortage of supply after the imposition of sanctions on Russian gas. The Dutch TTF, the benchmark hub for gas prices in Europe, went from under €5/megawatt hour (MWh) in mid-2020 to nearly €20/MWh early 2021. On 7 March 2022 prices closed at €227.20/MWh, an increase of over 4,500% (Institute for Energy Economics and Financial Analysis, 2022).

Investment in fossil fuel infrastructure is counterproductive for energy security, increasing our reliance on energy sources sold to the highest bidder in a fluctuating global market, with no obligation on suppliers to sell gas to Ireland at below market prices (Reuters, 2021). Maintaining our reliance on gas either as a direct energy source or for generating electricity leaves us vulnerable in the event of an interruption in gas supply. These risks to our energy supply and economy will only increase as fossil fuel

supplies depletes globally.

The CEPA Report claims that state-owned gas infrastructure will address the risks associated with commercial energy supply. However, in reality, 'state-owned' gas infrastructure would still oblige us to compete on a global level for gas supply, and source our gas from the commercial fossil fuel industry. Additionally, the cost of the shortlisted option "Floating LNG terminal (backup)" leased by the State, intended to only be used in the event of a supply shock and therefore arguably having "relatively low impact on carbon emissions" is prohibitive. The cost of a 10-year lease by Finland of an LNG terminal vessel with US-based Excelerate Energy "is estimated to be at 460 million euros ($487 million), in addition to which there are separate costs associated with the volume of use" (Reuters, 2022). Also, this option would not even guarantee any LNG deliveries to the leased terminal in the event of a supply shock - these deliveries being based on the highest bidder in the fluctuating global market. 2021 saw many cases of "LNG cargoes turning around in the middle of a voyage and heading to the highest price markets in Europe, as the market differentials have extended beyond $4/mmBtu," according to Felix Booth, head of LNG at energy intelligence firm Vortexa (Reuters, 2021). We must also consider the risk that the government may, in time, be forced to give full ownership to commercial companies should the cost of running state-owned terminals become too high.

The CEPA Technical Report notes that "By the end of 2020, there were a total of only 37 FSRUs in operation globally. Ireland's access to an FSRU may therefore depend on its ability to compete with global demand for a limited number of available units" (p. 100). This would indicate that Ireland tendering out to lease such infrastructure is in effect incentivising investment in new units of this infrastructure, and is still locked-in to this infrastructure globally if not locally in Ireland. To mitigate the risks associated with this unsustainable and unpredictable energy market, the optimum measure to guarantee energy security is to invest in indigenous renewables and renewable energy supply back-up. We urgently require energy security measures that do not rely on externally sourced supply, and need to plan for an independent supply of energy, in-keeping with our climate targets. In their energy security analysis, McMullin and colleagues (2018) illustrate that rapid phase-out of fossil fuels: (a) is technically achievable and feasible, (b) can eliminate the energy security risks of all imported fossil fuels and (c) enables Ireland to achieve our climate targets in line with the Paris Agreement.

The CEPA Technical Report also notes other feasibility issues with options involving LNG:

> *"Another implementation challenge is associated with the feasibility of using an LNG FSRU as a strategic store which would only be utilised during periods in which there is a material risk of demand disruptions. Under this operational framework, the LNG would need to be stored for extended periods of time in the FSRU in a pressurised and cooled state. We have not identified any FSRUs which are currently used for this purpose. As such, the technical feasibility of the FSRU to hold LNG for extended periods of time in a pressurised state would need to be determined. The same requirement would apply to any reserves that would need to be held under regulation if introduced for a commercial FSRU development."* (p. 100)

The CEPA Report purports that a demand management option is not realistic. However, as will be outlined in more detail in this submission, the review exposes the significant risk that data centres create for our energy security. The review is written with the assumption that the current trajectory of data centre growth will continue, yet the CEPA Report indirectly shows that a major threat to our energy security is the ever-increasing electricity usage by data centres. The quoted EirGrid report forecasts a sharp increase in electricity demand from "Data Centres & Large Energy Users". A national policy must be developed that sets a cap on the level of data centre energy demand that can be accommodated by the grid - both an overall cap, and a cap based on the time of use of the electricity - while meeting our renewable energy and climate targets consistent with our commitments under the Paris Agreement. A moratorium should be placed on data centre development until this policy is in place.

3. Are the five shock scenarios that were considered, and the additional scenarios related to the Russian invasion of Ukraine, sufficiently broad?

Section Summary

- Due to the unforeseen nature of geopolitical shocks known domestic energy security risks such as data centres should be prioritised and mitigated against
- Additionally, lessons should be taken from the Russian invasion by not prioritising a mitigation strategy depending on another fossil gas that is supply chain dependent and thus prone to geopolitical shocks

While the threat of geopolitical disruption to European gas supplies must be taken very seriously, the inherent unpredictability of shock scenarios requires that we mitigate known risks to our full potential, and the best short term and long term approach is a robust, native and democratised renewable energy supply.

It is illustrative that had this report been released 2 years ago, geopolitical instability would not have featured nearly so heavily. The likelihood of the risk of Large Energy User (LEU) expansion is not unpredictable like weather events, or international geopolitics, but rather entirely pre-determined as inevitable by our nationally elected political representatives. To list the growth of LEUs next to the war in Ukraine is disingenuous and misleading, suggesting our government has the same negligible control over both events. Additionally, It is reckless to assume that LNG supply is immune to the conditions that have caused this conventional gas crisis.

The ever-increasing domestic threat to our energy security by the proliferation of data centres is a risk which we can mitigate now and greatly contribute to Ireland's future energy security. Data centres' huge electricity demands place an ever-increasing strain on the electricity grid which is central to Ireland's energy insecurity. Recent years have seen rapid growth in the number of existing and planned data centres in Ireland, with 70 data centres operational as of May 2021 (Host in Ireland, 2018) and capacity increasing 25% in the last year alone. Dublin is now the largest market for data centres in Europe according to KPMG.

Powering data centres requires a huge amount of electricity and further data centre expansion will put unprecedented strain on the electricity grid. For example, if Amazon's eight centre project in Mulhuddart, Dublin 15 is realised, by 2026 it would use c. 4.4% of Ireland's entire energy capacity - the equivalent of Galway City (Lillington, 2018). Grid operator Eirgrid (2020) estimated that data centres may account for up to 27% of Ireland's electricity demand by 2028, while only including existing data centre applications in their calculations. This is why data centres should be viewed as a predictable and preventable threat to energy security which requires a moratorium on data centre development until they can be run renewably and without risks to Irish electricity supply.

Therefore a national policy must be developed that sets a cap on the level of data centre energy demand that can be accommodated by the grid - both an overall cap, and a cap based on the time of use of the electricity - while meeting our renewable energy and climate targets consistent with our commitments under the Paris Agreement. A moratorium should be placed on data centre development until this policy is in place.

4. Do you have any additional mitigation options that you think should be considered?

Section Summary

- The democratisation and decentralisation of energy production has not been sufficiently factored into the CEPA report as contributing factor in attaining energy security
- In addition, a society-wide reduction in energy demand has not been adequately factored into the report as a pathway forward

The CEPA Non-technical Report claims:

> *"On its own, renewable gas and hydrogen production may be insufficient to mitigate a significant shock event. We therefore only include these options within a gas mitigation package". (p. 29)*

Additionally, managing demand response in the gas sector is deemed:

> *"Unlikely to provide sufficient mitigation for significant shock events on its own. Therefore, we only included this mitigation option as part of a gas mitigation package" (p. 29).*

However, it is evident that these options, when combined, provide the optimum route to achieving sustainable and secure energy supply; by investing in Ireland's indigenous renewable potential, creating opportunities for green hydrogen production and simultaneously managing energy demand by democratising supply and implementing a less is more approach unbridled by the market maxim of growthism.

According to Ian O'Hora, Head of Green Economy at IDA Ireland, Ireland's geographical location gives us a strong advantage for renewable energy production, namely large-scale and offshore wind power. Ireland's position facing the Atlantic means we experience frequent and consistent winds. Our nation has the potential to become a leader in, and major exporter of renewable energy, given Ireland's sea to land mass is seven times the size of the country (Open Access Government, 2022). A recent report by the Irish Solar Energy Association highlights the growing capacity of PV solar panels to increase security of energy supply and save money for households, while importantly, reducing greenhouse gas emissions (Joshi & Dean, 2022). Energy Storage Ireland (2022) has highlighted the potential

for energy storage to replace fossil fuels and reduce emissions.

Legislation to support a society-wide reduction in energy demand is integral to managing Ireland's energy security. In 2018, the IPCC Special Report on Global Warming of 1.5°C emphasised the need for "deep emissions reductions in all sectors", multi-sectoral mitigation options and a significant upscaling of investments, including "rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems" (p. 15). The state must play an active role in facilitating these structural opportunities. McMullin et al. (2018) demonstrate that rapid phasing out of fossil fuels can eliminate the security of supply risks associated with imported fossil fuels while achieving broad decarbonisation. In addition, this structural transition would strengthen Ireland's national social and economic resilience. However, the authors highlight that societal support is fundamental to achieving this transformation (McMullin et al., 2018). Similarly, SEAI (2022) notes that "transitioning Ireland to a society based on sustainable energy systems and practices will require not only technological innovation, but will also require major social, behavioural and organisational change to support this transition".

Energy democracy can play a fundamental role in optimising energy security and efficiently managing energy demand, by decentralising energy supply and implementing a community ownership model. According to Climate Justice Alliance (n.d.) and World Future Council (2021):

> *"Energy Democracy represents a shift from the corporate, centralised fossil fuel economy to one that is governed by communities, is designed on the principle of no harm to the environment, supports local economies, and contributes to the health and well-being for all peoples. Thus it connects the transition to renewable energy with a process of democratisation, focusing on social benefits and their fair distribution and not on economic advantages for a few."*

An energy democracy approach sees energy as a human right, and empowers people to produce energy at a local level. Profit that is made from community-based energy infrastructure is re-invested into the community (World Future Council, 2021; Climate Justice Alliance, n.d.). Energy democracy facilitates value creation by giving rise to green, local employment, while also allowing small and medium-sized enterprises to develop, given the reliable access to energy and reduced energy costs.

Ownership measures are shown to increase community acceptance of energy transition infrastructure, and can take the form of individual shares in an energy project,

community ownership of part of the infrastructure, or joint ventures between communities and developers (Olsen, 2016). Numerous renewable energy exemplar projects exist around Europe, such as the Edinburgh Community Solar Co-operative, which empowers the public to be part of the transition to a low carbon society, the Som Energia non-profit renewable energy cooperatives in Spain and Amsterdam's community energy cooperatives— Ecostroom and Zuiderlicht - who work to turn empty roofs of the city (including many commercial roofs) into a community-solar powerhouse (Edinburgh Energy Solar Cooperative, 2021; Patagonia, n.d.; Som Energia, .n.d.). While energy democracy initiatives are owned and driven by local communities, strong policy frameworks supporting participation and rapid transition to renewable energy infrastructure are required to optimise the success of this energy systems model (World Future Council, 2021).

The CEPA Report does not discuss energy security at the community level, or potential for community led approaches to energy security. For example, there is potential for incentives to balance demand and supply at local levels (as called for by the EU directives on renewable energy communities (European Commission, n.d.)), thus reducing the burden of investment in, and dependence on, electricity distribution/transmission infrastructure. There is also potential to leverage energy storage at community level through batteries in public transport vehicles, other shared transport vehicles, or through local pumped hydro or other distributed energy storage approaches. The current cost of living crisis is a stark contrast to the potential for energy democracy. Where up to 28% of households are currently experiencing fuel poverty, an energy democracy approach would provide agency over supply (Age Action, 2022). Additionally, the profit gained from localised energy supply could be utilised to directly respond to and mitigate energy poverty, by developing energy systems that are universally accessible and affordable (World Future Council, 2021).

Further, to comprehensively manage Ireland's energy demand, the DECC must prioritise a de-growth approach, as a means to guaranteeing energy security in-keeping with our climate targets. When comparing 1.5 °C degrowth scenarios to technology-driven pathways (such as the reliance on high energy-GDP decoupling and large-scale carbon dioxide removal), Keyßer & Lenzen (2021) illustrate that the degrowth scenarios minimise many key risks for feasibility and sustainability compared to technology-driven pathways. In addition, McMullin et al. (2022) found that when considering the potential for cumulative indigenous CO2 removal through six separate NET (negative emissions technology) pathways, the total CO2 removed would be significantly less than that required to meet our climate targets. Additionally, even when NET limitations are considered, urgent and disruptive new policies would be required to implement CO2 removal to this scale to use these pathways in a timely basis. A

degrowth approach recognises that the economies of energy-intensive countries (such as Ireland) will need to shrink if we are to be able "to fit within the limits of our biosphere". Further, this economic de-growth is inevitable as we approach the planet's boundaries, and a de-growth model provides a route to manage it in a way that prioritises wellbeing and livelihoods and reduces inequalities. A de-growth model focuses on more autonomy for workers, increasing and improving public infrastructure and greater redistribution efforts to reduce inequalities. De-growth also prioritises investment in health, education and well-being over industries creating commodities with exchange value, but who contribute to massive waste and environmental harm (Green News, 2021).

5. Which gas supply mitigation options, if any, should be considered for implementation?

Section Summary

- Any options which involve new natural gas infrastructure must be ruled out as a mitigation option as they will lock us into additional use of this fossil fuel
- The option supported by NHNA is a demand management response, similar to the gas mitigation package but going further than that considered in the CEPA Report, as this is the only option that seeks to reduce gas usage and emissions as a response to energy insecurity due to our reliance on foreign sourced fossil fuels
- LNG has no climate benefit over coal or oil, whether from conventional and currently there is no scientific method to determine whether LNG supply is coming from fracked sources, which violates the Programme for Government
- Increased availability of gas would starkly contradict Ireland's national policy as well as its international commitments to climate action, such as the Beyond Oil and Gas Alliance which Ireland joined as part of COP26 thereby damaging Ireland's international reputation
- The underlying assumption of increases in gas usage must be rejected and opportunities for demand reduction should be prioritised and developed further to stay within our climate obligations

"The most secure energy is the energy we do not use and therefore energy efficiency should always form part of our response to energy security." (Energy Security Review p.3)

Antonio Guterres, speaking on the launch of the 3rd IPCC report says: 'Investing in new fossil fuel infrastructure is moral and economic madness. Such investments will soon

be stranded assets — a blot on the landscape and a blight on investment portfolios." Reducing demand for gas must be prioritised, both to improve energy security and also to meet Ireland's obligations under the Paris Agreement, the National Climate Action Plan and the Climate Action and Low Carbon Development (Amendment) Act 2021.

Gas demand-side response should be implemented. Any options which involve new natural gas infrastructure must be ruled out as a mitigation option as they will lock us into additional use of this fossil fuel. We need to rapidly phase out fossil fuels if we are to stay within 1.5 degrees of warming. Further investment in fossil infrastructure will close the window on meeting our obligations under the Paris agreement rather than getting us closer. Use of floating LNG terminals must be ruled out, regardless of whether commercially or State-leased. In addition to increasing Ireland's emissions, it would be impossible to confirm that the imported LNG is from non-fracked sources, contravening government policy.

Gas Networks Ireland, in its 2021 Network Development Plan forecasts annual gas demand growth of 15% between 2020/21 and 2029/30. This forecast assumes a drop in demand in the later years if offshore renewable wind targets are met, meaning that the annual gas demand increase could be above the 'best estimate' 15% increase. This level of increase in gas usage is not acceptable or consistent with Ireland's climate obligations. GNI's demand forecasts identifies growth in a number of sectors, including:

- **Residential**: GNI proposes converting up to 300,000 homes to gas heating (replacing oil). While gas heating may be less carbon intensive than oil, this is not a sustainable solution. Mitigating demand for gas means that it is essential that no more homes are added to gas heating. In 2019, 80% of Irish buildings had a BER rating of C or lower. Installation of Solar energy (and heating), insulation retrofitting and heat pumps must be accelerated as a proven effective mitigation strategy.
- **Commercial & Industrial:** GNI is promoting gas connections to data centres for onsite energy generation and grid backup. GNI "is in discussions with multiple data centre operators and we expect considerable growth of gas connections in this sector in the coming years" (p.76). This is another reason to consider a moratorium on data centres as an important mitigation option.

Specifically on the LNG FSRU, this option should not be implemented. LNG has no climate benefit over coal or oil, whether from conventional or fracked sources (Howarth, 2015:49). Methane, the primary component of natural gas, is a potent greenhouse gas (GHG) with 86 times more Global Warming Potential (GWP) than CO2 over a 20 year period (Myhre et al, 2013:714, Table 8.7). Gas, and particularly LNG, emits high levels

of methane at all stages of the supply chain (Alvarez et al, 2018). Methane leakage and the additional energy required to process LNG specifically make it 20% more GHG emissions intensive than short-distance gas (Anderson and Broderick, 2017). This highlights that even if fossil gas was needed for energy security, LNG would be inferior to short-distance gas. A 2014 study from the US Department of Energy calculated that, even using conservative methane leakage estimates, the methane leaks and energy used in the process of liquefying and transporting LNG from the US to China would have a greater climate impact than simply building a new coal plant in China and burning the coal there (US Department of Energy, 2014). Analysis by Oil Change International shows that the combined lifecycle emissions of 19 LNG export terminals would equal the annual emissions of 250 coal plants (Global Energy Monitor, 2022).

The option supported by NHNA is a demand management response, similar to the gas mitigation package, but going further than that considered in the CEPA Report (and as outlined in the public consultation document, with a rapid drop in gas demand, including limiting new connections to the natural gas grid). This is the only option that seeks to reduce gas usage and emissions as a response to our energy insecurity that results from our reliance on foreign sourced fossil fuels.

The level of this demand management, in addition to contributing to energy security, should be based on our obligations under the Paris Agreement and the Climate Act. Providing for, and enabling, increased availability of gas would starkly contradict Ireland's national policy as well as its international commitments to climate action, such as the Beyond Oil and Gas Alliance which Ireland joined as part of COP26 (Beyond Oil and Gas, 2022), thereby damaging Ireland's international reputation. This demand management can be focused on protecting vital services, like hospitals, residential heating, etc. and target aggressive demand management on data centres and other large energy users. A significant amount of risk associated with our energy security stems directly from the proliferation of data centres and the associated impact on the national grid, a moratorium on new data centre connections (both to the electric and gas grids) until the grid is green and secure enough to handle them would be a prudent move for both the climate and Ireland's energy security.

The scenarios and projections presented in the review are based on the assumption that further data centres will be constructed and connected to the Irish electricity grid. However, this increase in electricity demand is not inevitable. In addition to data centres adding to demand on the electricity grid, Gas Networks Ireland is also proposing adding gas connection directly to data centres for onsite electricity generation and backup. If Ireland was to instate a moratorium on further data centre development until enough renewable energy production and storage capacity is available, this threat to Ireland's

energy security would be prevented without the need for further investment in fossil fuel infrastructure.

To make an analogy to the transport system, this report largely follows a “predict and provide” response, following the transport planning policy up to the 2000s which aimed to facilitate ever increasing private car usage. The aim should be to plan for the amount of gas usage that can fit within our obligations under the Paris agreement, and plan our network and energy security systems around this. In this context, forecasted increases in gas usage must be rejected and opportunities for demand reduction should be prioritised and developed further.

The report states that “2020 NDP projections for gas supply show a very slight decrease up to 2030”. This appears to contradict Gas Networks Ireland’s best estimate of 15% annual increase in demand. If we are to treat the climate emergency as an emergency, there should be no new investment in fossil fuel infrastructure, and the gas consumption graph should be showing dramatic and rapid drops to close to zero, through decreases in non-essential energy demand, scale up in renewables, load-shed demand response and energy storage.

6. Which electricity supply mitigation options, if any, should be considered for implementation?

Section Summary

- We agree with the recommendation to not progress with additional conventional generation capacity due to the risks associated with the unavailability of gas supplies but also stress the emissions risks associated
- We suggest an additional recommendation is added that calls for direct investment into new green hydrogen generation, completely separate from any new fossil fuel infrastructure development as a promised upgrade down the line that is currently unfeasible

The majority of the electricity supply mitigation options present sensible pathways forward, we particularly agree with the recommendation to not progress with additional conventional generation capacity due to the risks associated with the unavailability of gas supplies. However, it is critical to also emphasise the ongoing climate crisis and the risks associated with the emissions of fossil gas production. As previously outlined methane, the primary component of natural gas, is a potent greenhouse gas (GHG) with

86 times more GWP than CO2 over a 20 year period (Myhre et al, 2013:714, Table 8.7). Short-term energy security is self-defeating if it endangers long-term energy security through fossil fuel lock-in.

We take issue that the only mention of green hydrogen is in relation to the conversion of gas-fired power plants to cater to this energy supply. Currently, converting LNG import terminals to green hydrogen is not technically or commercially practicable and is often used as a pretence to invest in fossil fuel infrastructure. Therefore we suggest an additional recommendation is added that calls for direct investment into new green hydrogen generation, completely separate from any new fossil fuel infrastructure development.

The CEPA Technical Report states that “While each of these [storage and non-fossil dispatchable] technologies is likely to play a role in the future energy mix, the deployment potential for some is likely to be limited up to 2030 and even beyond” (p. 28). However, the deployment potential for fossil fuel infrastructure is also limited before 2030. For example, the CEPA Technical Report shows similar timescales for green hydrogen infrastructure investment as for LNG and gas infrastructure investment. Therefore if we are to invest in infrastructure for 2030, we should be investing in non-fossil fuel infrastructure for 2030.

The CEPA Technical Report highlights Kinsale and Islandmagee as locations for fossil gas storage with “future use as a large-scale hydrogen storage facility” and that “much of the physical infrastructure that would be developed to store natural gas could potentially be repurposed to store hydrogen in the future.” The question arises as to why we would not simply develop these locations to store hydrogen in the first place, rather than developing them as fossil gas storage locations and later converting them into hydrogen storage locations. Consideration should be given to risks of leakage of hydrogen which is damaging, but not as damaging as risks the CEPA Technical Report identifies of leakage of fossil gas, methane, or carbon dioxide leakage in the case of storing fossil gas there.

The CEPA Technical Report states that “there is evidence to suggest that the cost of retrofitting an existing CCGT as a H2GT would cost between 15 to 20% of the initial capex of that plant” (p. 126). Therefore, we should invest in hydrogen generation (H2GT) in the first place, not invest in CCGT and later convert to H2GT.

The scenarios and projections presented in the review are based on the assumption that further data centres will be constructed and connected to the Irish electricity grid. However, this increase in electricity demand is not inevitable. If Ireland was to instate a

moratorium on further data centre development until enough renewable energy production and storage capacity is available, this threat to Ireland's energy security would be prevented without the need for further investment in fossil fuel infrastructure such as LNG or gas storage.

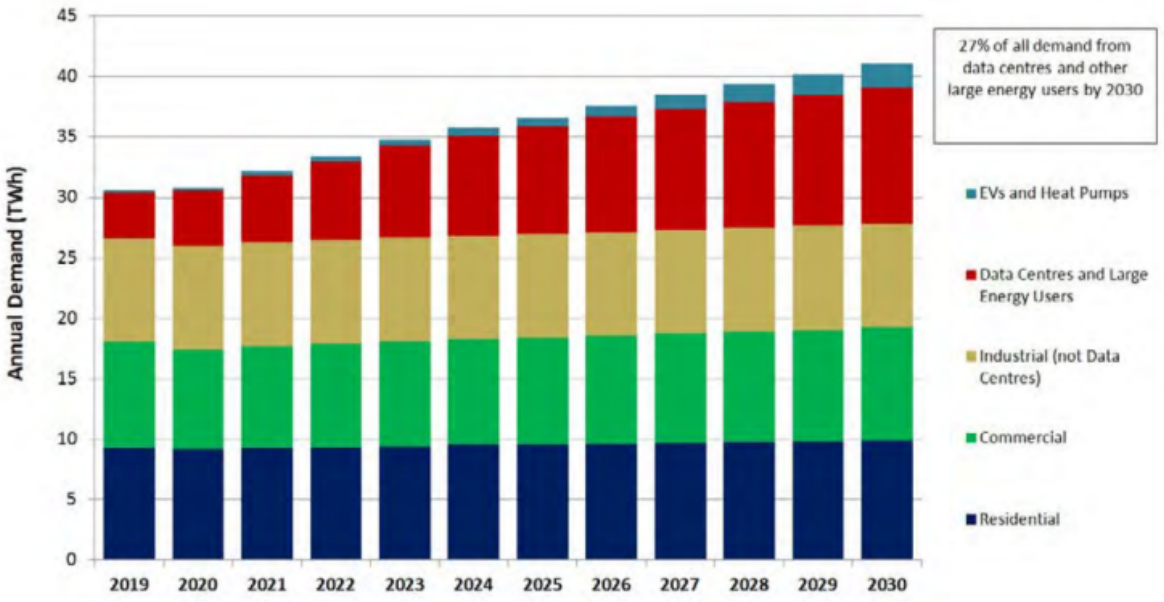
7. What measures should be considered on the demand side to support security of supply of electricity and gas?

Section Summary

- It should be emphasised that the risks posed to Ireland's energy security, as outlined in Eirgrid's All-Island Generation Capacity Statement, are largely a result of an enterprise strategy that allows for unsustainable data centre demand growth
    - Reports have shown that only about 14% of data stored is business critical with the remaining 86% being redundant
    - Regulation and oversight is needed to provide clarity that data centres in Ireland are practising data hygiene and storing information that provides value to the people of Ireland consummate to the energy demand
- Additionally, demand should be reduced by:
    - Requiring existing large energy consumers, including data centres, to reduce their overall demand, to time-shift their demand to times when renewables are available, including through requiring them to fund energy storage projects as a condition of operation
    - Ensuring large energy consumers face full costs of energy through high prices, and do not enjoy any direct or indirect subsidy to their energy costs or through their access to reliability
    - Accelerated program of retrofits and solar PV for all households and community buildings, on a Government run "install now, pay as you go" basis, so that having cash up-front is not a barrier
    - Electrification of and improvement to frequency and accessibility of public transport (rail and buses), promotion of active travel, promotion of car sharing, and reduction in use of private cars particularly with single occupancy

Two of the drivers of electricity demand according to the Climate Action Plan are forecast data centre growth and transport electricity demand. As mentioned in the CEPA Technical Report, Eirgrid's All-Island Generation Capacity Statement clearly

shows that the risks posed to Ireland's energy security are largely a result of an enterprise strategy that allows for unsustainable data centre demand growth with increased demand from electric vehicles being only a fraction of the size of data centres.



Source: EirGrid, All-Island Generation Capacity Statement 2021-2030

If Ireland is to seriously address the topic of energy security, the key focus must be on the energy demand of data centres.

As data centre companies make their money by charging their customers for the volume of data stored, the industry has no incentive to reduce the amount of data stored and as a result requires an ever-growing amount of energy. Reports have shown that only about 14% of data stored is business critical with the remaining 86% being redundant, outdated or simply never used (Veritas, 2015; Digital Decarbonisation, 2022). Yet this lack of regulation by the government allows for the storing and processing of unnecessary data that is driving the unsustainable growth of data centres within Ireland.

Ireland must introduce new limits on the types of data stored and the time period after which it should no longer be stored. The industry currently has no incentive to do this. It is vital that the State step in to curb the vast wasted energy consumed by data centres which typically waste 90% of the power they draw (New York Times, 2012; Tech Central, 2012; Discover, 2012; CNET, 2012)

A moratorium on data centres, in addition to significantly reducing the Climate Action Plan's goal of 936,000 electric vehicles and correspondingly strengthening measures to reduce car dependency in favour of active transportation, micro mobility options and

public transit would reduce the growth of the transport electricity demand. The OECD (2022) report “Redesigning Ireland’s Transport for Net Zero” states that “Car-dependent systems make rapid electrification slow and difficult, by locking-in large and growing vehicle fleets. Even with improved (and fully-electric) vehicles, they also fail to reduce life-cycle emissions”.

To reduce gas/electricity demand for heating, where technically possible, we must utilise heat generated from existing data centres for district heating systems. Denmark’s Ramboll Group (2019) recommends that the large quantities of waste heat generated by data centres should be utilised in district heating systems. Existing technology (such as heat pumps) to capture excess heat should be required and used to increase data centres’ energy efficiency.

Free home energy upgrades should also be significantly accelerated. The current wait time of approximately two years is unacceptable. Reducing this wait time significantly would reduce energy consumption and is especially important considering this programme is for people at most risk of energy poverty. While the COVID-19 pandemic was a factor in the backlog of work building up, this must be addressed urgently.

8. Do you have any views on how the mitigation options should be implemented?

Section Summary

- Care must be taken to ensure that any new technology or mitigation options are truly ‘green’ – whether hydrogen, or food and agricultural waste – and not creating other issues.
- Developing additional storage, that does not require fossil fuel infrastructure, should be the priority.
- Reducing demand, especially by large energy users, is also key.
- Large energy users must pay for usage and for storage capacity required to support their businesses.

Low carbon technology recommended by report	**Considerations and comments**
Additional indigenous biomethane Additional electricity generation capacity – (dispatchable) low-carbon (e.g., biomass)	The sources of biomethane are listed as food waste, manure, sewage sludge, crops, forestry, and straw. Care must be taken that these waste streams are genuine waste which cannot be avoided, and that these inputs do not have better uses than energy production (for example contributing to soil fertility or carbon sequestration). The focus could be that these sources are used on a large scale only during short term shocks rather than on a routine basis. The CEPA Technical Report notes that “there would be considerable savings associated with converting Moneypoint 1 & 2 from coal to biomass relative to developing new purpose-built biomass” (p. 119), therefore this infrastructure could be rarely used in this way during times of shock without substantial new infrastructure.
Indigenous green hydrogen gas production, with some converted back into electricity during shocks	Hydrogen should be truly green, i.e. produced when there is excess renewables on the grid, and not produced from fossil fuels (whether or not carbon capture or storage is involved). Care should be taken to avoid leaks of hydrogen into the atmosphere in the development of green hydrogen. Mixing hydrogen with fossil fuels in the gas grid is not an efficient way of heating buildings - electrification of building heating is much more efficient. The focus should be on hydrogen production, storage and generation infrastructure, not gas grid or pipeline investment. The CEPA Technical Report assumes that 0.46 TWh of hydrogen out of a total of 3 TWh of hydrogen would be injected into the gas grid. This 0.46 TWh of hydrogen would be much better used for other purposes, such as stored for electricity shocks, converted into marine or

Low carbon technology recommended by report	Considerations and comments
	Aviation fuel, used for essential industrial heat or replacing existing grey hydrogen, rather than injected into the gas grid.
Additional electricity interconnection	Additional electricity interconnection will enable Ireland to share its excess wind energy with Europe, thus contributing to Europe's decarbonisation, as well as enhancing energy security.
Additional electricity storage – pumped hydro, batteries	The development of Silvermines pumped hydro would support energy security, and other pumped hydro should also be considered, including small scale pumped hydro. Battery recycling and the sustainability of mining for battery minerals should be considered. While batteries, pumped hydro and green hydrogen are important to consider, other emerging energy storage technologies should also be considered.
Demand side response	Demand side response should be implemented through load shedding or load shifting, or energy storage, not through running of on-site fossil fuel generation by industry.

Reform of capacity remuneration mechanism

The Capacity Remuneration Mechanism (CRM) is the market mechanism which is supposed to ensure energy security through promoting investment in risk mitigation options. The CEPA Technical Report notes that "the CRU has directed EirGrid to source and deliver approximately 450 MW of additional generation capacity for the winters of 2023/24 to 2025/26. This direct procurement of additional generation capacity formed part of a package of measures announced by the Irish Government in June 2022" (p. 29).

Need to change who gets paid: The CRM provides regular availability payments mostly for fossil fuel generation infrastructure, and for fossil fuel generators located on-site in industries participating in demand response schemes. This includes incentivising investment in new and expanded fossil fuel infrastructure such as in Tynagh, Galway and in Kilroot, Antrim (Ambrose, 2020). The CRM does not provide any dedicated payments for long-duration storage infrastructure. Energy Storage Ireland has highlighted that the current market design does not support the investment in energy storage which is needed to meet security of supply (Granville-Willett & Turner, 2022). The CRM should also support community based participation and small scale distributed approaches to reliability, and not only large infrastructure projects.

Need to change who pays: Large energy consumers should be forced to pay for the storage capacity needs that their demand creates. The current version of the CRM is like an insurance scheme where all energy users and the Government are paying an insurance premium which primarily protects large energy consumers. It could be changed so that the Government pays for reliability for essential needs, and large energy consumers pay their own reliability costs.

9. Do you support the policy measures proposed in section 8 of the consultation paper?

Section Summary

- Not Here Not Anywhere is broadly supportive of joint planning and of regular energy security reviews, with a few important caveats:
    - Joint plans should not lead to increased gas usage or supply
    - Regular reviews should always focus on phasing down fossil fuels

Joint Planning

Not Here Not Anywhere acknowledges the interdependencies between Ireland's electricity and gas networks but cautions that joint planning must not lead to joint plans that advocate for increased gas supply.

Energy systems are subject to powerful and long-lived path dependence (Fouquet, 2016). The decisions made about energy supply in Ireland today will shape the decisions that are made in the future, when the window of time to reduce our reliance on fossil fuels and ensure a safe climate may or may not have closed.

Ireland committed to the phase-out of gas production when it joined the Beyond Oil and

Gas Alliance which Ireland joined as part of COP26 (Beyond Oil and Gas, 2022). Providing for, and enabling, increased availability of gas would starkly contradict Ireland's national policy as well as its international commitments to climate action, thereby damaging Ireland's international reputation.

Any joint planning by the operators of the electricity and gas transmission and distribution networks must serve to facilitate a demand-side response to limit, and ultimately phase out our use of gas in line with meeting our climate commitments as outlined in response to question 5 on this consultation.

Regular Energy Security Reviews

Not Here Not Anywhere welcomes the principle of regular reviews of the energy system so long as those reviews serve to continually phase-down gas use in Ireland's energy system in line with our climate commitments and decarbonisation targets. This energy security review and the CEPA Report are particularly focused on gas. We recommend that subsequent energy security reviews take a more holistic approach in order to consider the full range of options available that can support the rapid phase out fossil fuels required if we are to stay within 1.5 degrees of warming.

The scope of subsequent energy security reviews should remain focused on providing energy security in the context of the rapid phase-out of fossil fuels that is necessary in order to ensure a livable planet. We suggest that upcoming reports seek to answer the relevant questions discussed within the current energy security review to avoid an over-onerous amount of work for the department at a time when a major overhaul of our energy infrastructure will be taking place and there will be major demands on department time and resources.

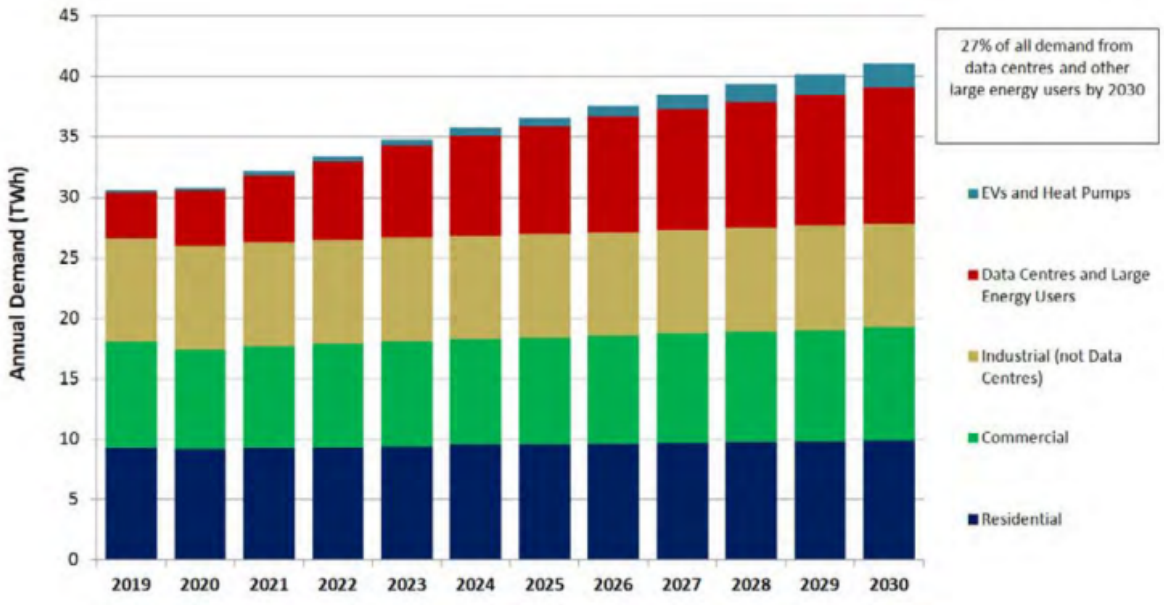
Regular reviews of energy security are valuable. However these need to be re-framed in terms of security of supply to meet essential needs of households and social services, not in terms of risks that large industrial energy consumers might be rationed.

Instead of framing analysis in terms of electricity and gas, it should be reframed in terms of energy. Energy security should be defined at household level and at community level as well as at national level and international level. Meeting a national energy security standard while households fall into energy poverty, or while local communities are more reliant than they need to be on the failure of or constraints in external generation, storage and transmission infrastructure, is not a complete reflection on energy security.

10. What further tools and measures do you think would contribute the most to Ireland's energy security of supply?

Demand-side

As mentioned in the CEPA Technical Report, Eirgrid's All-Island Generation Capacity Statement clearly shows that the risks posed to Ireland's energy security (electricity supply) are largely a result of an enterprise strategy that allows for unsustainable data centre demand growth.



Source: EirGrid, All-Island Generation Capacity Statement 2021-2030

If Ireland is to seriously address the topic of energy security, the key focus must be on the energy demand of data centres.

Data centre companies make their money by charging their customers for the volume of data stored with them. Reports have shown that only about 14-20% of data stored has value with the remaining 80-86% being redundant, outdated or simply never used (Veritas, 2015; Digital Decarbonisation, 2022). Yet this pointless storing and processing of useless data is what is driving the unsustainable growth of data centres.

Ireland must introduce new limits on the types of data stored and the time period after which it should no longer be stored. The industry currently has no incentive to do this. It is vital that the State step in to curb the vast wasted energy consumed by data centres which typically waste 90% of the power they draw (New York Times, 2012; Tech Central, 2012; Discover, 2012; CNET, 2012)

In order to improve our energy security situation, a moratorium on the development of new data centres must be implemented, alongside restrictions on existing data centres.

Such restrictions would include:

- a cap on energy demand that can be accommodated by the grid;
- the time-shifting of demand to times when renewables are available;
- requirements for data centre companies to fund energy storage projects as a condition of operation;
- restrictions must also be introduced which tackle the source of this data centre growth by limiting the volumes and time periods of data stored.

In addition to the above data centre specific restrictions, policy measures must also be brought in to ensure the following:

- large energy consumers face full costs of energy through high prices, and do not enjoy any direct or indirect subsidy to their energy costs or through their access to reliability;
- accelerated program of retrofits and solar PV for all households and community buildings, on a Government run “install now, pay as you go” basis, is developed so that having cash up-front is not a barrier; and
- rapid electrification of and improvement to frequency and accessibility of public transport (rail and buses), along with the promotion of active travel, car sharing, and reduction in use of private cars particularly with single occupancy.

As highlighted in answer to question 9 above, any joint planning by the operators of the electricity and gas transmission and distribution networks must serve to facilitate a demand-side response to limit, and ultimately phase out our use of gas in line with meeting our climate commitments as outlined in response to question 5 on this consultation.

Supply-side

On the supply-side of Ireland’s energy system more attention needs to be given to decentralised community renewable energy projects. This, coupled with retrofitting homes and actively identifying and encouraging homes that would benefit from solar panel installation can really help to reduce the risk of any potential fossil fuel supply shortage and help to protect homes and communities from the worst impacts of such events.

Solar panels have the potential to power 25% of Irish homes (RTÉ, 2022) with wave

potential to power another 75 - 100+% (Irish Times, 2019). Investment in wave should be considered in particular for island communities who are currently forced to pay a premium for their energy. In addition, Ireland's wind resources, in particular from floating offshore wind, has the potential to produce 30GW by 2030 (Irish Examiner, 2022) - more than enough to power every home in Ireland 15 times over. Through diversification of our indigenous renewable energy sources, along with investment in battery storage, green hydrogen generation and increased interconnection with Europe, Ireland can move away from the volatile fossil fuel markets.

References

Ambrose, C. (2020, May 8). *EPH to build 338 MW de-rated gas capacity at Kilroot in N Ireland*. Tynagh Energy Limited. Retrieved October 28, 2022, from https://www.tynaghenergy.ie/eph-to-build-338-mw-de-rated-gas-capacity-at-kilroot-in-n-ireland/

Age Action (2022). Ireland Needs a New Energy Poverty Strategy for Climate Justice. Retrieved from: https://www.ageaction.ie/news/2022/02/08/ireland-needs-new-energy-poverty-strategy-climate-justice

Biba, E. (2022). Diseases Explode after Extreme Flooding and Other Climate Disasters. *Scientific American.* Retrieved from: https://www.scientificamerican.com/article/diseases-explode-after-extreme-flooding-and-other-climate-disasters/

Bloomberg NEF (2022). Global LNG outlook overview: Tight supply expected until 2026 Retrieved from: https://www.bloomberg.com/professional/blog/global-lng-outlook-overview-tight-supply-expected-until-2026/

Buis, A. (2020) How Climate Change May Be Impacting Storms Over Earth's Tropical Oceans. *Ask NASA Climate*. Retrieved from: https://climate.nasa.gov/ask-nasa-climate/2956/how-climate-change-may-be-impacting-storms-over-earths-tropical-oceans/

Buljan, A. (2022). Turbine Catches Fire at 18-Year-Old Irish Offshore Wind Farm. *OffshoreWIND.biz*. Retrieved from: https://www.offshorewind.biz/2022/10/20/turbine-catches-fire-at-18-year-old-irish-offshore-wind-farm/

Climate Justice Alliance (n.d.) What is energy democracy? Retrieved from: https://climatejusticealliance.org/workgroup/energy-democracy/

CNET. (2012). NYT story on data center waste scares some, frustrates others.

Retrieved from cnet.com: https://www.cnet.com/tech/tech-industry/nyt-story-on-data-center-waste-scares-some-frustrates-others/

Digital Decarbonisation. (2022). Reducing the Digital Carbon Footprint. Together - Digital Decarbonisation for net zero. Retrieved from digitaldecarb.org: https://digitaldecarb.org/

Discover. (2012). discovermagazine.com. Retrieved from Data Centers Support the Cloud But Waste 90 Percent of Their Energy in the Process: https://www.discovermagazine.com/environment/data-centers-support-the-cloud-but-waste-90-percent-of-their-energy-in-the-process

Edinburgh Community Solar Co-operative. (2021). About Us | Edinburgh Community Solar Co-operative. https://www.edinburghsolar.coop/about-us/

EirGrid (2020) *All-Island Generation Capacity Statement*. Retrieved from: https://www.eirgridgroup.com/site-files/library/EirGrid/All-Island-Generation-Capacity-Statement-2020-2029.pdf.

Energy Storage Ireland (2022) Game Changer: How Energy Storage is the key to a Secure, Sustainable, Clean Energy Future in Ireland. Available at: https://www.energystorageireland.com/wp-content/uploads/2022/05/GameChanger-ESI-Report-May2022-Web-1.pdf

Engineers Ireland. (2022). To feed a growing population, farmers look to the sun. Retrieved from engineersireland.ie: https://www.engineersireland.ie/Covid-19-information-base/to-feed-a-growing-population-farmers-look-to-the-sun

European Commission (n.d.) Energy Communities. *Energy.* Available at: https://energy.ec.europa.eu/topics/markets-and-consumers/energy-communities_en

Fouquet, R. (2016). Path dependence in energy systems and economic development. *Nature Energy*, *1*(8), 1-5.

Gas Networks Ireland. (2021). *Network Development Plan 2021.*

Granville-Willett, A. & Turner, M.. (2022). Game Changer. How Energy Storage is the key to a Secure, Sustainable, Clean Energy Future in Ireland. Baringa Partners LLP. Retrieved from: https://www.energystorageireland.com/wp-content/uploads/2022/05/GameChanger-ESI-Report-May2022-Web-1.pdf

Green News (2021) What's the Degrowth Movement all about? Retrieved from: https://greennews.ie/degrowth-explainer/

Host in Ireland (2018) *Host in Ireland's Ecosystem Report 2022*. Available at: https://www.hostinireland.com/report.

Institute For Energy Economics and Financial Analysis (2022, March 11), "Russia's invasion of Ukraine is affecting global gas demand with LNG unable to deliver

energy security". Retrieved from: https://ieefa.org/articles/ieefa-russias-invasion-ukraine affecting-global-gas-demand-lng-unable-deliver-energy

IPCC, 2018: Global Warming of 1.5°C.An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T.

IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3–33, doi:10.1017/9781009325844.001.

Irish Examiner. (2022). Ireland has to move quickly if we are to become the Saudi Arabia of wind energy. Retrieved from irishexaminer.com: https://www.irishexaminer.com/news/spotlight/arid-40953404.html

Irish Times. (2019). Ireland needs to take a gamble now on wave energy. Retrieved from irishtimes.com: https://www.irishtimes.com/business/energy-and-resources/ireland-needs-to-take-a-gamble-now-on-wave-energy-1.4080749

Joshi, S. & Deane, P. (2022). Quantifying the potential for rooftop solar photovoltaic in Ireland. *Irish Solar Energy Association.* Retrieved from: https://irishsolarenergy.org/wp-content/uploads/2022/06/Quantifying-the-Potential-for-Rooftop-Solar-Photovoltaic-in-Ireland.pdf

Keyßer, L. T., & Lenzen, M. (2021). 1.5 C degrowth scenarios suggest the need for new mitigation pathways. *Nature communications, 12*(1), 1-16.

KPMG Retrieved from: https://home.kpmg/ie/en/home/insights/2021/04/data-centres-ireland-tax-benefits-capital-allowances.html (Accessed: 22 October 2022).

Lillington, K. (2018) 'Net Results: Data Centres Need to Power down Their Energy Requirements'. *The Irish Times*, 12 July. Available at: https://www.irishtimes.com/business/technology/net-results-data-centres-need-to-power-down-their-energy-requirements-1.3561745 (Accessed: 22 October

2022).
McMullin, B., Price, P., Carton, J., & Anderson, K. (2018). Is Natural Gas "Essential for Ireland's Future Energy Security"?. *Stop Climate Chaos.* Retrieved from: https://assets.gov.ie/76067/ebec928a-9d7a-4ffb-bfc6-d9f6321c4cdc.pdf
New York Times. (2012). *Power, Pollution and the Internet.* Retrieved from nytimes.com: https://www.nytimes.com/2012/09/23/technology/data-centers-waste-vast-amounts-of-energy-belying-industry-image.html?pagewanted=2&pagewanted=all

OECD (2022) Redesigning Ireland's Transport for Net Zero https://www.oecd.org/ireland/redesigning-ireland-s-transport-for-net-zero-b798a4c1-en.htm
Olsen, E. (2016). Renewable energy: public acceptance and citizens' financial participation.
Elgar Encyclopaedia of Environmental Law. Available at: https://www.elgaronline.com/view/nlm-book/9781786436986/b-9781783477616-l_39.xml
Open Access Government (2022). Ireland could become European leader in renewable energy production. Retrieved from: https://www.openaccessgovernment.org/ireland-could-become-european-leader-in-renewable-energy-production/135942/
Patagonia (n.d.) Community Energy in the Netherlands. Retrieved from: https://eu.patagonia.com/gb/en/wethepower/getinvolved/netherlands/
Ramboll Group. (2019). Unprecedented data centre surplus heat recovery to fuel district heat network. Retrieved from: https://ramboll.com/projects/rdk/unprecedented-data-centre-surplus-heat-recovery
Reuters. (2020). *Global LNG projects jeopardized by climate concerns, pandemic delays - report.*
Retrieved from: https://www.reuters.com/article/us-climate-change-gas-idUSKBN247303
Reuters (2021). *LNG cargoes diverted toward Europe from Asia as gas prices soar*
Retrieved from: https://www.reuters.com/markets/europe/lng-cargoes-diverted-toward-europe-asia-gas-prices-soar-2021-12-21/
Reuters (2022) *Finland leases floating LNG terminal for 10 years to break free from Russian gas.*
Retrieved from: https://www.reuters.com/business/finland-agrees-10-year-charter-fsru-us-firm-excelerate-2022-05-20/

RTÉ. (2022). Solar panels could power 'quarter of Irish households'. Retrieved from rte.ie/news: https://www.rte.ie/news/ireland/2022/0701/1307826-solar-panels-could-power-quarter-of-irish-households/

SEAI (2022). 2022 National Energy Research and Policy Conference Retrieved from: https://www.seai.ie/events/research-conference/

SOM Energia (n.d.) Who are we? Retrieved from: https://www.somenergia.coop/es/quienes-somos/

Stephens, Jennie C. (2019-03-04). "Energy Democracy: Redistributing Power to the People Through Renewable Transformation". *Environment: Science and Policy for Sustainable Development. 61* (2): 4–13.

Tech Central. (2012). *Data centres waste 90% of power drawn.* Retrieved from techcentral.ie: https://www.techcentral.ie/data-centres-waste-90-of-power-drawn/

Veritas. (2015). *The Databerg Report.* Retrieved from veritas.com: http://images.info.veritas.com/Web/Veritas/%7B364a7ca5-e05c-4fce-971b-88e18c62eafb%7D_45145_EMEA_Veritas_Strike_Report_Gulf.pdf

World Future Council (2021). Energy Democracy – Power to the People! Retrieved from: https://www.worldfuturecouncil.org/energy-democracy-power-to-the-people/

Tayeb, Z. (2022, October 17). *China has stopped sales of LNG to Europe to make sure its own households have enough gas for the winter, report says*. Yahoo! Finance. Retrieved October 28, 2022, from https://finance.yahoo.com/news/china-stopped-sales-lng-europe-103248207.html?guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAABqeBkK1v1FtU0C2d_ZVOWTkapCcrAK9HqdmmjkWAIu76WZJpXctTT7Vjs6ogM04WfcR-NQ63P-ffeuCnery6pa8teVHVI670e1o_wUwBt03cUeAVkW4tR7H3juXtG6Jz-5j0R5zyIL61KhunD-juthBeQgs6IIF-4QxS6cOyCEo&guccounter=2