

Consultation on IPA minded-to decision for the OHA Pilot Projects

Clara Semal & Rob Rome
Director of European Business Development & Commercial, Customer & Regulation Director
National Grid Ventures
Ventures House, Warwick Technology Park, Gallows Hill
Warwick
CV34 6DA

Bert Maes
Project Director Nautilus
Elia Transmission Belgium
Boulevard de l'Empereur 20, 1000 Brussels
Belgium

Ofgem
10, South Colonnade
Canary Wharf
London
E14 4PU

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Dear Ofgem,

NGV and Elia Joint Response to the consultation on Ofgem's Cap and Floor regime: Initial Project Assessment of the Offshore Hybrid Asset Pilot Projects

Thank you for the opportunity to respond to the above consultation.

National Grid Ventures (NGV), together with our European partners, successfully operates six point-to-point interconnectors connecting to GB. Elia is the national TSO of Belgium and operates two point-to-point interconnectors, including Nemo Link, the joint Elia-NGV cap and floor pilot project.

NGV and Elia are jointly developing the Nautilus project, connecting GB to the Princess Elisabeth Island (PEI), the world's first artificial energy island, currently under development by Elia. Once constructed, the world leading PEI will host, among others, a HVDC node to connect 1.4GW of offshore wind, while also serving as a landing point for interconnectors that link Belgium to its European neighbours.

This is a joint response on behalf of NGV and Elia, with respect to Nautilus, one of the two Offshore Hybrid Asset (OHA) projects selected for Ofgem's Cap and Floor OHA Pilot scheme. NGV is submitting a separate response with respect to the second OHA project, LionLink. Please consider this to be a public response, except for those annexes marked as confidential.

We strongly disagree with Ofgem's minded-to position to reject a regulatory regime for Nautilus. The Nautilus project offers strong and broad benefits to GB consumers and the UK. This response provides details on project developments, and presents wider evidence of the benefits case, to justify the approval of Nautilus to the OHA pilot scheme. Some of these benefits can be quantified into monetary terms, while other less tangible long-term advantages cannot. In our view, the quantified elements that form Ofgem's CBA of Nautilus have resulted in an under-estimation of its net monetised benefits which we do not consider to be representative of the full value of progressing the project.

The key role that OHAs can play in enabling the deployment of offshore renewables to meet the UK's decarbonisation policy objectives and targets was clearly articulated by Ofgem in its Interconnector Policy Review¹ and recognised in its decision to open a dedicated pilot scheme for OHAs. In the case of these early hybrid interconnection opportunities, it is right that alignment with government policy direction and strategic benefits contribute to Ofgem's assessment of the pilot projects, and we are disappointed by the misalignment in Ofgem's minded-to decision to reject the pilot OHA regime for Nautilus.

The regulatory assessment of new cross-border infrastructure needs to recognise the strategic value of offshore hybrid projects for delivering security of supply, enabling decarbonisation as well as consumer affordability and avoid adopting narrow interpretations of quantified benefits.

In the IPA consultation, Ofgem identified three key issues on which its minded-to reject position for Nautilus was based: reservations surrounding high constraint costs and the impact on GB consumers, uncertainty over project configuration and cost-revenue sharing arrangements for welfare allocation between GB and Belgium. All three key issues are directly addressed within the confidential annex of this response.

We believe that the evidence presented in this response justifies a revision to Ofgem's position for the project to be approved into the OHA pilot scheme.

If you have any questions or require further details on the content of this response, please contact Miles Ten Brinke (NGV - miles.brinke@nationalgrid.com) or Thomas Van Den Broucke (Elia - thomas.vandenbroucke@elia.be).

Yours sincerely,

Bert Maes, Project Director Nautilus (Elia Transmission Belgium)
Clara Semal, Director of European Business Development (NGV)
Rob Rome, Commercial, Customer and Regulation Director (NGV)

¹ <https://www.ofgem.gov.uk/sites/default/files/2021-12/ICPR%20Decision%20Paper.pdf>

Executive Summary

NGV and Elia strongly disagree with Ofgem's minded-to reject position on the Initial Project Assessment of Nautilus.

- National Grid Ventures (NGV) and Elia disagree with Ofgem's conclusion that the benefits offered by the Nautilus project do not justify its approval for award of an Offshore Hybrid Asset (OHA) pilot regulatory regime.
- Nautilus will:
 - Deliver huge benefits to British and Belgian consumers, producers and both economies.
 - Facilitate the build-out of offshore wind by increasing the export capabilities of GB, reducing the need for wind curtailment and reducing overall carbon emissions across GB and Europe.
 - Enhance the security of supply of both GB and Europe.
 - Pave the way for the UK's delivery of coordinated hybrid infrastructure in the North Sea.
- Nautilus allows the UK to extend its energy cooperation with Belgium and has secured strong political support from both countries, including Project of Mutual Interest status.

Regulatory delays have had material impacts to this project and presents risks to the viability of UK participation in future projects. Now is the time to act and proceed.

- Ofgem's IPA process has endured successive regulatory delays. A firm IPA decision was originally anticipated by the end of 2023. These delays have materially impacted programme cost, schedule and NGV's position as project partner.
- The prevailing regulatory uncertainty prevents NGV and Elia from entering firm commitments with the supply chain to progress Nautilus and mitigate against the risks to costs and schedule of the increasingly constrained global supply market.
- The pace of change across the global supply chain, industry and policy environment means that a drawn-out regulatory assessment process is at risk of being undermined by external factors even before it concludes. Ofgem needs to act with urgency to enable the build-out of this strategic offshore energy infrastructure.
- European TSOs will be watching this GB regulatory process to assess the viability of developing hybrid projects with the UK. It's essential that the UK can signal its ability proceed with these complex multi-party delivery programmes.

The strategic value of Nautilus to the UK as crucial infrastructure should not be underestimated. OHAs are the first step towards integrated North Sea coordination that offer direct GB consumers benefits, enable the integration of renewable energy and strengthen the resilience of our power system.

- The rapid expansion of offshore wind is a cornerstone of the decarbonisation policies of both the UK and EU and the extensive deployment of interconnection is seen as a key enabler to integrate that renewable energy.
- The UK government has set decarbonisation targets to create 50GW of offshore wind and 18GW of interconnector capacity by 2030. Our European neighbours have similar ambitions with the European Commission committing to 300GW of offshore wind by 2050, alongside interim combined targets that the UK government supported in various North Sea summits.
- The strategic direction expressed by European TSOs and policy makers is that future cross-border projects should take the form of hybrid interconnections as the offshore build-out moves towards renewables-integrated grids.

- In contrast to point-to-point interconnector projects, the case for OHAs is no longer primarily commercial. As strategic grid infrastructure extends to offshore, the traditional economic assessment undertaken by Ofgem is too narrowly focused and does not capture the full value to be gained from progressing OHAs, especially in critical benefits such as security of supply, carbon reduction and reduced curtailment.
- The vision of the future GB decarbonised energy system relies on the integrated North Sea cross-border network. The vision of the future GB decarbonised energy system relies on the integrated North Sea cross-border network supporting a more variable renewables-based energy system. We need to make progress and ensure the UK learns, gains experience and credibility if we are to influence the rules and framework for this coordination. Non-Standard Interconnectors (NSIs), the category of OHAs defined by Ofgem as including EU but not GB offshore wind, are the first step in this development and this is a critical window of opportunity - we need to act.
- Ofgem's net zero duty enables it to take into account decarbonisation targets in key energy infrastructure decisions that are aligned to decarbonisation policy objectives. It is clear that the strategic value of OHAs must be factored into Ofgem's assessment of Nautilus which will strengthen the assessment of Nautilus.

Ofgem's economic assessment undervalues the case for Nautilus and there is continued uncertainty around some of the fundamental assumptions that will impact results. The monetised results should not be interpreted as precise evaluations of project impacts in the way it appears they have been.

- Ofgem's economic assessment has been narrow and appears to be primarily based on the traditional approach to assessing point-to-point interconnectors. This framework is no longer representative of the drivers or benefits of progressing these pilot projects.
- It is unclear how much weight Ofgem has assigned to the hard-to-monetise benefits, such as security of supply, decarbonisation impacts and reduction in wind curtailment. These elements, along with the strategic opportunity that the project represents, all contribute to its economic and societal value. If hybrid projects continue to be tested only on the basis of socioeconomic welfare, there will be high risk of stagnation (which we are already observing with UK interconnector projects) in the essential build-out of cross-border infrastructure.
- The modelled GB constraint costs are over-estimated and should not be interpreted as consumer disbenefits when in fact they provide a signal for network reinforcement.
- Ofgem's analysis grossly underestimates the benefits of Nautilus and overestimates its costs due to the methodology adopted and assumptions applied.
 - The economic assessment relies on extreme decarbonisation and price trajectories for GB and EU countries that make GB predominantly the net exporter, which will drive distribution of welfare benefits, congestion revenue allocation and decarbonisation benefits.
 - Referencing the Marginal Additional results will lead to the most conservative view of benefits especially in the context of IPA minded-to positions on projects in this window, one option to derive a more reflective view of impacts may be to undertake MA analysis on a smaller pool of the highest scored projects, among which the Nautilus project, should be performed.
 - The economic assessment assumes an inflated interconnector capacity baseline which results in undervaluing the incremental impact of Nautilus, which, as discussed, is exacerbated by the focus on Marginal Additional results only.

- The cumulative impact of the assumptions and modelling decisions that Ofgem has made has resulted in an extremely pessimistic view of net project benefits (due to undervalued benefits that have been further reduced by inflated constraint costs).

It is right that OHAs are being assessed within the pilot scheme which should be treated as a process that is distinct from the established regime for point-to-point interconnectors.

- The purpose of the pilot scheme is to recognise different regulatory framework requirements for new asset types, this provides a great opportunity to learn and adapt and the pilot regime should avoid rigid constraints from past precedent.

The Nautilus project offers significant long-term value to GB consumers and is strategically vital for both the UK and Belgium, the broad benefits it offers justifies its approval for a regulatory regime.

1.1. NGV and Elia strongly disagree with Ofgem’s minded-to reject position on the Initial Project Assessment of Nautilus.

NGV and Elia strongly disagree with Ofgem’s conclusion that the benefits offered by the Nautilus project do not justify its approval for award of an Offshore Hybrid Asset (OHA) pilot regulatory regime.

Nautilus will deliver tremendous strategic value to GB. The insights and practical experience gained from the development of hybrid technology will place the UK in a leading position to shape the regulatory arrangements and deliver these new types of assets.

In addition, Nautilus will deliver significant benefits to GB, Belgium and Europe. The project will provide reliable and affordable energy supplies to British and Belgian consumers, as well as maximise the use of clean energy by providing mutual cross-border access to those resources. This, in turn, will help reduce overall carbon emissions across Europe. Crucially, Nautilus will enhance the security of supply of both GB and Europe and pave the way for the UK’s development and delivery of coordinated hybrid infrastructure in the North Sea.

The Nautilus project allows the UK to extend its energy cooperation with Belgium, as celebrated by both Belgian Energy Minister Tinne Van der Straeten and UK Energy Minister Andrew Bowie on 14 December 2023 at the British Embassy in Brussels, Belgium. Nautilus has rightly been given strong political support from both countries, as well as having secured Project of Mutual Interest (PMI) status².

1.2. Regulatory delays can have material impacts, both to this project and present risks to the viability of UK participation in future projects. Now is the time to proceed.

Ofgem’s IPA process has endured successive regulatory delays, a firm IPA decision was originally anticipated³ by the end of 2023, the delays experienced materially impact programme cost, schedule and the perception of NGV as a viable project partner.

Nautilus is part of a broader programme of works around the Princess Elisabeth Island (PEI), led by Belgium. This ambitious programme is leading the way in Europe as an example for the successful deployment of a major hub for offshore wind. Now is a critical window of opportunity for UK partnerships in early flagship European programmes such as these. Participation requires developers to keep pace with multi-party timelines against the backdrop of an increasingly constrained global supply market. If Nautilus does not proceed now, future opportunities may be more limited for the UK or only available at a significantly higher cost to the consumer. Learnings which can build towards future energy islands or meshed offshore hubs would also be lost.

² Projects of Mutual Interest (PMI) are key cross-border energy infrastructure projects between the EU and non-EU countries, which contribute to EU energy and climate policy objectives. Alongside the Projects of Common Interest (PCI) which link EU countries, PMIs are internationally recognised for contributions to energy and climate goals and benefit from streamlined planning and regulatory approvals.

https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_6048

³ ‘Update following our consultation on the Multi-purpose Interconnector interim framework’ Dec-22

The prevailing regulatory uncertainty prevents NGV and Elia from entering firm commitments, with each other and with the supply chain, to deliver Nautilus.

There are significant interactions between the Nautilus project and Elia's PEI programme of works⁴. Given those interactions, as well as lead times for various components, firm supply chain commitments need to be made very early on to secure timely delivery. The continued regulatory uncertainty over Nautilus and the GB regulatory regime, challenges our ability to proceed with these complex multi-party delivery programmes. This in turn is likely to send an unhelpful signal to other European TSOs who will be watching this GB regulatory process to assess the viability of developing any future hybrid projects with the UK.

The pace of change across the global supply chain, industry and policy environment means that a drawn-out regulatory assessment process is at risk of being undermined by external factors even before it concludes. Ofgem needs to act with urgency to enable the build-out of this strategic energy infrastructure.

OHAs are strategically critical for the UK's position in the buildout of the North Sea and, ultimately, enabling a decarbonised energy system.

2.1 OHAs enable the integration of renewable energy and strengthen the resilience of the GB power system.

The accelerated deployment of offshore wind is central to the decarbonised energy systems envisaged by government policy in both the UK and EU, with UK targets to create 50GW of offshore wind by 2030 and the EU's target of 300GW of offshore renewable energy by 2050. These ambitions have been reinforced by the collective commitments made by the North Seas Energy Cooperation (NSEC) countries for the expansion of offshore wind in the North Sea. At the second North Sea Summit in April 2023 in Ostend the expanded group of nations, which included Great Britain, agreed to enhance the network of interconnected infrastructure across the North Sea with combined offshore wind targets of 120GW by 2030 and 300GW by 2050. Cross-border infrastructure built on the foundation of clear policy and planning is critical to enable this. The UK government has an interconnector capacity target of 18GW by 2030 and we are failing to deliver this with only 9.8GW operational today and a further 1.9GW under construction. Similarly, the 2035 GB interconnector capacities anticipated in the latest 2023 Future Energy Scenarios appear increasingly unlikely to be realised⁵, particularly those under Leading the Way and Consumer Transformation.

Significant flexible cross-border transmission capabilities will be needed to ensure that the rapid expansion of offshore wind capacity is cost-effective such that the operation of that capacity avoids renewable curtailment, and, in periods of low generation, consumer demand is met at the most affordable prices. OHAs play a critical role in delivering these ambitions.

2.2 OHAs are the first step towards integrated North Sea coordination.

Combining interconnection and offshore wind, OHAs are the next generation of transmission assets that can bring the UK closer to the decarbonised, affordable and secure whole energy system envisioned by government. Representing a departure from traditional point-to-point interconnectors

⁴ Public consultation on PEI conducted by Elia from 20 November 2023 to 22 January 2024

https://www.elia.be/en/public-consultation/20231120_public-consultation-task-force-princess-elisabeth-zone

⁵ FES23: 12-17GW by 2030, 15-24GW by 2035

and radial wind connections, these cross-border connections offer more efficient use of clean energy, reduced offshore electricity infrastructure and a reduced onshore footprint of projects landing at UK coastlines. Participation in the delivery of these complex first-of-a-kind projects represents a strategic opportunity for the UK to position itself as a committed and influential player in the development of the North Sea, learn through their development and ensure that this learning is fed into the UK's strategic planning of transmission build out. The UK's policymakers, regulators and developers will be able to gain invaluable first-hand experience and learnings that can be applied to the benefit of future projects as offshore electricity infrastructure development accelerates. Importantly, demonstrable experience and commitment in these early hybrid opportunities, will bolster the UK's ability to influence the development of the regulatory frameworks and supply chain practise that will determine the coordination of energy resources in the North Sea.

2.3 The strategic plans of European TSOs and policy makers for cross-border projects is hybrid interconnection.

With the strategic targets for offshore wind and further interconnection both in the UK and in Europe, it's becoming increasingly clear that point-to-point cross-border links and radial offshore wind will not be sufficient for an expansion of this magnitude. This is particularly true for the North Sea region where more offshore coordination of energy transmission and rationalisation of the connection framework will be required, to fully benefit from the plentiful supply of renewable energy within that geographical area.

At the European level, the overall direction of travel is clear. Various studies undertaken by both the European Commission as well as the European Network of Transmission System Operators for Electricity (ENTSO-E) have highlighted that multi-purpose and hybrid projects will play a key role in facilitating the evolution of offshore transmission infrastructure. They are also the essential first step towards the eventual construction of more complex 'meshed' grid structures, which could allow clusters of offshore wind farms to be connected to offshore hubs that connect to each other between various onshore terminals⁶.

Echoing this, the most recent policy positions and messaging from European TSOs is that the appetite for future point-to-point connections is now limited and that opportunities to collaborate on increasing cross-border capacity will be hybrid projects. Statnett has been commissioned by The Norwegian Ministry of Petroleum and Energy to investigate potential grid solutions of hybrid offshore wind connections, which will inform future offshore policy decisions⁷. In a recent consultation by the French regulator CRE on the opportunity for new interconnection capacity between France and the UK, the indication from RTE's assessment is potential support for one further 1GW interconnector project⁸. Meanwhile, TenneT and Elia, NGV's partners on LionLink and Nautilus have respectively published leading thought pieces on progressing hybrid projects and their market arrangements⁹.

2.4 Ofgem's Net Zero Duty provides latitude to make strategic decisions in line with long-term objectives.

Ofgem's recently acquired net zero duty strengthens its ability to consider a broader view of policy alignment and long-term environmental, economic and fiscal growth impacts when making regulatory decisions such as this on strategic energy infrastructure. In our view, the assessment of the OHA projects should also reflect on this new mandate, which directly links consumers' interests to specific net zero targets.

⁶ European Commission, Directorate-General for Energy, Antoine, O., Papangelis, L., Michels Alfaro, S., et al., Technical requirements for connection to HVDC grids in the North Sea, Publications Office, 2020; ENTSO-E, Third ENTSO-E position paper on Offshore Development on interoperability (January 2021).

⁷ [Options for future offshore grid | Statnett](#)

⁸ [Public consultation no.2024-01 of 5 March 2024 on the opportunity for new electricity interconnection capacity between France and the United Kingdom \(cre.fr\)](#)

⁹ [Paper on making hybrids happen published March 2024; Offshore bidding zone paper published April 2024](#)

In contrast to point-to-point interconnector projects, the case for OHAs is no longer primarily driven by the price difference between the connecting markets. Being strategic infrastructure, the OHAs offer a number of other benefits, many of them being much harder to monetise. Therefore, the traditional economic assessment undertaken by Ofgem is too narrowly focused and does not capture the full value to be gained from progressing the OHA projects.

The monetised results from Ofgem's CBA assessment fail to capture the full value to GB of delivering Nautilus.

3.1 Ofgem's economic assessment undervalues the case for Nautilus and the monetised results should not be interpreted as precise evaluations of project impacts.

NGV and Elia disagree with Ofgem's minded-to position to reject the project and Ofgem's CBA underestimates the value of the benefits that delivering Nautilus offers to GB.

Having secured PMI status, which Ofgem supported, Nautilus has been recognised as 'strategically beneficial' for GB, Belgium and Europe. In our view, while these strategic benefits cannot be monetised easily, they are critical to realising the UK's long-term decarbonisation ambitions and it is right that they contribute to Ofgem's overall IPA assessment. However, the monetised costs and benefits that have formed Ofgem's CBA, have underestimated the net benefits to be gained from delivering the project.

In summary:

- All cost benefit analysis (CBA) modelling is necessarily subject to limitations and sensitive to the input assumptions taken at the point of analysis. In our view, some of Ofgem's CBA choices have resulted in an underestimation of the quantifiable net benefits of Nautilus.
- The socioeconomic welfare (SEW) assessment is not reflective of the primary drivers for progressing OHA projects.
- OHA projects offer significant wider benefits through enabling the future decarbonised energy system: avoided renewable curtailment, avoided CO₂ emissions, avoided loss of load and redispatch savings. This value is not fully captured in the assessed monetised benefits.
- The modelled GB constraint costs are over-estimated and should not be interpreted as consumer disbenefits.

3.2 Sensitivities and Interpretation of the CBA analysis

All cost benefit analysis (CBA) modelling is necessarily subject to limitations and sensitive to the input assumptions taken at the point of analysis. In our view, some of Ofgem's CBA choices have resulted in an underestimation of the quantifiable net benefits of Nautilus.

- **The interconnector capacity baseline in Ofgem's CBA is inflated at 14.3GW**, of which 2.6GW (~20%) represents projects that have not yet taken final investment decision and there is no clear path to delivery (primarily because of lack of support in the connecting country). Frequently, the modelling effect of this is to dilute credible project benefits, and this will be particularly true for quantified security of supply benefits. This effect, of producing suppressed project benefits, is considerably exacerbated in the results of the Marginal Additional (MA) approach, for which the interconnector capacities of the seven projects being assessed in the third interconnector application window and the second OHA pilot project are assumed within the baseline.

- **Primary reference to MA results will provide the most conservative view of project benefits.** The combined use of the First Additional (FA) and MA modelling produces an envelope of upper and lower bounds for potential project impacts. However, in the context of Ofgem’s minded-to positions for projects in this application window, the prioritisation of MA results risks distorting system margins and significantly understating expected benefits that the project will deliver. Only one Window 3 project has a minded-to approve position and the reject positions have sometimes been on grounds external to the main CBA metrics, such as maturity or deliverability in the connecting country. The effect of this is to dilute the benefits of the other projects being assessed, in contrast to the FA results which will be a closer reflection of reality. This is particularly the case for security of supply results for which the value of benefits, as discussed later in this section, are underestimated.

In forming its final evaluations of likely project benefits, Ofgem should consider either reviewing the FA results of the strongest three to four projects, Nautilus being one of them or undertaking a second iteration of MA analysis for Nautilus on that smaller pool of strongest projects. Doing so would better reflect the benefits of those projects being progressed.

- **The choice of EU energy scenario implies an extreme projection of GB as a net exporter.** An interconnector project’s CBA will be highly sensitive to the energy scenarios used in the modelling, on both sides of the cross-border connection. While three FES 2022 scenarios are used in Ofgem’s analysis for GB, for EU countries a single scenario is used based on the 2020 Ten Year Network Development Plan (TNYDP). Consequently, it is clear that the EU assumptions do not fully capture the more recent government policy positions of connecting countries, resulting in a faster trajectory of decarbonisation for GB than in the Belgium and EU. This included assumptions for Belgium on capacities of nuclear, offshore wind, CCGT and interconnection.

This will fundamentally impact the projected price differentials and interconnector flows, which in turn will affect the profile of SEW benefits and projected constraint costs. The results of studies undertaken by NGV and Elia have indicated stronger economic benefits from Nautilus than those produced in Ofgem’s CBA (e.g. positive consumer welfare impacts over the 25-year period in four out of five studies), and we expect that one of the key differences has been the European input assumptions (concrete figures of these studies can be found in the confidential annex to this response). Most importantly, these studies use the more recent TYNDP 2022 scenarios. We note that the IPA CBA is an outlier, resulting in the highest net exports from GB – the other CBAs had more varied results, predominantly GB export but at far less pronounced levels based on a less exaggerated difference in assumed GB and EU connecting country decarbonisation trajectories.

3.3 Interpretation of socioeconomic welfare (SEW) results

The socioeconomic welfare assessment (SEW) is not reflective of the primary drivers for progressing OHA projects.

Total welfare benefits of interconnector projects are typically low. The SEW assessment has been the conventional approach for providing a quantitative assessment of interconnector projects in the cap and floor application windows. With GB having typically been projected to be the higher priced market and net importer in previous windows, for previous interconnector projects it has been relatively simple to demonstrate their direct consumer welfare benefits. However, it should be noted that the CBA net *total* welfare impacts of these projects were still relatively marginal and it appears that the economic case was based on the modelled consumer benefits (see Table 1 for total welfare impacts of the Windows 1 and 2 projects that have taken Final Investment Decision (FID)). NSL, IFA2

and Viking Link are now all operational and, alongside the wider GB interconnector portfolio, have delivered demonstrable value to GB consumers, especially through their contributions to security of supply. Ofgem was right to approve these projects for the regulatory regime but might not have done so had a narrow focus been taken on the total welfare alone.

Table 1: Total GB welfare impacts, NPV (MA results) for cap and floor regime projects that have taken FID

£ bn	Base	Low	High
NSL (2013 prices) ¹⁰	0.3	-0.8	1.0
IFA2 (2013 prices) ¹¹	0.1	-0.3	0.4
Viking Link (2013 prices)	0.2	-0.6	0.6
Greenlink (2013 prices) ¹²	0.1	-0.1	0.3
NeuConnect (2015 prices) ¹³	-0.3	-1.0	0.4

With GB forecast to be a net exporter, the shift in the allocation of welfare derived from additional interconnection to GB was anticipated in the conclusions of Ofgem’s Interconnector Policy Review. However, despite direct GB consumer benefits no longer being the principal advantage of additional cross-border capacity, Ofgem rightly proceeded with announcing this latest cap and floor application window based on the opportunity for broader benefits for the UK, in line with government policy ambitions.

For Nautilus, higher projected GB exports will benefit the producer welfare in GB and the consumer welfare in Belgium. Ofgem’s assessment of SEW impacts of Nautilus broadly finds net improvements in total welfare from the project (ranging between £0.4bn to £1bn under the MA analysis). While NGV and Elia agree that under most scenarios the net SEW impacts of Nautilus will nevertheless be positive, **it is not appropriate to focus narrowly on the total welfare benefits as the monetised evaluations of the OHA projects.** The key advantages of delivering the OHA projects are captured in wider benefits elsewhere.

3.4 The wider benefits of OHAs projects

OHA projects offer significant wider benefits through enabling the future decarbonised energy system: avoided renewable curtailment, avoided CO2 emissions, avoided loss of load and redispatch savings. This value is not fully captured in the assessed monetised benefits.

OHAs, and interconnection more broadly, will be critical to ensuring a resilient decarbonised electricity system. The UK government’s energy security strategy and ESO’s Future Energy Scenarios (FES) have both identified the importance of increasing the deployment of flexible technologies, specifically interconnectors, to enable security of supply. Interconnectors are one of a few clean, mature flexibility solutions that can be deployed at scale to help the UK meet its 2035 clean power system and 2030 offshore wind targets as part of wider energy security goals.

It is not clear that the principal benefits that Nautilus delivers are adequately recognised within the monetised assessment of the project.

- GB security of supply is under-valued in Ofgem’s CBA

¹⁰ [Initial Project Assessment for the NSN interconnector to Norway](#), Dec 2014

¹¹ [Initial Project Assessment of FAB Link, IFA2, Viking Link and Greenlink Interconnectors](#), Mar 2015

¹² [Update on IPA of the Greenlink interconnector](#), Aug 2015

¹³ [Initial Project Assessment of the GridLink, NeuConnect and NorthConnect Interconnectors](#), Aug 2017

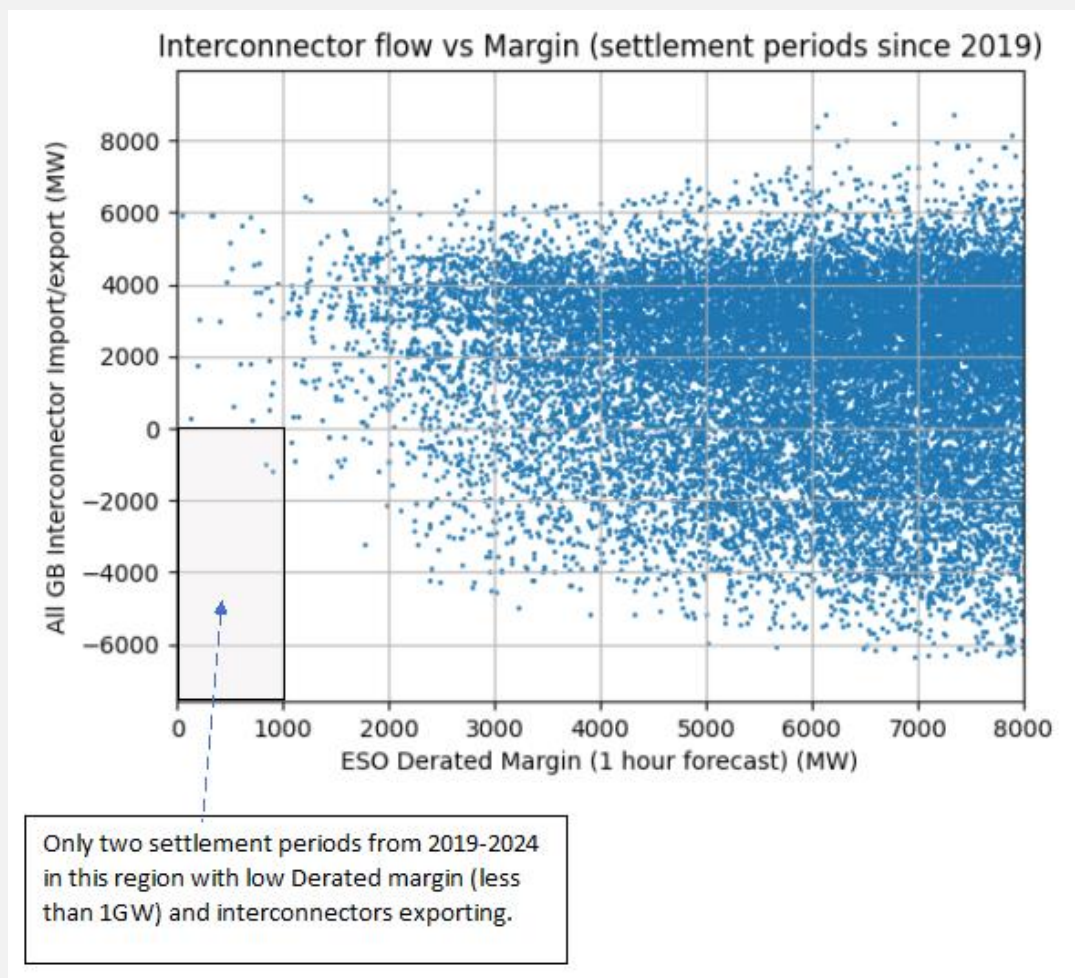
- Ofgem's CBA has assessed vast decarbonisation benefits across GB and Europe from delivering but the monetised measure fails to capture this positive contribution, with the decarbonisation impact being represented as a societal cost to GB.
- Avoided curtailment of renewable energy is an unquestionable wider benefit of increased interconnection capacity, but this is not monetised.
- **GB security of supply is under-valued in Ofgem's CBA.** The transmission-level flexibility that interconnection brings to a decarbonised electricity system provides a vital contribution to affordable security of supply. It is critical that this is appropriately accounted for in Ofgem's IPA assessment.

The assumptions underpinning Ofgem’s CBA has resulted in GB being forecast to predominantly be a net exporter by 2030. However, ‘net’ trends will inevitably conceal considerable underlying market volatility and occasional price shocks, and in those periods cross-border interconnection can ensure that consumer demand and security of supply is met at the most affordable prices.

Interconnectors play a key role in supporting GB security of supply during times of electricity system stress

De-rated margin is an indicator of GB system tightness, published each hour by the ESO. A de-rated margin of less than 1GW could be considered ‘tight’ while a margin of less than 500MW is likely to trigger a capacity market warning notice if forecast in advance.

By plotting GB imports/exports against the de-rated margin it is clear that the interconnectors that link GB to continental Europe have a strong tendency to operate in the GB-import direction when GB margins are tight. There were just two instances of GB-exports when de-rated margins have been below 1GW since 2019 and none when the level was lower than 500MW.



In line with the performance of the existing operational GB interconnector portfolio, Nautilus would offer robust benefits to GB through its support to security of supply. Offering 1.4GW of capacity, when GB margins are tight Nautilus will deliver huge power flows to GB as other

operational interconnectors do today. For the future GB electricity system in which intermittent renewables make up a significant share of the generation mix, this magnitude of flexible capacity will provide crucial benefits to system security.

Quantifying the incremental value that additional interconnection brings to security of supply as a monetised benefit is not straightforward. We understand that a quantified metric is preferred by Ofgem and the chosen method was to derive the reduction in unserved hours of energy. This is one approach but has limitations given that, by definition, future energy scenarios are constructed to provide different paths for ensuring there is sufficient system margin to meet demand. It is unsurprising that under the most decarbonised GB scenario in Ofgem's CBA, the **security of supply benefit of Nautilus is nearly £5bn using the FA approach**. While it represents one scenario, this quantified benefit should not be discounted from Ofgem's economic assessment on the basis that it is not Ofgem's MA central case. The nature of the risk on security of supply, and the corresponding opportunity cost of not having sufficient system margins, is that it should reflect the worst-case credible scenario, of which is the FA approach.

- An alternative **measure for evaluating the contribution of assets to GB security of supply is to assess the impact they might have on the Capacity Market (CM)**. The CM is the instrument used in the GB electricity market to ensure security of supply for which the total cost in a given year is the cost of providing a targeted GW supply that exceeds peak demand.

For illustrative purposes, NGV conducted analysis to calculate the potential cost savings that Nautilus and LionLink could contribute to the CM, as price takers in the auctions, by providing an additional 2GW de-rated capacity to security of supply from 2032 onwards. We expect the CM to tighten between 2030 and 2035, driven by the exiting of gas plant, potential delays in the Hinkley C nuclear plant and faster electricity load growth from data centres and the electrification of heat and transport. Under these conditions, the CM clearing prices are more sensitive to any change in price taker capacity. Based on our analysis, **including both OHA pilot projects in the capacity mix in 2032 could save consumers an additional £1.2bn in CM payments for 2032 alone**, maintaining the same security of supply levels and CM capacity procurement targets. Extending this analysis, **inclusion of Nautilus and LionLink in the capacity mix over the period 2032-2040 could save consumers an additional £6.7bn**.

- Ofgem's CBA has assessed **vast decarbonisation benefits across GB and Europe** from delivering but the monetised measure fails to capture this positive contribution, with the decarbonisation impact being represented as a societal cost to GB. In any assessment of decarbonisation impacts, it is right to account for the net effect across relevant geographies rather than impact within a single jurisdiction (e.g. GB alone, which would be misleading). The CBA identified **overall net reductions in carbon emissions across GB and Europe of 10.6Mt in Ofgem's MA central case** (Consumer Transformation) and this is a hugely significant project benefit.

While the overall decarbonisation impact of Nautilus (in reduced volume of CO₂ emissions) is represented in Ofgem's CBA multi-criteria, the monetised CO₂ reduction (as societal value) only references the GB impact. A further consequence of GB being the net exporter is an expected increase in the dispatch of thermal generation in GB compared to the counterfactual, meanwhile there is a net increase in overall usage of renewable energy sources across Europe. The monetised decarbonisation impact to GB of Nautilus is represented by a £0.5bn societal cost in Ofgem's MA central case. This conclusion is deeply misrepresentative of the actual positive contribution that Nautilus would make to decarbonisation, as demonstrated in the non-monetised results. It is a

fundamental distortion in Ofgem's assessment not to monetise the net European impact of decarbonisation. **In CBA analysis undertaken by NGV, NGV found decarbonisation benefits of £2.5bn from the delivery of Nautilus** (calculated as CO₂ savings). In the Joint CBA, NGV and Elia found European societal cost of carbon benefits by 2040 of €40-180m/year across the six modelled scenarios (full details of the Joint CBA are set out in the confidential annex).

- **Avoided curtailment of renewable energy** is an unquestionable wider benefit of increased interconnection capacity, but this is not monetised. One of the most compelling wider benefits of increased interconnection is the avoided curtailment of renewable energy sources through increased integration. Again, like the overall decarbonisation impact, this is not monetised in Ofgem's CBA, which identifies Nautilus as capable of delivering an average benefit of 0.1 TWh/year in the MA central case. We understand that Ofgem's choice not to monetise this indicator has followed ENTSO-e guidance, however, not doing so risks failing to recognise the substantial value to the integration of renewables that is delivered by Nautilus. As part of a project CBA undertaken by Afry for NGV, across the 25-year period, **renewable curtailment benefits of £2.1-£2.9bn were identified from the delivery of Nautilus.**

3.5 The modelled GB constraint costs are over-estimated and should not be interpreted as consumer disbenefits. NGV and Elia are deeply concerned that the output of the ESO's GB constraint cost modelling is being used within the overall CBA to infer large-scale consumer disbenefits from the OHA pilot projects, when in fact they should provide a signal for network reinforcement. We note that generation connections are not subject to this form of assessment due to the Connect and Manage regime but are likely to produce significant constraint costs in the absence of wider transmission infrastructure.

In GB, while interconnectors and OHAs are developer-led, ultimately the GB connection location is decided by the ESO. Through the Connection and Infrastructure Options Note (CION) process, developers are given their GB connection point by the ESO. Given that an assessment has already been undertaken and concluded by ESO for the selection of the connection location, it is very unfortunate that a second assessment can be undertaken by ESO within this IPA process that is capable of discrediting the case for delivering this critical infrastructure.

In our experience, **constraint cost analysis is extremely sensitive to inputs used and chosen modelling techniques,** with the potential for different (reasonable) approaches to the same question to lead to considerably divergent results. Amongst other factors, these results will be extremely sensitive to assumptions on GB network design (the analysis will not use the most recent recommendations from the ESO's Beyond 2030 report¹⁴), the assumed location of GB generation and possible interactions with future market design reforms.

As with SEW analysis, the system constraint impacts of the GB network will be highly sensitive to the direction of flows (and extent to which GB is a net exporter). Depending on the connection location, export flows may exacerbate or alleviate existing GB network constraints. As we noted above, the CBA assumptions have resulted in net export flows across Nautilus. Were the flows less export dominant or even reversed, as may be produced using different input scenarios and baseline interconnection, the extent of these projected impacts could be reduced.

¹⁴ <https://www.nationalgrideso.com/future-energy/beyond-2030>

NGV and Elia would suggest caution is taken in how the ESO results are used against the wider CBA. Interconnectors are transmission assets connecting GB to other markets providing critical flexibility to the GB grid, it is inappropriate both to interpret their existence as the cause of transmission constraints and to directly interpret these results as consumer disbenefits. In our view, **the ESO's analysis undertaken for Ofgem has resulted in over-inflated constraint costs and should be given less weight in the overall IPA assessment**, doing so would improve even further the case for Nautilus.

There are distinct differentiators that set OHAs apart from point-to-point interconnectors. The flexibility of the OHA pilot scheme should be harnessed to recognise this.

It is right that OHAs are being assessed within the pilot scheme, which should be treated as a process that is distinct from the established regime for point-to-point interconnectors.

The pilot scheme offers a valuable opportunity to evolve the cap and floor regime to be suitable for OHAs projects. We are disappointed by Ofgem's assessment that Nautilus has not demonstrated sufficient net benefits yet for regulatory approval, and in our view the real benefits will be greater still than those monetised values in the CBA results.

The cap and floor regime has successfully facilitated the positive final investment decisions of six point-to-point interconnectors to GB, with NGV being joint partner in the four that are now operational and operating jointly with Elia the first cap and floor interconnector Nemo Link. The enduring regime, which built on the first-of-a-kind regulatory framework developed with the Nemo Link pilot project, has proved to be an effective policy that has been replicated across countries and technologies. However, distinctive benefits, risks and commercial models set OHAs apart from point-to-point interconnectors. This is the first opportunity to test the regime for OHAs and, just as the regulatory process was developed in conjunction with development of the Nemo Link pilot project, the OHA pilot scheme should allow for 'learning by doing' and enable appropriate adjustments in response to the unique features of this new asset type.