Energy for generations

ESB Generation and Trading's response to the Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems

28 October 2022

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1. INTRODUCTION

ESB Generation and Trading (ESB GT) welcomes the opportunity provided by the Department of the Environment, Climate and Communications to respond to this important consultation on the Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems. This timely review is an opportunity for stakeholders to participate in the development of Government policy on security of supply while at all times maintaining a clear focus on the need to decarbonise Ireland's energy system at affordable cost. Indeed, this is a prudent approach given the pace of change in global energy systems.

ESB GT is fully committed to the transformation of Ireland's energy supply, becoming a net zero provider of electricity by 2040 as outlined in our strategic plan *Driven to Make a Difference.* ESB GT aims to produce over 60% of our power from renewable sources by 2030. We will achieve this target by continuing to invest in the electricity sector in Ireland and through the development of new onshore and offshore renewable electricity generation capacity. In addition, we will invest in new technologies that will optimise the ability of the electricity system to supply renewable power to customers. ESB is installing a synchronous condenser at Moneypoint which will be Ireland's first such carbon free, renewable enabling technology.

2. EXECUTIVE SUMMARY

ESB GT believes that security and diversity of Ireland's primary energy supplies for the gas and electricity systems are not adequate and that measures to strengthen these are required. The State has a variety of options to hand. Some of these have a short-term impact while others can assist long-term energy security for Ireland into the future. Both are important to consider as Ireland endeavours to solve short-term difficulties and avoid future ones.

Short-term measures that Ireland should prioritise include:

- Maintaining and enhancing a diversity of energy sources that are alternatives to the dominant natural gas. This can be done by maintaining non-gas generation sources and secondary fuel storage for gas-based generation.

- Construction of natural gas storage facilities (to replace coal, HFO and petrol/diesel storage that has been or will be displaced by the transition to renewable energy sources)

In the long term, energy security is enhanced by

- Aggressive roll out of indigenous renewable electricity generation (onshore wind, offshore wind and solar).
- Transition from natural gas storage to hydrogen storage – delivering decarbonisation while maintaining energy resilience and security.

We believe the correct approach to security of supply in the electricity sector is to have adequate underground storage of gas along with an aggressive build out of renewable electricity. The renewable electricity will do the heavy lifting and the gas, initially methane and then hydrogen, will fill in the gaps when wind and solar are not available.

ESB GT is the largest user of natural gas in the country. We agree that the security of gas supplies is vital to the wider economy and in particular to the electricity sector. Failure of gas supply is the electricity sector's biggest security of supply risk. Security of supply for Ireland's gas (and electricity) remains a sovereign responsibility. At present Ireland has no gas storage. **Strategic indigenous underground storage of natural gas should be implemented immediately. Ireland should have a strategic natural gas storage of about 16.6 TWh (1.5 bcm[1]) that is fully capable of transitioning to the storage of green hydrogen within 10 years. Such a solution is deliverable. it can be implemented in a relatively short time, and it compares very favourably with any other possible solution.**

There are some benefits to combination of large-scale underground storage with an LNG Floating Storage & Regasification Unit (FSRU). An FSRU adds additional import capacity and provides diversity to imported gas from the UK. It provides partial mitigation against the political risk of non-delivery of gas from the UK as well as failure of both existing Ireland-UK gas interconnectors.

We believe that if (a) the security of gas supplies is ensured as outlined above, (b) that as a minimum 5 GW of offshore wind, 2 GW of additional offshore wind dedicated to hydrogen, and 8 GW of onshore wind and 1.5 GW of solar is built before 2030, (c) that the 2 GW of gas generation foreseen by the RA by 2030 is delivered, and (d) that firm plans are put in place to develop large-scale green hydrogen production and storage in Ireland in the next 10 years,

[1] Approximately 28% on Ireland's annual consumption, close to EU average of 26% per Europe's Gas Stores Are Almost Full. But There's a Catch | BloombergNEF (bnef.com)

then the basic security of the electricity system is assured with the level of electricity interconnection that is planned to be in place at the end of this decade. The situation could be improved by adopting more aggressive renewables targets, particularly for offshore wind.

In summary, ESB GT is recommending the large-scale storage of natural gas until the point that green hydrogen becomes the fuel of choice for a decarbonised electricity sector. Such an approach, if properly phased, optimises the use of existing assets, avoids the stranding of any future investment, integrates the gas (methane and eventually hydrogen) and electricity sectors, puts a ceiling on the use of natural gas in order to allow carbon budgets to be achieved, and sets the country on a course for a sustainable future with a secure energy system driven by renewables and green hydrogen.

3. CONSULTATION QUESTIONS

1.0 Introductory comments

ESB Generation and Trading (ESB GT) disagrees with the approach taken by DECC's consultants CEPA in their analysis of security of supply in Ireland. We believe that CEPA have failed to take a strategic approach to security of supply and hence the report is, in our view, quite transactional. The CEPA report is flawed on several grounds:

- It fails to define what security of supply actually means
- It fails to address security of supply in a holistic manner
- It attempts to but ultimately fails to fully address the interaction of the gas and electricity markets
- It fails to take a long-term approach by not addressing security of supply beyond 2030 when such an approach would permit both short-term and long-term issues to be explored and appropriate solutions to be proposed
- It assumes that all the Government 2030 climate change targets are met but does not address what might happen to energy requirements if we fall short of these targets
- It does not address the key roles of the gas and electricity grids in security of supply and does not explore how novel approaches might enhance security of supply

- It is not clear how the proposals in the report impact on legally binding sectorial carbon budgets
- There is a failure to explore how co-operation with Northern Ireland might enhance the security of supply in both jurisdictions

Definitions of energy security

The IEA[2] defines energy security *as the uninterrupted availability of energy sources at an affordable price.* It goes on to say that "*energy security has many aspects: long-term energy security mainly deals with timely investments to supply energy in line with economic developments and environmental needs. On the other hand, short-term energy security focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance*"

The World Energy Council's *World Energy Trilemma Index*[3] states that energy security measures the "*ability to meet current and future energy demand*" and how it withstands and responds to system shocks. It covers "*the effectiveness of management of domestic/external energy sources*" and the "*reliability and resilience of energy infrastructure.*"

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

- It is imperative that 7 GW of offshore wind and 8 GW of onshore must be in operation by 2030, along with firm plans for more wind in the 2030s, so that we can reduce our exposure to imported fossil fuels. Unfortunately, there are risks that these targets will not be met. All legal, regulatory and market arrangements must be expedited to deliver these renewables.

[2] Energy security – Topics - IEA
[3] World Energy Trilemma Index | 2021 | World Energy Council

- Premature earlier than planned closure of gas generation plants for economic or environmental reasons. Gas plants could close because they are no longer economic due to factors such as inadequate renumeration in the capacity market or high carbon prices. They could also come under pressure due to more onerous limits on emissions arising from any changes in the Industrial Emissions Directive.
- The risk associated with Ireland's planning regime and the associated delays in the consenting and permitting timelines for the delivery of infrastructure are well known and should be considered in all scenarios.
- Supply chain problems in the build out of new renewables, new renewables-enabling technology, or even new gas generation.
- Failure of market mechanisms or rules that allow for efficient trading across the gas and electrical interconnectors to GB, perhaps driven by diverging political or regulatory approaches
- Extended outage of one or more large CCGTs
- Cyber and other state actor risks are not in any way addressed. It is now obvious that critical national gas and electricity infrastructure is very vulnerable to attack.

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

Mitigation options for the additional risks identified above include:

- Pull out all the stops to ensure delivery of the Government's renewables targets by 2030.
- Put in place all the required administrative, planning and commercial foundations required to get 7 GW of offshore wind in operation by 2030
- Accelerate the development of offshore wind, including floating offshore wind, on the south and west coasts

- Ensure that the capacity mechanism incentivises thermal plant to invest in long-term maintenance programmes that ensure high levels of availability and reliability
- Implement EU Regulation on Clean Energy Package Articles 12 & 13
- Allow the use of hybrid grid connections, both onshore and offshore
- Develop and implement a comprehensive 20-year strategy for energy storage in Ireland
- Issue the Hydrogen Strategy and support implementation with policy support and efficient, effective funding mechanisms.

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

It is reasonable to question why 30 days was chosen as the duration for the loss of gas interconnectors. Why not 60 or even the 90 days as is currently the case for petroleum products?

Could a starting point for scenarios not be how long we could survive with the current arrangements?

Scenarios 4 and 5 are very mild as they assume everything else is OK except for the loss of gas interconnectors. A better test would be the loss of gas interconnectors along with very low wind conditions.

Scenarios beyond 2030 should be explored because it is highly likely that many of the actions necessary to address issues in the 2030s will need to be taken in the current decade.

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

Green hydrogen

Green hydrogen will be an essential component of a carbon neutral energy economy in Ireland. It is difficult to envisage a carbon neutral energy system that doesn't incorporate hydrogen as a significant component. The principal contributions of green hydrogen will be to:

- Provide seasonal levels of zero carbon energy storage to underpin energy security and continuity of energy supplies. Energy storage needs are likely to be significantly greater in the future energy system due to the intermittency and seasonality of wind and solar resources. Coupled to that electrification of winter heat and other requirements will place greater seasonal variation on the electricity system than we currently experience.
- Decarbonise sectors of the economy that are not suited to electrification. This includes long distance transport, high temperature industrial applications, shipping, and aviation.
- Provide an energy source for dispatchable backup generation to generate electricity when wind and solar resources are inadequate.

Ireland should align with EU policy that green hydrogen is the only long-term viable source of zero carbon hydrogen. In particular, blue hydrogen is not consistent with a climate-neutral energy sector and should not be pursued by Ireland.

Hybrid connections

ESB GT defines a hybrid grid connection as using a single grid connection associated with an existing power plant to also connect new assets to the system. Maximising existing infrastructure should be encouraged where possible, and hybrid grid connections have an important role to play in delivering new renewable electricity capacity.

Thermal-offshore wind hybrid connections can maximise the use of existing grid infrastructure, will minimise the need to develop new grid, will minimise the impact of project attrition and will increase competition for the benefit of the consumer. Using hybrid grid connections will ensure

that grid capacity in addition to grid reinforcements identified in the SOEF Report can be used to deliver policy on time and at the least cost.

ESB GT believes that offshore wind-thermal hybrid grid connections will be an essential component of connecting new offshore wind projects in time to meet national policy targets. Hybrid grid connections are now facilitated within the RESS process and must be facilitated within the ORESS process. The role offshore wind-thermal hybrid grid connections can play has been referenced by ESB and others in the recent Phase Two Offshore Wind consultation. We cannot envisage any scenario in which 7 GW of offshore wind can be delivered by 2030 without the extensive use of offshore wind hybrid connections.

ESB GT believes that sharing an existing connection is a positive step forward in developing assets and must be allowed as it utilises the existing grid and will provide value for money to the customer. ESB GT believes the delivery of the renewable targets outlined in the Programme for Government by 2030 will be next to impossible without enabling hybrid grid connections.

To utilise hybrid connections (sharing MEC) progress must be fast tracked as the current approach will not deliver the facility on time to maximise the benefits.

Renewables

It is imperative that 7 GW of offshore wind and 8 GW of onshore must be in operation by 2030, along with firm plans for more wind in the 2030s, so that we can reduce our exposure to imported fossil fuels. All legal, regulatory and market arrangements must be expedited to make this happen.

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

Long-term security of gas supplies can be achieved by transitioning to green hydrogen produced from offshore wind. Use of methane should be continued until sufficient supplies of green hydrogen become available. New policies and supports are required to ensure that this happens within 10 years.

ESB GT is the largest user of natural gas in the country. We agree that the security of gas supplies is vital to the wider economy and in particular to the electricity sector. Failure of gas supply is the electricity sector's biggest security of supply risk. Security of supply for Ireland's gas (and electricity) remains a sovereign responsibility. At present Ireland has no gas storage. **Strategic indigenous underground storage of natural gas should be implemented immediately. Ireland should have a strategic natural gas storage of about 16.6 TWh (1.5 bcm[4]) that is fully capable of transitioning to the storage of green hydrogen within 10 years. Such a solution is deliverable. It can be implemented in a relatively short time, and it compares very favourably with any other possible solution.**

There are some benefits to combination of large-scale underground storage with an LNG Floating Storage & Regasification Unit (FSRU). An FSRU adds additional import capacity and provides diversity to imported gas from the UK. It provides partial mitigation against the political risk of non-delivery of gas from the UK as well as failure of both existing Ireland-UK gas interconnectors.

Additional points of entry into Ireland's gas system all come with problems such as the difficulty in finding gas when everyone else is trying to do the same.

In addition, we see serious problems in the proposal to use FSRU as strategic storage. FSRU is a transportation technology rather than a storage technology. We understand that FSRUs are used by others as a means of transporting LNG rather than storing LNG. A boil-off rate of 0.2% per day means that 73% of the stored gas is lost in a year. Whereas the lost gas may be injected into the gas grid, it is not available as stored gas unless continuously replaced. Boil-off gas would have to be re-liquified if it was to be put back into storage. This would require an expensive liquefaction plant. Replacement gas may be expensive at the times that it is needed.

It is by no means certain that a FSRU would be available within the next three years as there are many potential buyers but few units available. FSRU are more suited to the commercial trading of gas. i.e., the importation of attractively priced LNG tankers. The long run price of LNG is typically 60% greater than pipeline gas. **It is probably possible to combine large scale underground storage with an FSRU, but an FSRU on its own would not be a good solution and is not a substitute for large scale underground storage.**

Underground storage gives Ireland storage capacity far in excess of FSRU, weeks rather than days. In addition, underground storage of natural gas can be progressed to the storage of

[4] Approximately 28% on Ireland's annual consumption, close to EU average of 26% per Europe's Gas Stores Are Almost Full. But There's a Catch | BloombergNEF (bnef.com)

green hydrogen, creating a pathway for the de-carbonisation of gas in Ireland. Underground gas storage has a low CO_2 footprint. Capex and Opex are lower than the alternatives, leading to a far lower LCOS[5]. Finally, the visual impact of underground storage is far less than other options.

Table 1 summarises the advantages and disadvantages of underground storage, FSRU and LNG terminals.

	Underground Gas Storage	FSRU	LNG Terminal
Size	7 to 15 TWh	1 TWh	1 to 3 TWh
Duration of storage	Up to 90 days (storage technology)	Up to 7 days (importation technology)	Up to 21 Days (importation technology)
CO_2 footprint	Low	High (energy intensive and boil off)	
CapEx (€m/TWh)	50 to 150	450 to 550	400 to 500
Levelised Cost of Storage (€m/TWh)	5 to 15	40 to 70	30 to 45
Hydrogen ready	Yes	No	
Years of operation	40	20 to 25	30
Visual impact	Unseen (sub-surface and offshore)	High visibility (natural harbour)	High visibility (coastal land)
Prior experience	Kinsale	Overseas examples	
Security of supply	Yes	No	No

Table 1: Comparison of underground storage, FSRU and LNG terminal[6]

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

Renewables

Every MWh of electricity that can be generated from renewables is a MWh that does not have to be generated from gas. Government targets for onshore wind, offshore wind and solar for

[5] Levelised Cost of Storage
[6] Data kindly provided by Snam S.p.A.

2030 must be met. In fact, it would be preferable if these targets were accelerated. All impediments to the achievement of these targets must be removed. A key step on the road to security of supply is extensive use of renewable generation along with the deployment of renewables enabling technology such as batteries, synchronous condensers, etc.

Ireland has a rare opportunity to create a global offshore wind industry given its seabed resource, particularly off our west coast. Our offshore wind potential can be harnessed to create green hydrogen, a clean fuel source which can be stored. The capability to create and store green hydrogen is a critical step in delivering a net zero society – the ability to store clean energy from renewables which can be used when the wind is not blowing, and the sun is not shining. It will also create a domestic and export green hydrogen industry. In seizing this opportunity, it will require a series of concerted actions from the State and wider energy industry both now and progressively over the coming decade.

Offshore wind combined with green hydrogen production can help Ireland in delivering on a wide range of goals, including:

- Reducing carbon emissions
- Strengthening energy security
- Developing zero carbon dispatchable energy
- Creating high-value employment and supply chain opportunities, and
- Enhancing regional development

We believe that there are four key items that, if acted upon quickly, can position Ireland to deliver 7,000 MW of offshore wind by 2030 while also creating an industry to deliver long-term enduring economic and social benefits to the State.

1. Enable floating offshore wind projects now
2. Utilise the existing grid network as efficiently as possible using hybrid connections
3. Build early supply chain confidence
4. Set up Ireland for hydrogen power generation

Ireland needs to accelerate the planned trajectory for the development of Irish renewables, particularly offshore wind. We need to set targets for renewables development that deliver the journey to net zero required by 2050. Infrastructure or development challenges should be secondary to decarbonisation in setting out the required trajectory. These are challenges to be overcome and shouldn't be allowed to dictate the overall pace of decarbonisation.

Renewable projects for hydrogen production as well as electricity production have to be developed. In particular, target the immediate acceleration of offshore wind in the east, south and west coasts, including floating offshore wind making use of hybrid offshore grid

connections. It is imperative that we identify and designate specific renewable energy and hydrogen clusters. At a minimum, ESB GT believes that there should be Dublin, Cork Harbour and Shannon Estuary clusters but others may be viable and/or required. In particular, target the immediate acceleration of offshore wind in the east, south and west coasts, including floating offshore wind making use of hybrid offshore grid connections. Finally, deliver a market mechanism to replace fossil fuels as back up to renewables in the energy market. Set 2040 as a climate neutral electricity system target on the path to an overall climate neutral economy by 2050.

Secondary fuel for gas turbines

Increasing the duration of the secondary fuel obligation for CCGTs and GTs on distillate is should be explored but one must remain cognisant of the following points:

- There are significant planning, environmental and COMAH issues to be addressed
- Not all sites have space for additional storage
- There will be an impact on life of gas turbine hardware and maintenance costs
- Operators will incur considerable additional capital and operational costs, and these will have to re-imbursed in a clear and transparent manner outside the capacity market.

Interconnectors

We would question the contribution that has been attributed to interconnectors in all security of supply events as some scenarios will inevitably mean that one's neighbours will also be short of electricity at the same time as oneself. There is a need to find the optimum balance between the level of electrical interconnection and the amount of generation assets that are located on the island.

The theoretical benefits associated with increased interconnector capacity (but would be limited by different structural characteristics of the adjoining jurisdictions) include:

a) Capacity, particularly if the capacity in neighbouring countries is quite different from that in your home country

b) Markets can maintain high levels of generation from intermittent renewables rather than curtailing generation when it is not required to meet domestic demand and

increased flexibility, including interconnection, will be important to help integrate renewable energy

c) A decrease in emissions - meeting carbon emission targets for the power sector will be increasingly influenced by interconnector activity.

d) Security of supply, in certain cases

e) Interconnectors can cause electricity market prices either to fall (if importing and facilitating the use of cheaper generation from another market) or rise (if exporting and facilitating increasingly expensive generation to run within your own market)

Some of the negative aspects of interconnectors include:

a) Additional system services and inertia required in home country as interconnection generally displaces domestic thermal generation, which provides important benefits for managing system stability

b) Security of supply benefit is worth less to the importing market the larger that market. Larger markets are more likely to have a diversity and scale of domestic generation resources to manage risks at home

c) Interconnectors may require additional upgrades within the existing transmission systems to accommodate changes in physical system flows.

d) Losses

e) Absence of back-up generation in home country due to being economically displaced by the interconnector

Even if there are price differences during a stress event, interconnector flows have not always historically acted rationally in response to price triggers, and they could potentially reduce security of supply if they displace domestic generation. There is a common misconception that further interconnection would in all circumstances help security of supply, particularly during periods of sustained absence of wind in Northern Europe. Interconnectors do provide some help, but two factors need to be considered. If your neighbours are suffering from the same supply problems such as negligible renewable generation due to weather conditions, they may not be able to help you. Secondly, extra interconnectors do not provide a proportional increase in security of supply. The law of diminishing returns applies. It is a bit like installing more pipelines. The new pipelines do not in themselves conjure up more stuff to flow in them when

you need it. As more and more countries de-carbonise their electricity systems, they will have less and less back-up thermal generation available.

Hydrogen as a zero-carbon fuel for electricity generation

Hydrogen and its associated infrastructure is one component of a larger climate neutral energy system. The efficacy of the system to decarbonise is dependent on all necessary infrastructure components being in place at the appropriate times. Therefore, the hydrogen strategy must sit within an overall framework that sets out how Ireland intends to move from 14% to 100% decarbonisation by 2050.

Also, it is important to understand the components of the future energy system and focus now on these sectors. Failure to do this risks investment in sectors or technologies that will not and cannot be part of a zero-carbon energy system.

From an infrastructure perspective, the carbon neutral energy system requires:

- ***Sufficient zero-carbon generation sources***. In the Irish context, the minimum requirement exceeds 30 GW – primarily offshore wind with its higher expected load factors. Energy sources in excess of 30 GW are required should Ireland target decarbonisation of marine shipping, aviation, or other sectors.[7]
- ***Hydrogen*** electrolysers – c.15 GW – most of which are serviced by generation sources dedicated to hydrogen production while others can toggle between the electricity and hydrogen sectors. Hydrogen can provide a store of zero carbon renewable energy of seasonal scale sufficient to ensure security of supply of the energy system. Hydrogen also is essential to decarbonise sectors not amenable to simple electrification. Examples here include heavy and long-distance transport, shipping, aviation, and high temperature industrial applications. Stored hydrogen is essential to power a climate neutral energy sector in response to seasonal supply/demand differences and in response to the periodic unavailability of wind and solar resources – sometimes for extended periods of time.
- ***Seasonal energy storage*** sufficient to provide the Irish energy system with continuity of supply and strategic security of supply. This is needed to overcome the intermittency of renewable generation sources, seasonal variation in demand/supply and maintain a strategic energy reserve akin to that currently in place at EU level for petroleum products and more latterly, natural gas. ESB estimates that this storage capability will utilise hydrogen or associated carriers and requires up to 90 days of seasonal storage capacity.

[7] https://windenergyireland.com/images/files/our-climate-neutral-future-0by50-final-report.pdf

For security of supply, this requires multiple underground storage reservoirs utilising depleted gas field and salt caverns.

- ***Always available zero carbon generation***, powered by green hydrogen, of sufficient capacity and with sufficient access to green hydrogen to provide production backup to intermittent renewables for the production of electricity. This backup role can be for extended periods of time. August / September 2021 included a 6-week window with limited wind energy production – for example. This zero-carbon fleet is likely to combine both hydrogen compatible gas turbines and hydrogen fuel cells.

  Each of these infrastructure sectors requires a policy framework that fosters its development at a pace sufficient for the effective decarbonisation of the overall energy sector. Each sector can be considered as an important pillar within a single overall decarbonisation masterplan. This framework must address promotion of both production and demand. It must ensure that the right economic framework exists for the development of each sector at the right pace. It must align infrastructure development with other decarbonisation initiatives such as public engagement and behaviour change. Finally, it must ensure that the necessary industry safety, operating, and regulatory frameworks are in place where new sectors are being developed.

Pumped storage

Whereas a second pumped storage plant may provide additional system services, the stored energy (< 2GWh) will never be sufficient to provide security of supply in the event of the loss of all gas supplies from GB (TWh).

LOLE

EirGrid employs a Loss of Load Expectation (LOLE) generation adequacy standard when planning the electricity system. The LOLE is the mathematical expectation of the number of hours in the year during which the available generation plant will be inadequate to meet the instantaneous demand. The adequacy standard is set at 8 hours Loss of Load Expectation (LOLE) per year for Ireland.

In GB, National Grid sets the LOLE standard at 3 hours while in Northern Ireland, SONI uses 4.9 hours. This means that Ireland has lower security of supply standard than neighbouring markets. Therefore, as part of this review, the appropriateness of the current 8 hour setting of LOLE should be assessed.

Electricity markets

A well-functioning energy market is a key part of maintaining an investable and secure electricity system. In fact, this is an important part of the European Commission's energy policy with the recent Clean Energy Package placing a focus on the removal of unhelpful interventions in the internal energy market such as price caps or distortions. The price in the electricity market should increase when the availability of capacity reduces, and the price should reduce when there is excess demand or at times of significant wind, etc. We believe that the following should be included in any review of security of supply:

- Review of the existing market to identify regulatory interventions that might prevent the proper functioning of the market. Specifically, this should review whether bidding controls or administrative settings of capacity market parameters represent an implicit or explicit price cap in the energy, capacity or ancillary service markets which might either reduce new investment or result in premature retirement of existing plant.
- In the context of smart meter rollout, review of the networks tariffs and market charging to see if they sufficiently encourage electrification and demand side response. This should examine the link between wholesale prices and end user prices to customers to ensure that customers can get access to the signals sent from wholesale price.

Green Atlantic at Moneypoint

ESB has set an ambitious and bold course of action to help Ireland achieve climate action targets and transition the country to reliable, affordable, net zero energy. Green Atlantic @ Moneypoint is a multi-billion Euro programme of significant investments on the County Clare site over the next decade. ESB has already commenced work on transforming Moneypoint into a green energy hub, constructing a new €50m Sustainable System Support – this Synchronous Compensator will be the largest of its kind in the world. This new plant will provide a range of electrical services to the electricity grid which would previously have been supplied by thermal fired power stations. Its operation will enable higher volumes of renewables on the system. A floating offshore wind farm of 1,400MW will be developed off the coast of Counties Clare and Kerry in two phases by ESB. Once complete, the wind farm will be capable of powering more than 1.6m homes in Ireland. Subject to the appropriate consents being granted, the wind farm is expected to be in production within the next decade. Moneypoint will become a centre for the construction and assembly of floating wind turbines. A deep-water port already exists at the site, making it an ideal staging ground for the

construction of the wind farm. It is expected this will generate a significant number of direct jobs in the Mid-West region. In the longer term, the development of Moneypoint will support wider plans of Shannon Foynes port, and working with local stakeholders, help make the Shannon Estuary a focal point for the offshore wind industry in Europe. ESB's plans include investment in a green hydrogen production, storage and generation facility at Moneypoint towards the end of the decade. A clean, zero-carbon fuel, green hydrogen will be produced from renewable energy and used for power generation, heavy goods vehicles in the transport sector and to help decarbonise a wide range of industries such as pharmaceuticals, electronics and cement manufacturing.

Biomass at Moneypoint

The CEPA report envisages 450 MW of biomass in the form of the conversion of two units at Moneypoint to biomass firing. Studies carried out by ESB GT indicate that 420 MW of capacity could be provided by the conversion of two units to biomass as a de-rating of approximately 30% must be applied to each unit to reduce the risk of fouling and slagging when burning biomass due the particular characteristics of the Moneypoint boilers. A capital expenditure of the order of €200m would be required to convert the two units to biomass firing, not including any provision for life extension of the units. The storage potential of imported biomass at Moneypoint is assumed to be approximately two weeks. This imposes a probable limitation on the volume of electricity that could be generated of approximately 200 GWh should additional supplies of biomass not be available during an energy security event. In addition, the sustainability of using biomass in large power plants is coming under increasing scrutiny. There is no guarantee that biomass will retain its status as a sustainable fuel over the next decade.

Moneypoint on HFO

ESB GT was surprised to see that there was no mention of the role that Moneypoint as a strategic reserve on HFO could have in alleviating security of supply worries, particularly as a short-term approach up until the end of the current decade. This is a low-cost solution that is quicker and easier to implement than the conversion of Moneypoint to biomass. Moneypoint is one of the last opportunities for Ireland to retain fuel diversity. The current HFO storage capability of 50,000 tonnes at Moneypoint equates to approximately160 GWh of energy output or 9 days for all 3 units generating a total of 855 MW. Further increasing the HFO storage capacity on site to 21 days would bridge the gap until further deliveries of HFO to site could

be made, thereby extending the output potential on HFO indefinitely, assuming the ability to source HFO. Moneypoint as a strategic reserve on HFO is a short-term solution.

Batteries and peaking plant

We believe that batteries and peaking plant have a role to play in the security of the electricity system but that they are necessary but insufficient. Policy should continue to support investment in these areas.

Grid

The electrical grid should be capable of connecting sufficient renewables to achieve net zero greenhouse gas emissions target for 2050. There should be a more flexible approach to grid development to give the highest chance of success in delivering the 2030 sectoral targets while planning for net zero electricity sector by 2040.

The power from the 2 GW of additional offshore wind following the recent Government announcements on Sectoral Emissions Ceilings should not be tied to the point of landing for the production of hydrogen but rather it should be made available to locations best suited to the production of green hydrogen by means of adequate grid connections.

All available grid capacity, including the availability of west-coast capacity, should be made available to all market participants to allow all generating technologies to compete for a route to market in a non-discriminatory manner. Offshore wind should be developed off the South Coast and West Coast, and EirGrid should develop the grid in these areas. Experience shows that development of grid reinforcements take time. They should be identified and progressed now to meet the future energy needs of the country beyond 2030.

Offshore wind hybrid grid connections can maximise the use of existing grid infrastructure, will minimise the need to develop new grid, will minimise the impact of project attrition and will increase competition for the benefit of the consumer. Using hybrid grid connections will ensure that grid capacity in addition to reinforcements identified in the SOEF report can be used to deliver policy on time and at the least cost.

Grid reinforcement should be preferentially developed at 220kV and 400kV rather than at 110kV to provide sufficient scale and address projected long-term transmission requirements. Underground networks should be considered if that is the only way to extend the HV network.

In summary, ESB GT considers renewables, secondary fuel, LOLE, markets, Moneypoint on HFO and batteries to be the best short-term electricity options, i.e., up to 2025. Renewables, interconnectors, hydrogen, Green Atlantic @ Moneypoint, and grid are the better long-term options.

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

Energy saving and energy efficiency: Governments and government agencies should take the lead in demonstrating the commitment to energy saving. Consumers should be encouraged by financial support to save on energy use. Options like improved insulation provide on-going energy savings. Energy saving should go beyond simply saving natural gas, but also electricity. Consumers would be asked to turn down their thermostats to save on energy, leaving more available for later.

Fuel switching: Those industries that could switch energy or feedstock away from natural gas should be encouraged to do so, so that more natural gas could be available for other users.

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

No answer.

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

Section 8 of the consultation paper includes measures to address joint planning of the national electricity and gas networks. Signalling the effect of the renewable gas market on future planning of electricity and gas networks, it proposes joint annual assessments for electricity and gas to support the holistic consideration of the energy system.

It is important to point out that the proposed Gas Package (EU Hydrogen and Decarbonised Gas Market Package)[8]. Current network planning schemes and practices are deficient as there are discrepancies between the EU-wide ten-year network development plan ('TYNDP') and national network development plans ('NDP'). A better linkage between TYNDP and NDP would allow transnational exchange of information on transmission systems usage. Therefore, the proposals in the current consultation may fall short of the proposals in the Gas Package.

Background – amendments to the EU Security of Supply Framework

In June 2022, in response to security of supply concerns, the European Council adopted amendments to the EU Gas Security of Supply Regulation (EU 2017/1938). This relates to the Gas Supply Standard to be maintained by each Member State[9]. The revised regulation made amendments to Article 6, requiring underground gas storage on Member States' territory be filled to at least 80% of their capacity before the winter of 2022/2023 and to 90% in subsequent winters. Under this new legislation, gas storage facilities are considered critical infrastructure.

For those Member States without storage, market participants are required to have agreements in place with other Member States for storage equivalent to 15% of annual consumption subject to physical limitations or by way of derogation from the 15% requirement, burden sharing arrangements in place with other Member States with storage facilities. Ireland's compliance with the existing Article 6 N-1 supply standard has already been compromised by the UK departure from the EU. There is scope for third country inclusion in the Article 7 risk assessment and for agreements with third countries to be recognised by the EU (i.e., for example, UK-Ireland Intergovernmental Agreement (IGA) was notified before BREXIT). Member States without storage, such as Ireland, may also apply incentives or compensation to participants for the cost of the obligation imposed by this regulation. Section 8.3 of the consultation document outlines the nature of Ireland's existing international arrangements, but do not address *how* the existing arrangements (if amended) will enable Ireland to meet the revised Regulation.

For the purposes of the amended regulation, gas flows to Ireland from mainland Europe via a third country (i.e., the UK) means that any storage arrangement between Ireland and another Member State would need to involve the UK. Alternatively, it may be possible to amend the voluntary arrangements under the UK-Ireland IGA to reflect the EU's new storage regime and notify this to the EU.

[8] resource.html (europa.eu)
[9] Council adopts regulation on gas storage - Consilium (europa.eu)

As gas storage capacities and national situations vary greatly, depending on their situation, Member States will be able to partially meet the storage target by counting stocks of liquefied natural gas (LNG) or alternative fuels. However, given that this only allows a Member State to partially meet the storage target, the proposed measures should be analysed through the lens of the EU's proposed Gas Package.

The Gas Package's proposed directive specifically addresses gas storage and security of supply, and specifically includes measures includes specific measures to improve cooperation and resilience, notably to ensure a more effective and coordinated use storage and operational solidarity arrangements. The Gas Package is discussed in greater detail below.

The EU Hydrogen and Decarbonised Gas Market Package

In December 2021, the European Commission published the Hydrogen and gas markets decarbonisation package (Gas Package). This is a review and revision of the Gas Directive 2009/73/EC and Gas Regulation (EC) 715/2009 and builds on the 2020 EU Hydrogen Strategy. This Directive establishes rules for the transport, supply and storage of natural gas and the transition of the natural gas system to a system based on renewable and low-carbon gases, and establishes common rules for the transport, supply and storage of hydrogen using the hydrogen system[10].

According to the European Commission, "*it enables the market to decarbonise gas consumption, and puts forward policy measures required for supporting the creation of optimum and dedicated infrastructure, as well as efficient markets. It will remove barriers to decarbonisation and create the conditions for a more cost-effective transition*."[11] This draft package envisages hydrogen and other low-carbon gases as complements to electrification in areas where the latter is too difficult or too costly, such as energy-intensive industry or heavy-duty transport. It is worthwhile exploring how the proposed policy measures in this consultation will assist in meeting the objectives of the proposed Gas Package, and Ireland's ability to contribute to the storage aspects of the proposed gas package.

[10] resource.html (europa.eu), Article 2.

[11] Hydrogen and decarbonised gas market package (europa.eu)

1.10 What further tools and measures do you think would contribute the most to Ireland's energy security of

In order to make enduring recommendations, it is worthwhile to examine the nature of existing EU policy and legislative proposals and Ireland's ability to align with these objectives. These include RePowerEU, the Gas Package and the recently published "State of the Energy Union 2022- Ireland Energy Snapshot".

The proposed Gas Package and Security of Supply

The proposed measures aim to align an evolving gas and (soon to be) hydrogen system with the EU's broader ambitions of a cost-effective energy transition, including greenhouse gases emissions reduction by at least 55% by 2030 and climate-neutrality by 2050. The revision of the Gas Regulation, particularly for low-carbon emission gases and hydrogen, also fits well with other aspects of the Green Deal such as the taxonomy classification[12].

With respect security of supply, the proposal amends the EU Security of Supply Regulation and aims to extend the scope of the regulation to renewable and low-carbon gases in the natural gas grid, while also adapting it to new risks, such as cyber threats. The amendments will adopt a regional approach to make more efficient use of storage, for example by agreeing on risks and measures in regional risk groups. It is worthwhile considering what the regional approach to storage will mean in the Irish context, especially the mitigation measures proposed in the consultation.

The measures proposed require Member States to explicitly make storage part of their security of supply risks assessments at regional level, including risks linked to the control of storage by entities from third countries. The rules also seek to develop a strategic approach to gas storage by incorporating storage considerations into energy risk assessments. The proposed Directive will require Member States to explicitly make storage part of their security of supply risks assessments, both at national and regional level, including risks linked to the control of storage by entities from third countries.

[12] The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. It could play an important role helping the EU scale up sustainable investment and implement the European green deal. The first delegated act (the implementing legislation) sets out greenhouse gas thresholds relating to hydrogen production and other criteria for other hydrogen-related activities.

The measures in the Gas Package which should be considered in the review of national review of security of supply include:

- The recognition that access to natural gas storage facilities and liquefied natural gas (LNG) facilities is **insufficient** in some Member States, and therefore suggests the implementation of the existing rules needs to be improved, such as **taking the potential and uptake of renewable and low-carbon gases** for these facilities in the internal market into account. (Recital 25, Regulation). Ireland's security of supply policy should provide a pathway for the storage and uptake of low-carbon gases, such as hydrogen. This will meet Ireland's security of supply and decarbonisation objectives.
- Specific rules to improve cooperation and resilience, notably concerning **improved coordinated storage and solidarity rules**, should be introduced in this Regulation and in Regulation (EU) 2017/1938 (Recital 68, Regulation). Ireland's security of supply policy should reflect how Ireland will address this aspect of the Gas Package, considering the nature of Ireland's gas interconnection arrangements.
- The analysis of the functioning of the storage capacities in the **regional common risk assessments** should be based on objective assessments of the needs for the security of supply, duly taking into account cross-border cooperation and the solidarity obligations under this Regulation. (Recital 69, Regulation). As referenced is response to question 9, whilst the joint planning aspect discussed in section 8 of the consultation paper reflect the interdependencies between electricity and gas systems, Ireland's security of supply policy would benefit from providing for participation in regional risk assessments.
- The proposed Regulation underlines the importance of avoiding **stranded assets** in the clean energy transition and the goal of reducing the dependency of the Union to external fossil fuels providers. (Recital 69, Regulation). Recent reports from the World Bank[13] caution against the risk of stranded assets, specifically with respect to the role of LNG in the low and zero-carbon shipping. The European Investment Bank (EIB) has a ban on fossil fuel lending (EIB Group Climate Bank Roadmap 2021-2025)[14], shifting its focus to energy lending to enable the decarbonisation transition. With respect to security of supply, the EIB defines carbon neutrality requiring "very significant deployment of low-carbon energy, as a basis for the further electrification of the economy, as well as for the deployment of renewable and low-carbon fuels, notably

[13] The Role of LNG in the Transition Toward Low- and Zero-Carbon Shipping (worldbank.org)
[14] EIB Group Climate Bank Roadmap 2021-2025

low-carbon hydrogen". It is noteworthy that lending will be examined through the lens of Taxonomy compliant activities.

- LNG and storage system operators shall, at least every two years, assess market demand for new investment allowing the use of renewable and low carbon gases in the facilities. When planning new investments, LNG and storage system operators shall assess market demand and take security of supply into account. (Article 8, Regulation) In a similar vein to the point above on stranded asset, this requirement upon LNG and storage system operators to assess the viability of renewable and low carbon gases in their facilities should be considered in Ireland's security of supply, alongside proposals as to how this will be reported and assessed.
- Member States should consider storage measures through regional cooperation in case of unaddressed risks. In order to contribute to security of supply whilst maintaining a spirit of solidarity between Member States, notably in the event of an energy supply crisis, it is important to provide for a framework for regional cooperation in a spirit of solidarity. (Recital 132, Directive). The proposal defines enabling conditions to deployment of voluntary joint procurement of gas strategic stocks to be used in case of emergency. Ireland currently has a derogation with respect to meeting the storage requirements of EU Gas Security of Supply Regulation (EU 2017/1938). Ireland's future security of supply policy should aim to support objectives of the Gas Package whilst aligning with Ireland's statutory climate targets.

Hydrogen related aspects & the Taxonomy

The proposed Directive points to the limited availability of large-scale underground hydrogen storage facilities and distributed unevenly across Member States. It recommends that given the potentially beneficial role for the functioning of hydrogen transport and markets, access to such large-scale underground storages should be subject to regulated third party access to ensure a level playing field for market participants (Recital 72, Directive). This provides a signal underlining the merits of developing indigenous storage capacity for hydrogen.

Significant levels of investment are required to address Ireland's security of supply. The interaction of strategic investment and the Taxonomy will be a determining factor in informing investment decisions. As references in response to Question 9, the Taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. When it comes to hydrogen related activities, the EIB, for example, will assess energy lending through the lens of Taxonomy (among other criteria). The Taxonomy will act in tandem with

EU legislation with a view to delivering the objectives of Fit for 55. For example, the EIB Group Climate Bank Roadmap 2021-2025 designates the operation of hydrogen storage assets as eligible, as the Taxonomy considers it eligible if the infrastructure is used to store taxonomy-eligible hydrogen. This is an important element to consider in future-proofing strategic energy storage investments.

RePowerEU

Staying on the topic of hydrogen, RePowerEU provides some greater policy context on the short to medium term energy landscape, including the role of hydrogen with respect to energy security and decarbonisation. REPowerEU was the EU's response to the massive disruption in the global energy market in early 2022 and includes a range of financial and legal measures to build the new energy infrastructure and system that Europe needs.

In the short-term, it focuses on alternative supplies of gas, oil and coal as quickly as possible, while looking to the need for renewable hydrogen in the future. **It seeks to speed up the green transition and direct massive investment to renewable energy, whilst enabling industry and transport to substitute fossil fuels at a faster rate to reduce emissions and dependencies.**

There are several aspects of RePowerEU of relevance to the evolving policy landscape and Ireland's security of energy supply:

- In RePowerEU, the European Commission has flagged its intention to consider legislative measures to require diversification of gas supply over time by Member States. Ireland's Security of Supply should be cognisant of these forthcoming legislative measures, and what type of infrastructure will be required to provide an enduring response to security of supply[15].
- The potential of a mechanism, such as the Resource and Recovery facility framework, to contribute to Ireland's energy security of supply.

    - The Recovery and Resilience Facility (RRF) was the largest component of the European Union's landmark instrument for recovery from the coronavirus pandemic. Under the RRF, Member States submitted recovery and resilience plans (RRF) outlining measures and actions to enable economic recovery, including the green transition.

[15] Questions and Answers on the REPowerEU Communication (europa.eu)

- The European Commission annually assesses Member State progress through the European Semester report. In *Ireland 2022 Country report*[16], the European Commission said "The Irish recovery and resilience plan (RRP) includes measures to support the green and digital transition, as well as the social and economic recovery. Ireland's RRP amounts to EUR 989 million, which is equivalent to 0.3% of 2019 GDP. The plan comprises 25 measures (16 investments and 9 reforms) structured around three components: (i) advancing the green transition; (ii) accelerating and expanding digital reforms and transformation; and (iii) social and economic recovery and job creation (see Graphs 2.1 and 2.2 and Annex 2). Measures in the plan have the potential to contribute to addressing a range of challenges that are also relevant to all four dimensions of competitive sustainability. Nonetheless, given the modest financial contribution and the entrenched nature of some of the challenges, the Irish RRP cannot be expected to fully resolve all associated needs during its lifetime." With this assessment in mind, Ireland's Security of Supply policy should take note of the range of EU mechanisms that could enhance Ireland's security of supply infrastructure, whilst working towards the EU's decarbonisation objectives. As noted in RePowerEU, funding "will be made available to Member States in the form of non-repayable financial support (grants) under direct management, to support exclusively reforms and investments included in the new REPowerEU chapters of Member States' recovery and resilience plans". In Ireland 2022 Country report, the European Commission said "The Irish recovery and resilience plan (RRP) includes measures to support the green and digital transition, as well as the social and economic recovery. Ireland's RRP amounts to EUR 989 million, which is equivalent to 0.3% of 2019 GDP. The plan comprises 25 measures (16 investments and 9 reforms) structured around three components: (i) advancing the green transition; (ii) accelerating and expanding digital reforms and transformation; and (iii) social and economic recovery and job creation (see Graphs 2.1 and 2.2 and Annex 2). Measures in the plan have the potential to contribute to addressing a range of challenges that are also relevant to all four dimensions of competitive sustainability. Nonetheless, given the modest financial contribution and the entrenched nature of some of the challenges, the

[16] 2022-european-semester-country-report-ireland_en.pdf (europa.eu)

Irish RRP cannot be expected to fully resolve all associated needs during its lifetime."

- With this assessment in mind, Ireland's Security of Supply policy should take note of the range of EU mechanisms that could enhance Ireland's security of supply infrastructure, whilst working towards the EU's decarbonisation objectives. As noted in RePowerEU, funding "will be made available to Member States in the form of non-repayable financial support (grants) under direct management, to support exclusively reforms and investments included in the new REPowerEU chapters of Member States' recovery and resilience plans".

State of the Energy Union 2022- Ireland Energy Snapshot

Member State reports[17] with country specific recommendations are published alongside the annual State of the Energy Union Report[18]. Ireland's recommendations are as follows:

"Reduce overall reliance on fossil fuels. Accelerate the deployment of renewable energy, in particular offshore wind, including by introducing reforms to improve the efficiency of the planning and permit system, particularly by reducing the duration of procedures. Upgrade energy infrastructure, including for storage, and enhance the stability of the grid. Ensure the fast implementation of deep building retrofits. Accelerate the electrification of transport, including by installing charging facilities."

Ireland's security of energy supply will be bolstered by increased renewable energy accompanied by the necessary storage infrastructure. The examination and a solution to existing internal barriers (i.e., planning and consenting timelines) and decision-making with respect to the shape of Ireland's energy storage should be executed as soon as is practicable.

[17] State of the energy union 2022 - snapshots per EU country (europa.eu)
[18] EUR-Lex - 52022DC0547 - EN - EUR-Lex (europa.eu)