CONSULTATION ON **ENERGY SECURITY**

SSE Submission

Oct 2022

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Who we are

SSE is the largest renewable energy developer, operator, and owner in Ireland's all-island Integrated Single Electricity Market. Since entering the Irish energy market in 2008, SSE Group has invested significantly to grow its business in Ireland, with a total economic contribution of €3.8bn to the State's economy over the past five years. We have also awarded over €9 million to communities in the past 10 years as part of our community benefit programme.

SSE is building more offshore wind energy than any other company in the world right now. We are currently constructing the world's largest offshore wind energy project, the 3.6 GW Dogger Bank Wind Farm in the North Sea, a joint venture with Equinor and Eni. This is in addition to Scotland's largest and the world's deepest fixed bottom offshore site, the 1.1 GW Seagreen Offshore Wind Farm in the Firth of Forth, a joint venture with TotalEnergies, which reach first power in recent weeks. In the most recent Scotwind process, SSE Renewables was awarded the rights, along with partners Marubeni Corporation (Marubeni) and Copenhagen Infrastructure Partners (CIP), to develop what will become one of the world's largest floating offshore wind farms off the east coast of Scotland.

We are bringing our world-leading expertise in offshore wind energy to Ireland with plans to deliver over 3 GW of offshore wind energy in Irish waters, starting with our Arklow Bank Wind Park Phase 2 project off the coast of Co. Wicklow.

Through our SSE Thermal business we continue to provide important flexible power generation. SSE's power station Great Island is Ireland's newest combined cycle gas turbine (CCGT) power station and one of the cleanest and most efficient on the system, generating enough electricity to power half a million homes. The acute need for flexible generation in Ireland has been demonstrated over the last eighteen months, with EirGrid's generation capacity statements over the last two years showing that a shortfall in generation capacity is a significant risk this coming winter and for a number of winters to come, resulting in emergency measures being implemented by the CRU and Government.

While existing power stations continue to play a critical role on the system, SSE view the future of dispatchable thermal generation as being abated thermal, with carbon capture and storage, hydrogen or other low-carbon fuels being the primary options. SSE have over 5 GW of zero and low carbon thermal under active co-development in the UK.

We will continue to evaluate opportunities to bring our expertise and investment in decarbonised flexible generation to Ireland, but it is vital that the state, regulator and TSO provides appropriate investment landscape to unlock such developments.

Key Recommendations

SSE have highlighted the following recommendations in relation to the risks, shock scenarios and options as highlighted in the consultation.

- Non-availability (or full export) of electricity interconnectors should be included as a supply-side risk.

- The risk of unused renewable electricity and increasing level of constraints should be considered as a supply side risks.
- The CRM review should be considered a live consideration, rather than a resolved one for the purposes of this Security of Supply Review.
- DECC should consider inclusion of a further two shock scenarios, these being:
  - Cyber-security incident
  - Near-simultaneous trip of two generators
- Carbon Capture and Storage (CCS) should be included as a potential mitigation option.

In addition, we make the following recommendations with respect to the development of a security of supply approach for Ireland and the mitigation of the risks identified in the study:

- The development of hybrid connection policy and hydrogen strategy should be prioritised and would facilitate diversity of generation at sites.
- Significant investment in the grid infrastructure is needed to reduce level of constraints and comply with Clean Energy Package requirements for active reduction in constraint levels.
- An Bord Pleanala, MARA and Statutory Consultees must be properly resourced for the volume of projects in Ireland's pipeline.
- Planning permission should be included as a pre-requisite for participation in future Offshore RESS as is the case onshore.
- The review of Ireland's planning system should be prioritised and judicial review reform should be brought forward to ensure fairness, transparency, timeliness and cost-effectiveness.
- A strongly developed, flexible and future-proofed CRM must be developed where the eligibility of interconnectors has been reassessed.
- Investment certainty in all aspects of market reform will be needed to encourage investor confidence in future procurement opportunities.
- Any change to gas quality must be signalled well in advance to reduce the risk of any increase in risk to security of supply.
- Government should support use of biofuel and biodiesel, where it can be sustainably sourced, in support of security of supply and as a steppingstone to hydrogen powered/decarbonised generation.
- The development of a black start market should be considered to drive investment in system security resilience.
- We strongly welcome the identification of hydrogen plant conversion as a potential mitigation option, the development of which will require the appropriate business models and a cohesive hydrogen strategy for Ireland.

Consultation Questions

Risks

Q1. Are there any other security of supply risks that you can identify in addition to those set out in section 6?

and

Q2. If there are other risks that you have identified, could you outline some mitigation options to address the risk(s)?

SSE has responded to Q1 and Q2 together for ease of reference (i.e. noting additional risks alongside mitigations for the same.

As a general comment, **SSE believes the risks highlighted in DECC's report are reasonable** – though not comprehensive. We note the inclusion of disruption to gas import as a risk but would suggest the need to include the equivalent for electricity i.e. disruption to electricity interconnection

Electricity Interconnection

At the outset, we wish to highlight our view that interconnector benefits should be considered in the context of facilitating rollout of offshore wind to provide energy exports and in the further integration of markets, where this unlocks consumer benefit (as demonstrated by a cost benefit analysis). We believe, however, that it is fundamental to Ireland's security of supply that our generation capacity requirement is covered by domestic generation/technologies, and that interconnectors are not relied upon to meet this demand (given the potential that they will export at times of need).

While interconnectors play an important role in support of renewables, interconnectors do not provide firm capacity, and instead respond to the signals in the markets where they participate. This means there is no guarantee that an interconnector will be importing electricity to Ireland when the system is tight given other markets could be experiencing similar system tightness, particularly where climates and weather patterns may be similar.

Analysis that we have conducted (2020-to date) using publicly available data demonstrates that at times of scarcity, when you would expect interconnectors to be providing significant import MWs, their contribution is of the order of only 100MW on import. This volume as compared to the size of some of the island's CCGTs or the flexibility of OCGT peakers which do not require countertrading across jurisdictions where a scarcity situation could be experienced at the same time. This reinforces our view that an approach that involves reliance on interconnectors would pose a risk to Ireland's security of supply.

It is important that the role of interconnection in the market and its impact on security of supply is considered in the round:

- Interconnection cannot play the same role as domestic generation with respect to security of supply – i.e. it is not dispatchable and it is not directly underwritten by firm generating capacity.
- Interconnection cannot be relied on to provide firm capacity given flows are dictated by price differential between the markets at either end.

- Mechanisms to reverse or alter flows (such as TSO-TSO trades) cannot be guaranteed, and are reliant on the situation in neighbouring markets

As such, in our view, interconnectors **should not be able to participate in the Capacity Mechanism** or should participate with a zero/negative de-rating factor. In this respect, we agree with the recommendations of CEPA in the recent Best New Entrant study[1], that interconnectors are not a practical candidate for Capacity Auctions and also do not represent standard technology for the purposes of a Capacity Auction.

We would highlight that not all perceived interconnector benefits at a European level may will be applicable in Ireland, given the fundamentally different nature of our power system/market. For example, "Towards a sustainable and integrated Europe " was published in November 2017 by the European Commission and outlined five key benefits that greater interconnection would bring to the European energy system including that they would "contribute to generation adequacy by lowering the needs for operational security margins."

We suggest that Irish Government, Regulators and TSO exercise extreme caution in taking the approach of lowering security margins. The SEM operates as a single market area and small synchronous area, versus significantly bigger synchronous areas comprising multiple markets/bidding areas such as Continental Europe and the Nordic Area. As such, the operation of our IE/NI synchronous area has fundamentally different characteristics and security criteria, as acknowledged and accounted for under the EU System Operation Guideline as developed under the Third Energy Package.

Finally, Interconnectors must be facilitated in a way which ensures fair treatment for domestic generation, especially where interconnection introduces a risk of displacement of domestic generation. This is particularly critical given the need to incentivise investment in flexible generation in Ireland.

Potential mitigations:
In our view, it is imperative that Government give very careful consideration to the expansion of interconnectors, such that they:

- Facilitate increased development of renewable energy in support of increasing domestic demand.
- Are not detrimental to Ireland's domestic security of supply (where there is a risk at times of stress that neighbouring system stress is more likely to be imported to the detriment of our market).
- Are not detrimental to the entry and retention of domestic generation (interconnectors should be assumed at zero to ensure sufficient domestic resilience).
- Provide a benefit to the consumer (incl. in relation to security of supply).
- Are located strategically to avoid network pinch points and to avoid displacement of local generation.

As we note above, it is important to note that investment in interconnectors could potentially undermine or make more challenging the investment in domestic firm dispatchable capacity - critical for ensuring Ireland's security of supply. This is because higher levels of interconnection will potentially reduce operational opportunity for flexible generation, moving it from running a peaking profile to running very little as back-up. We note this may not be detrimental if capacity is being invested in on the basis of little contribution

1 Best New Entrant Study 2022 (semcommittee.com)

from running in the market, something which would require the appropriate market structures and signals. However, we note from recent consultations and decisions issued by the SEM Committee that there appears to be an ambition towards entry of CCGTs to replace other "baseload" generation that has aged. As above, there is even less investment case for such generation running very little on back-up, due to the effect of increased interconnection, without careful market design. DECC and CRU should therefore give careful consideration as to how investment signals for flexible or baseload generation will be provided and the interaction of this with any increasing levels of interconnection.

Recommendation – DECC should include non-availability (or full export) of electricity interconnectors in its supply-side risks

Cybersecurity

Cyber related incidents are potential risks to security of supply. Digitalisation is introducing new risks and changing the 'attack surface' for cyber threats. With the digital landscape constantly and rapidly evolving, the defence mechanisms employed need to keep pace. These issues were not included within the scope of this review. The EU Security Union Strategy, presented in July 2020, identifies the energy sector as requiring dedicated support to ensure its resilient against physical, cyber and hybrid threats. We would encourage the Department to include cyber threats within the scope of future reviews of energy security.

Recommendation: Cybersecurity should be included as a risk and included in the scenarios analysis.

Constraints and effective use of grid infrastructure

Integrating higher volumes of renewable generation will bring challenges that need to be addressed if we are to manage the dispatch down of wind generation and use our renewable resources in the most effective manner.

There is currently a lack of transmission capacity in areas of the country where large numbers of renewable projects are planning to connect, representing a significant barrier to meeting our 2030 targets. Many connected renewable generators are already seeing very high constraint levels which means that a large amount of renewable electricity is going to waste. There are measures which could and should be implemented to mitigate this risk, including

- **Battery storage and hybrid connections** - At present, the treatment of battery storage in the market and the development of hybrid connections policy to allow for diverse generation "behind the meter" have both lagged in their progression. Both of these policy workstreams (to be expediated by CRU and the TSOs), could go some way to allowing for this wasted energy to be stored and used at times of need for the system. In the future, this may also provide a potential growth stream for the production of hydrogen, but again would be reliant on the development of a hybrid connections policy.
- **Delivering a Hydrogen Strategy** - the development of a hydrogen framework for Ireland is also a strong potential mitigation to this point. A successful strategy would provide the opportunity to maximise renewable electricity through production of hydrogen for use in storage and as fuel for flexible power stations, reinforcing security of supply and bringing export value to Ireland. The

production of hydrogen will be able to utilise periods of high renewable output in particular, going some way to combat increasing levels of unused energy

- **Implementation of Clean Energy Package** - It is also pertinent to point out that under the Clean Energy Package, Article 13, there are requirements for the active reduction of constraints year-on-year, with the maximum ceiling being 5% dispatch down. These obligations came into force in 2020 and remain undelivered.

In pursuit of the latter mitigation option (and, indeed, EU obligation), there remains a high risk that without the **significant investment in our grid infrastructure** constraint levels will continue to increase significantly for both existing and future projects.

To put this in context, the degree of constraints faced by a project (existing or future) has a direct impact on the expected ability of a project to cover their investment costs. Left unchecked, increasing constraints will also likely put significant upward pressure on overall costs of renewable development, something which is unlikely to be conducive to effective build-out of renewable energy in Ireland and will be a negative for the consumer. Whilst this investment is needed in areas throughout the country, we would specifically note the need for investment in the East Coast to accommodate the large volume of offshore wind expected to connect over the next decade.

Recommendation (mitigation): the development of hybrid connection policy and hydrogen strategy would facilitate diversity of generation at sites and a future in hydrogen production via electrolysers powered by wind energy.
Recommendation (mitigation): significant investment in grid infrastructure to reduce level of constraints and comply with Clean Energy Package requirements for active reduction in constraint levels.
Recommendation: DECC should include the risk of unused renewable electricity and increasing level of constraints it its supply side risks.

Delays to delivery of new generation and grid infrastructure

In order to meet our decarbonisation targets and ensure security of supply, Ireland plans to consent and construct 7 GW of offshore wind, double our onshore wind capacity to 8 GW, build 2.5 GW of solar and 2 GW of flexible thermal by 2030. We welcome these targets and have plans to bring forward our own projects in support of these ambitions.

Adequate resourcing - We are concerned, however, about the capacity of the planning system to deal with this volume of activity across energy sector. In relation to offshore wind, we welcome the enactment of the Maritime Area Planning Act at the end of 2021. This new Act modernises Ireland's offshore consent regime, will set up a regulatory authority and guide the development of ORE in Ireland. Scores of projects will need to apply for planning permission to An Bord Pleanala over the coming years. The Board, MARA and Statutory consultees, need to be resourced sufficiently to ensure project timelines are kept on track and Ireland is able to meet its offshore wind target. This will be vital in meeting the twin objectives of decarbonisation and bolstering our energy security.

Planning as a pre-requisite for ORESS - We also have concerns about the way in which it is proposed the Offshore RESS auctions will be structured (according to latest updates from DECC). To be eligible to

compete in the auction, projects will only require a Maritime Area Consent (MAC) rather that full planning permission. Whilst we understand the circumstances that led DECC to proceed with ORESS1 ahead of projects having planning permission (e.g. the limited pool of Phase 1 projects), we should not forget that this is a highly unusual and risky approach. Repeating this approach in ORESS2 would exacerbate that risk and undermine the credibility and, potentially, the success of Ireland's offshore sector in setting down the foundations for swift, well-managed and resourced projects that will lead to the achievement of our climate targets. This will not only increase the risk of awarding contracts to projects which are ultimately not delivered, but will undermine the credibility of the Irish offshore wind sector in the eyes of the global supply chain (as projects compete for the limited pool of boats, skills, equipment and manufacturing capacity).

Appeals and Judicial Review - All infrastructure projects also face the prospect of lengthy appeals and Judicial Review. As a responsible developer, we value a transparent planning system and judicial system whereby there is a fair opportunity and access for affected and interested members of the public to participate. We also value certainty, predictability and timeliness in relation to the planning process. As such, we welcome the review of the planning system that is currently underway and plans to reform the judicial review process to enhance the timeliness, efficiency, and cost-effectiveness of the process.

Potential mitigations/Recommendations

- Ensure An Bord Pleanala, MARA and Statutory Consultees are properly resourced for the volume of projects in Ireland's pipeline.
- Making planning permission a pre-requisite for participation in future Offshore RESS as is the case onshore.
- Prioritise the review of Ireland's planning system and bring forward judicial review reform to ensure fairness, transparency, timeliness and cost-effectiveness.

Market reform

Market reform is needed to better support development of new, dispatchable generation but also to support hydrogen plant conversion. We understand CEPA's report assumes that issues with the CRM are addressed as part of the recent review of the CRM undertaken by the SEMC. Addressing issues with the CRM and future-proofing it are critical to safeguarding our security of supply.

It is critical that the CRM is developed in a manner that will encourage the entry of new, domestic generation and we are aware of the ambitions of Government to deliver 2 GW of flexible generation to meet the needs of the country. However, the CRM is a blunt instrument at present when it comes to its use in the development of alternative fuel-driven generation (i.e. biofuels) and plant conversion of existing capacity contracted units (i.e. CCS or hydrogen). We do not consider it reasonable to consider that reform of the CRM has already been resolved as assumed in this consultation.

This is for the following reasons:

1. **Interconnector participation** - The impact of interconnectors in the CRM is one factor that is hampering the procurement of domestic generation, since interconnectors are assumed as generators for the purposes of the CRM design. As the single largest in-feeds, they effectively underestimate the capacity requirement for the system where the interconnectors are at zero (i.e.

the amount of domestic generation needed to power the country in the event of interconnectors not flowing or on export). We are recommending that interconnectors are no longer included in the CRM market design, or their de-rating factors are set to zero.

2. **CRM reform** - The type of reform identified in the associated CRM review would need to be implemented both in the existing framework and as part of the new CRM framework due for renewal and Commission approval in 2026, suggesting issues with the CRM will not fully be resolved quickly and could impact the time periods under consideration by this consultation.
3. **Best New Entrant** - The most recent signal of CRM reform is the Best New Entrant parameter. A consultation has been issued for its amendment, for implementation for capacity delivery year 2026/27. The Best New Entrant[2] is a parameter which signals the theoretical costs and investment for the best reference unit for prospective capacity to align to, when entering capacity auctions. The proposed Best New Entrant to be set for 2026/27 capacity delivery year is unlikely to promote the flexible generation being targeted by Government policy. This is due to the reliance in the underpinning analysis on an older turbine technology class which is also less flexible overall, and which we understand will not provide the conversion potential to hydrogen or other fuels. The last Best New Entrant remained in place for a four-year period. It is reasonable to assume a similar lifetime for the proposed amendment to this parameter, into capacity auctions targeting delivery in 2030.

The assumption, therefore, that all CRM market reform issues have been resolved and have met all their ambitions, is premature. There is a reasonable likelihood that impacts will be seen for the timeframe this consultation is considering.

More broadly with reference to market reform that encourages the development of flexible, dispatchable generation, it is worth noting that the market presents several complementary and essential revenue streams to encourage entry and retention of generation. An additional and significant revenue stream for the flexible generation expected to arrive is System Services. Where the value of these services is being eroded within its existing framework to 2025[3], and is suffering from high uncertainty beyond 2025[4], this effects the entry of new generation within the considered timeframe in this paper. Where CRM is a procurement mechanism, System Services is an operational mechanism. Both of these provide a signal for investment in new generation, and especially new, more efficient generation capable of providing more services to the system, e.g. black start.

Recommendation (mitigation): a strongly developed, flexible and future-proofed CRM where the eligibility of interconnectors has been reassessed. Investment certainty is provided in all aspects of market reform to encourage investor confidence in future procurement opportunities.
Recommendation: the CRM review should be considered a live consideration, rather than a resolved one for the purposes of this Security of Supply Review.

2 SEM-22-076 BNE-Net CONE Consultation Paper.pdf (semcommittee.com)
3 DS3-System-Services-Consultation-16-Sept-2022.pdf (eirgridgroup.com)
4 System Services Future Arrangements High Level Design Decision Paper | SEM Committee

Gas Quality

It is important Ireland ensures that gas quality is maintained at a level that does not pose risks to units on the system. Gas generators play a key critical role in ensuring security of supply. It is therefore essential that gas generation can operate reliably and flexibly. Any changes to the characteristics of the gas supplied to generators can affect the safe operation of the plant and its ability to meet system requirements. Gas turbines are tuned to specified gas compositions to manage combustions dynamics and emissions limits. Each one is different and needs to be assessed individually.

The Gas Safety regulations are currently under review in the UK. This could impact on the gas characteristics delivered e.g. a reduction in the Wobbe index[5]. This could cause gas turbines to reduce load or trip. It could also have other implications including a reduction in ability to deliver system services.

Gas Generators would need to know well in advance about the details of any change in gas quality and when this is likely to occur.

Recommendation: Any change to gas quality must be signalled well in advance to reduce the risk of any increase in risk to security of supply.

Q3. Are the five shock scenarios that were considered, and the additional scenarios related to the Russian invasion of Ukraine, sufficiently broad?

SSE note the scenarios outlined in the consultation:

1. *A 2-week cold spell based on 1 in 20 temperatures + low wind and low solar. (Weather affects all of Ireland and neighbouring countries/interconnected markets).*
2. *Scenario 1 + an outage of the largest electricity interconnector (EWIC in 2025 and Celtic IC in 2030) that last for 30 days.*
3. *Scenario 1 + an outage of the IC2 gas interconnector which lasts for 30 days*
4. *A full disruption of gas supplies from GB assuming average winter conditions which lasts for 7 days.*
5. *A longer disruption of gas supplies from GB which lasts 30 days assuming average winter conditions.*

We believe the shock scenarios look **reasonable**. As noted already, we believe a cybersecurity incident should have been modelled as a potential shock scenario. We would note that one of the likeliest though unplanned scenarios that could impact on system security is the **simultaneous trip or compound outages of units**. Whilst this scenario goes beyond the operational standards to which the TSO operates, multiple significant blackouts in European power systems have been seen due to this issue. This risk is likely to be heightened in a system with consistent reliance on older units, something which is likely to remain the case in Ireland over the coming decade.

[5] The Wobbe Index is used to compare the combustion energy output of different composition fuel gases.

Recommendation: DECC should consider inclusion of a further two shock scenarios, these being:

- Cyber-security incident
- Near-simultaneous trip of two generators

Mitigation Options

Q4. Do you have any additional mitigation options that you think should be considered?

Carbon Capture and Storage

We note that Carbon Capture and Storage (CCS) is not included on the long list of mitigation options. CCS may offer part of the solution for Ireland in providing low-carbon, flexible and dispatchable capacity that can simultaneously decarbonise the system and support security of supply.

We also note that CCS is being progressed in numerous other jurisdictions as a part of the overall solution for decarbonising the energy sector. SSE has multiple power CCS projects it is actively developing in GB having invested millions over the past 20 years. As is well understood, CCS has some natural advantages in GB that do not exist in Ireland including depleted North Sea oil/gas beds suitable for use as storage, as well as significant heavy industry which can also utilise CCS. Notwithstanding these points of difference, CCS does have potential in Ireland. An EAI study undertaken by MAREI (UCC) "Our e-mission future" illustrated the additional role that CCS could have in decarbonising the electricity sector. As the report notes, "Carbon capture and storage (CCS) is a uniquely important technology that features strongly in global scenarios that achieve Net Zero emissions in line with the Paris Climate Agreement".

To become a reality in Ireland, the approach may need to be different from that in the UK. The cluster approach favoured there, utilising a mix of power generation, heavy industry and North Sea storage to underpin investment in shared infrastructure, is likely to have less potential here. A "shipped" approach, however, may be more appropriate with carbon emissions shipped to countries with storage capability (such as Norway, something under active development as part of the "Northern Lights" project).

As with electricity generation from hydrogen, CCS will need a sound commercial structure and effective incentives, with some form of financial support potentially needed given the high costs associated with initial development and establishment of associated infrastructure. The CRM solely is unlikely to promote investment in such infrastructure given its relative costs versus unabated fuel-sources.

Recommendation: CCS should be included as a potential mitigation option.

Q5. Which gas supply mitigation options, if any, should be considered for implementation?

We note the following options from consultation:

- *Strategic gas storage*
- *Strategic Floating LNG*
- *Gas package – combination of strategic storage, renewable gas (biomethane and H2)*

SSE has no comment on the proposed options nor suggested addition options. As we note in response to Q6, however, hydrogen storage will be fundamental to the development of hydrogen in Ireland.

We would also reiterate the need for mitigation measures for any significant changes to gas quality (Wobbe index decrease/increase). As we highlighted earlier in our response, such a change could impact on security of supply if not mitigated effectively. We note such a change is under consideration as part of the gas code modification process but may require wider stakeholder input (including Government) depending on how it progresses.

Q6. Which electricity supply mitigation options, if any, should be considered for implementation?
and
Q8. Do you have any views on how the mitigation options should be implemented?
SSE has responded to Q6 and Q8 together for ease of reference (i.e. noting additional risks alongside mitigations/recommendations for the same).

We outline below our views on the electricity supply mitigation options.

Additional interconnection

As outlined above, interconnector benefits should be considered in the context of facilitating the rollout of wind power and delivering consumer benefit (where demonstrated by a cost benefit analysis). We believe is it fundamental to Ireland's security of supply that our generation capacity requirement is covered by domestic generation/technologies, and that interconnectors are not relied upon to meet this demand (given the potential that they will export at times of need). Please see our response to Q1 and 2 for further detail.

Additional pumped storage

SSE has a rich heritage of hydro development primarily in Scotland. We operate eight hydro schemes in Scotland. We constructed the first large-scale hydro power station in Scotland in 2008 since the hydro revolution of the 1940s and 50s, Glendoe. Our hydro portfolio totals 1,459 MW and includes 300 MW of pumped storage and 750 MW of flexible hydro. We are also developing the 1,500 MW Coire Glas pumped storage scheme. Should the project receive consent it would double the current storage capacity in Great Britain.

In our experience, it can take a decade or more for a pumped storage project to go from concept to operation. While this technology is a good option to bolster security of supply, we do not believe it to be feasible by 2030.

Lower carbon fuels as a pathway to hydrogen (Biofuel plant)

Biofuel and biodiesel-powered plant provide a potential steppingstone to the delivery of decarbonised flexible generation and, specifically, hydrogen powered generation. At present, full hydrogen powered generation is unlikely to be viable given high cost threshold and minimal production, storage and transport infrastructure in Ireland. This should change in future years, with the Government's hydrogen strategy well placed to drive a hydrogen economy. In the near-term, however, hydrogen-ready generation could be

developed with the use of alternative fuels, which are lower carbon than the counterfactual gas, distillate and heavy fuel oil, such as biofuel or biodiesel. Such developments could provide near-term security of supply with lower life-cycle CO2 emissions than current fossil-fuel powered generation.

SSE Recommendation: Government should support use of biofuel and biodiesel, where it can be sustainably sourced, in support of security of supply and as a steppingstone to hydrogen powered/decarbonised generation.

Increased secondary fuel storage

Secondary fuel requirements are a significant commitment for existing conventional generators to provide comfort to the system in the event specifically of a gas supply interruption. Where there is an expectation for fuel storage to be increased, we expect this relates to obligations on generators or NORA to hold extra stocks. We acknowledge that many countries have chosen to move away from the requirements for holding of secondary fuel. We respect the need for this to remain in place in Ireland given its unique characteristics as a small island nation on the end of the European network and reliant on gas imports.

However, it is important to be aware that any increase fuel storage comes at significant cost and waste to generators. The tanks to store secondary fuel, take considerable space on sites where land is always at a premium. Generators are not remunerated for the cost of continuing to hold secondary fuel stocks and generators have no ability to run on secondary fuel unless instructed by the TSO during a gas supply interruption. The additional burden of provision of this service should, therefore, be weighed up against the likelihood it will ever be required. In Ireland, we have never yet had cause for generators to run continuously on the secondary fuel they must maintain at site. The rationale for increased fuel storage is, as such, unclear.

We would, instead, be in favour of a focus on other forms of energy storage that can better utilise the significant renewable resources we have but cannot be fully optimised given infrastructure limitations currently. This could be a significant area of innovation for Ireland and could set us in the lead again in terms of best realisation and use of our domestic renewable resources.

The ambition for additional secondary fuel storage could be seen to relate to the criteria for Large Energy Users[6] to have dispatchable back-up generation that also holds stocks of secondary fuel, as a requirement to secure a grid connection. We have signalled before that this could be counterproductive to emissions targets since this back-up would contribute to emissions and would be difficult to monitor. There are no obligations to ensure any of such back-up meets ambitions for net zero or carbon abatement and, therefore, significant caution should be taken in the rollout of any such requirement.

Lastly, on the subject of emergency scenarios, where secondary fuel storage would be utilised, it is important to reference black start. There is the potential for the development of a market for black start services[6] which effectively mitigate the scenario of blackouts on the system. We believe the TSO has been asked to explore the potential for such a market to be developed, in line with EU obligations on TSOs to have planning and contingencies to govern Emergency Restoration and Market Suspension. In the context

6 CRU2113-Emergency-Restoration-Network-Code-Decision.pdf (section 4.3)
Full-Technical-Report-on-Shaping-Our-Electricity-Future.pdf (eirgridgroup.com) (footnote 64)

of a review of Security of Supply, it is worth making it clear that these contingency options are not currently available transparently in the SEM via a market or other framework. The development of a black start market would represent an additional investment signal for the type of high efficiency, high flexibility generation that Government is expecting.

SSE Recommendation: The development of a black start market should be considered to drive investment in system security resilience.

Hydrogen plant conversion (CCGT to hydrogen)

We believe this option offers opportunities to meet the twin objectives of safeguarding our security of supply and decarbonisation and should be taken forward as a priority. SSE sees the use of hydrogen in the power sector as a significant near to medium-term priority in Ireland. This can provide new or repurposed, decarbonised flexible generation capacity to underpin security of supply. Given current security of supply challenges, Ireland is presented with a clear imperative to get new generation capacity onto the system. We should also consider the role that existing assets, sites and grid infrastructure can play in realising this opportunity as soon as possible. We welcome the identification of hydrogen plant conversion as a potential mitigation option.

Ireland's potential for renewable energy is considerable but to ensure security of supply firm and dispatchable generation options will be necessary, particularly as electrification drives an increasing dependence on a reliable electricity supply. Hydrogen-fired power stations can play this crucial role, enabling load shifting of renewable power through the production, storage, and subsequent deployment of hydrogen to power thermal generation. These power stations can also provide system services needed to balance the grid which are currently provided by the existing synchronous, unabated power stations.

Development of gas-fired turbines which can be fired on up to 100% hydrogen is continuing at pace as countries across the EU commit to this transition. All major turbine producers are also committing to transition to 100% hydrogen fired power generation, thereby introducing an additional form of incentive to transition towards this form of thermal generation.

As noted in our introduction, SSE has partnered with Equinor to jointly develop Keadby Hydrogen, the world's first major 100% hydrogen-fuelled power station. This station will replace older, carbon-intensive generation on the electricity grid, providing flexible and efficient power to support variable renewable generation and maintain security of supply. It will have a peak demand of 1,800 MW of hydrogen, producing zero emissions at the point of combustion and will be the world's first major 100% hydrogen fired power station, securing at-scale demand for hydrogen in the region for decades to come. It is estimated that the demand from the facility could account for a third of the UK's 5 GW hydrogen production goal. With appropriate policy mechanisms in place, Keadby Hydrogen could come online before the end of the decade.

The project will use the parallel hydrogen and CO2 pipeline infrastructure being developed by the Zero Carbon Humber (ZCH) partnership – which includes Equinor and SSE Thermal – and offshore CO2 infrastructure developed by the six-member Northern Endurance Partnership (NEP) – which includes Equinor. Both ZCH and NEP won public funding from the UK's Industrial Strategy Challenge Fund in March.

Critically, hydrogen powered generation could not only be crucial to maintaining a sufficient, flexible, and decarbonised energy supply but can establish a significant and credible demand base for hydrogen in Ireland. This, in turn, can underpin investment in large scale production of hydrogen, something which will open up access to hydrogen in other sectors.

We believe that to realise the opportunity offered by Hydrogen, Ireland will require the creation of an entirely new value-chain comprising:

- Low-carbon Hydrogen Production – primarily through electrolysis, maximising Ireland's renewable energy generation potential to produce 'green' hydrogen.
- Hydrogen Storage – vital to the efficient management of an energy system, balancing mismatch between demand and supply and providing security.
- Hydrogen Transport and Supply – Infrastructure and systems to connect hydrogen producers with hydrogen users.
- Hydrogen Use – Growth in hydrogen demand from a range of sectors including industry, transport, power generation, production of hydrogen derivatives and export to other markets.

Without the appropriate incentive, the market does not currently support hydrogen plant conversion. Business models need to address more than just the cost of low carbon hydrogen. The cost can be subsidised to the same level of natural gas/other counterfactual fuel, but there are additional risks which bring additional costs that aren't solved purely through intervention in the production market. This includes new equipment (bringing additional risk and cost), and a higher fuel security risk (in the short to medium term given the lack of established hydrogen supply chain).

SSE Recommendation: We strongly welcome the identification of hydrogen plant conversion as a potential mitigation option, the development of which will require the appropriate business models and a cohesive hydrogen strategy for Ireland.

Policy measures

Q9. Do you support the policy measures proposed in section 8 of the consultation paper?

We note the following policy measures in the consultation:

Joint planning

We note the suggestion that the annual assessment for electricity and gas should be produced collaboratively and jointly by the operators of the electricity and gas transmission and distribution networks. As the consultation notes, interdependency between electricity and gas is likely to increase in coming years and, as such, **we support the proposed measure**.

Regular Energy Security reviews

We support technical analysis on energy security every 2 years. It will be key to establish what role this report would have and to what extent would it be an input into the work undertaken by CRU and EirGrid to secure the system (e.g. grid planning, capacity market).

International Arrangements

SSE strongly supports continued collaboration with UK and EU on all matters in relation to energy and, specifically, in relation to our mutual security of supply.

Q10. What further tools and measures do you think would contribute the most to Ireland's energy security of supply

Adequate Grid Infrastructure

Security of supply needs to be attained in tandem with improving the grid capacity. Electricity will form a much larger proportion of final energy consumption towards 2030. This will require significantly more transmission infrastructure, non-infrastructure solutions, and the upgrade of the existing network. Development of the grid must not become the key barrier to meeting decarbonisation targets thereby requiring more expensive short-term measures. Debate has focused on utilising existing grid infrastructure as much as possible, and this is important, but this does not negate the need for new grid investments.